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Who Decides Matters: Female Representation and Academic Career Advancement

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Who Decides Matters: Female Representation and Academic Career Advancement *

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Abstract

This paper investigates the gender gap in academic promotions. The theoretical model proposed, in which men and women collectively negotiate their career upgrades but with different bargaining power, predicts that the likelihood of career progression for women depends negatively on the share of female scholars among the eligible candidates and positively on the available resources and women's bargaining power. We relate the latter to metrics of women's relative representation, such as the Glass-Ceiling Index, the Female Ratio, and the Share of Females in the boards in charge of deciding about those promotions. Leveraging a novel and suitably built dataset covering the universe of Italian Universities' Departments, we find robust evidence supporting these predictions. In particular, the probability of women being upgraded to associate and full professors is strongly and positively associated with the shares of women in the pool of professors in charge of deciding about those promotions.

JEL Codes: J16, J71, J53, D79

Keywords: gender gap, bargaining power, gender representation, career advancement, academia

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1 Introduction

Although the presence of women in academia has increased constantly in the last years, a picture of disparity still appears. In fact, while the gender distribution is pretty much balanced among undergraduates, Ph.D. graduates, and even non-tenured researchers, women are still less likely to secure tenure, and once done, they are still less likely to achieve the highest career levels. Arguments based on productivity, self-selection, shyness, and fertility have been shown to provide only a partial explanation of the gender gaps observed in entering and - especially - in getting career advancements in academia (Filandri and Pasqua (2021), Larivière et al. (2013), Mairesse and Pezzoni (2015), Nielsen (2016), Jappelli et al. (2017), De Paola et al. (2017), Bosquet et al. (2019), Ramos et al. (2020)).

In a recent paper, Brunetti et al. (2024) are able to add to the picture another potentially relevant factor of the gender gap observed in Italian academia. In particular, they explore the role of mobility, dissecting the results by promotions that occurred within the same institution and those that occurred along with a move to a different University. Specifically, when it comes to "internal" upgrades, i.e. those occurring within the same University, the observed gap, estimated after controlling for traditional justifications provided by the literature, namely, attitude to compete and scientific productivity, is quite remarkable in size: 4 percentage points for transition to associate professor and as much as double for upgrades to full professorship. On the other hand, the gap is remarkably reduced, up to six times smaller, for external promotions. A suggestive conclusion is that promotions are not all alike. Internal promotions might be commingled by personal attitudes, long-lasting relationships, and negotiation skills, which typically disadvantage women. On the other hand, career advancements outside one's previous institution might follow a more purely competitive mechanism based on skills and credentials inferable from the candidate's overall curriculum vitae only.

Building on this conclusion, this paper aims to take a step further and investigate an additional potential contributor to the gender gap observed in internal career advancement opportunities. Specifically, we focus on the different collective bargaining power that men and women have in negotiating their internal promotion, depicting how it might be reconnected to their respective representation in the boards where career advancements are decided and, hence, how it might eventually affect their likelihood of career advancement. This focus is consistent with the significant impact that gender representation has in determining the results of negotiation processes recently pointed out by the literature (see, e.g. Baranski et al. (2023)).

Our emphasis is deliberately placed on "internal" upgrades, i.e., those occurring within the same University. Several factors contributed to this decision. First, they are the vast majority: 97.33% of all the competitions for associate and full professors announced in Italy between 2012 and 2021 have been won by scholars who previously held a lower-rank position in the same University announcing the competition. Second, as proved in Brunetti et al. (2024), these are the ones in which the gender gap is more persistent, even after controlling for both scientific productivity and individual attitudes of shying away from competition. Third, internal promotions are those in which personal interactions, with both peers and higher-rank colleagues, are more likely to play a significant role, and - as Amer et al. (2024) recently proved - personal interactions tend to widen the gender gaps.

Our contribution is twofold. First, we propose a simple theoretical model that sketches the essential mechanism of the negotiation process that occurs within a Department when a limited

amount of resources is allocated for promotions. The Department members are divided into two groups according to their gender. The two groups negotiate their promotion collectively and have different bargaining power. Our model predicts the probability of career advancement for the two competing groups as a function of the resources available for upgrades, the degree of representation of each group within the pool of eligible for an upgrade, and the bargaining power of each group.

Second, we test the model predictions empirically using data referred to all the Departments of the Italian public Universities. The dataset is suitably derived starting from the data referred to the universe of professors working in Italian universities between 2012 and 2021. Leveraging the information provided for each professor on gender, the Department of affiliation, and the academic position at the end of each year, we are able to retrieve the actual frequency of career advancements for (men and) women in each Department. Then, we link it to the available resources, to the share of females among those eligible for promotion, and to different measures of female representation within the Department, and in particular, within the boards in charge of the decisions about promotions, which we claim could well act as a proxy of their bargaining power.

We find robust evidence in support of the testable implications derived on the basis of the theoretical model. Specifically, the probability of career advancement is negatively associated with the share of women among those eligible for upgrades, consistent with a competition framework. Moreover, it is found to increase with the share of females in the pool of professors actually in charge of deciding on these career advancements. Finally, the probability of career advancement is found to be positively associated with the resources available in the Department, but only for upgrades to associate professorships. In other words, the progression to the highest academic career level for women does not seem to be a matter of the available resources.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature exploring the impact of gender on negotiation outcomes. Section 3 describes the institutional background while Section 4 presents the stylized model that offers testable predictions on the main determinants of the probability of female career advancement within a University Department. The data set used and the empirical strategy implemented are presented in Section 5, while the main results and their robustness are discussed in Sections 6 and 7, respectively. Finally, Section 8 concludes.

2 Related literature

A vast body of literature addresses the issue of gender gaps in the labor market. The most relevant for this paper is the stream of literature that specifically focuses on the role of gender in the output of negotiations.

Most studies exploit salary negotiations, finding that women are less likely to initiate negotiations in the first place. For instance, in a field experiment involving nearly 2,500 job seekers, Leibbrandt and List (2015) find that the gender pay gap is more pronounced when the job posts are ambiguous about the possibility of negotiating the wage. In this case, women are more likely to be willing to work for a lower wage than advertised and less likely to negotiate a higher wage than men. Among the possible causes for this reluctance to engage in negotiations is the greater anxiety that women report compared to men when they negotiate (Bowles et al. (2005), Small et al. (2007)).

In addition, there is consistent evidence that, when negotiating, women request significantly lower wages than men (Rigdon (2012)), and gain less than men (Babcock and Laschever (2009); Gerhart and Rynes (1991)). For instance, Säve-Söderbergh (2019) uses data on salary negotiation requests between recent college graduates and their prospective employers at the time of employment, and finds that women ask for salaries that are three percentage points lower than their male counterparts applying for similar jobs. As a result, women obtain lower starting wages from employers.

The persistent gender gap in labor market outcomes is also often related to the different attitudes that men and women have in negotiations, which a wide body of both experimental and survey studies link to different preferences for risk, ambiguity, and altruism (see, e.g., the survey by Recalde and Vesterlund, 2023). Experimental evidence shows that women are less confident and competitive in negotiations (Niederle and Vesterlund, 2007), they tend to be more generous than men (Eckel and Grossman, 1998; Rigdon et al., 2009), and they are significantly more cooperative (Eckel and Grossman, 2001; Eckel et al., 2008).

Not surprisingly, the gender composition of the negotiating team is found to be relevant in determining the outcome of the negotiation, as testified by lab experiments exploiting multilateral bargaining settings. Dufwenberg and Muren (2006) find that in three-person teams, groups with female majorities offer more to an individual recipient and choose the egalitarian division more often than groups with male majorities. Quite interestingly, they also show that increasing the number of women in the group increases the team's generosity, but this does not happen when just one woman is added to a group of men. This result suggests that women need to be "more than a token" in order to significantly affect the outcome of a negotiation, as claimed by Eckel et al. (2008). In another multilateral bargaining experiment with varying gender composition, Baranski et al. (2023) find that the exclusion of women from the alliances is a key determinant of the gender gap in earnings. They indeed find that men tend to form male-majorities more often and that in mixed coalitions, they are less loyal to their female partners, making a mixed-gender coalition less likely to be stable, while the same result is not found for women.

Consistently, Biasi and Sarsons (2022) find that the gender composition of schools' and districts' leadership makes the difference in shaping the gender pay gap. Indeed, analyzing the wages of public school teachers in Wisconsin after a reform that introduced the possibility for teachers to negotiate their salary, they find a statistically significant gender wage gap only in schools with a male principal and in districts with a male superintendent. Other studies , e.g., Grissom et al. (2012); Husain et al. (2023); Cardoso and Winter-Ebmer (2010); and Flabbi et al. (2019) focus on the congruence between the gender of managers and employees. Among the most recent contributions in this direction, Cullen and Perez-Truglia (2023) find a significant advantage for men in interacting with a male manager: after transitioning from a female to a male manager, men are significantly more likely to be promoted than male employees who experienced the transition from a female to another female manager. This effect is not found for female employees. From back-of-the-envelope calculation, the authors estimate that removing this advantage would reduce the gender gap by roughly 40%.

The closest contribution to our study is Kunze and Miller (2017). Exploiting a large dataset of white-collar private sector workers in Norway, the authors find that the gender gap in career

advancement is reduced when more women are in the next higher ranks. Interestingly, they also find that the number of female coworkers, i.e., at the same rank, increases the gender gap. According to the authors, these results prove that the link between the observed gender gaps in promotion and female representation is not one-directional. On the one hand, more female bosses in the next higher rank contribute to the reduction of the gender gap in career advancement. On the other hand, more female peers increase the gender gap, a result that could be explained by greater competition and less cooperation among those who must compete for limited resources.

To sum up, both experimental and survey literature provide consistent evidence: the observed gender gap in promotions could be connected to the composition, in terms of gender, of both the bargaining committee and the pool in charge of the decision-making process.

Against this background, we thus explore, both theoretically and empirically, the role of gender representation, both among the eligible candidates and in the pool of those in charge of the relative decision, on the probability of career upgrades for female professors in the context of Italian public academia.

3 Institutional Framework

Career upgrades within Italian academia represent the ideal setting for our analysis for several reasons.

First, the salaries of Italian universities' professors are non-negotiable and gender-neutral, as they are set by the Ministry of the University and reported in specific salary tables. Salaries can only increase significantly with career advancement.[1] This means that, in the Italian academic context, career upgrade negotiations can be compared to salary negotiations to some extent. Despite the non-negotiability and the gender-neutrality of salaries, a salary gap between male and female professors is yet there due to the significant gender gap in terms of the likelihood of promotion observed in Italy (see, e.g., Filandri and Pasqua (2021) and Brunetti et al. (2024)).

Second, an academic career upgrade comes with an increase in remuneration but not necessarily with longer working hours, as opposed to many private-sector jobs. In fact, associate and full professors have similar obligations. Teaching loads (set by the law) are identical, and additional administrative tasks are not mandatory. Besides, with very few exceptions (Head of the Department, Dean, and Rector), all administrative tasks can be assigned to associate or full professors indifferently. In other words, promotions correspond to a salary increase but not necessarily to an increase in hours worked, effort, and job responsibilities. Thus, since associate and full professors share the same burden in terms of job duties, there is no reason why women should refrain from competing to be promoted. [2]

Lastly, career upgrades are easily observable, as we explain in Section 5, as detailed data about professors working in Italian Universities are publicly available.

In Italian academia, upgrades from assistant to associate professor and from associate to full

[1] Salaries also undergo minor and largely automatic increments with seniority in the same career level.

[2] Bosquet et al. (2019) similarly focus on the promotion system for French academic economists, and note that professors have similar obligations at all hierarchical levels. Accordingly, "*female associate professors should not feel more constrained in terms of combining career and family duties by becoming full professors; hence, there is no obvious reason why they would prefer not to be promoted*" (p. 1021).

professor can only occur by winning a public competition opened by a Department once it has the required economic resources.[3]

Italian public universities obtain their resources (almost) entirely from the Italian Ministry of the University. The Ministry allocates these resources yearly based on a series of criteria. Some of these criteria are set at the national level and thus are common to each University, such as the general turnover. In contrast, others are University-specific, such as the number of currently working and ceased professors, the student-teacher ratio, the performance based on the Evaluation of Research Quality (VQR, Valutazione della Qualità della Ricerca), the ratio between personnel expenditure and entrances, and other pertinent indicators of budget sustainability. Yet, none is linked to the gender composition of the staff, so the Ministry maintains full gender neutrality in allocating the resources. These resources are conventionally expressed in Staff Points (Punti Organico). One Staff Point corresponds to the average cost of a full Professor and is used as a benchmark measurement unit for the other career levels. Indeed, an associate professor corresponds to 0.7 Staff Points, while an assistant/tenure-track professor to 0.5 Staff Points.

It is important to notice that budget rules in Italian academia are such that if the public competition for an associate professor is eventually won by a scholar already working in the University announcing the position, the overall cost for the University is 0.2 Staff Points (i.e., the difference between the "value" of the associate position, 0.7, and the "value" of the assistant professor already affiliated to the department, 0.5), rather than 0.7 Staff Points. By the same token, the overall cost of an upgrade of an associate to full professor within the same University is 0.3 (=1 - 0.7) rather than 1 Staff Points. Not surprisingly, 97.33% of all competitions announced in Italy in the last decade were eventually won by professors who previously held a lower-rank position in the same University that announced the competition. This means that competitions for associate and full professors are often used to upgrade scholars already working in the same Department, and only to a lesser extent to recruit new scholars.

Provided the resources, the opening of a new position is decided by each Department. More specifically, decisions concerning the opening of positions of associate professors are made by the joint board of full and associate professors affiliated with the Department, while decisions relative to the opening of full professor positions are made by the board of affiliated full professors only.

Several factors are taken into account when making this decision, including scientific productivity and professional networks, teaching commitments, and institutional responsibilities of eligible candidates aiming for an upgrade, which are often more than one and with similar qualifications. The process leading to the final decision typically spans several months, during which eligible scholars advocate for their candidacy. We conjecture that this is the point of the process where the gender of the scholars who bargain their upgrade, on the one hand, and the gender composition of the deciding board, on the other, are likely to matter the most.

[3]These competitions can be either "selective" or "valutative". In the former case, participation is allowed to all scholars already holding a position at the same level elsewhere (e.g., associate or full professors in another Italian University or abroad) and to those accredited with the National Scientific Habilitation (NSH) for the corresponding level and in the specific scientific area (procedures regulated by Law 204/10, Art. 18). In the latter case, only scholars accredited with the NHS and who are already affiliated with the university that announces the competition (as set by Law 240/10, Art. 24) can compete. It should also be noted that we are not considering as negotiable upgrades the transitions of the so-called RTD-B researchers to associate professors, as they are tenure-track researchers following their own specific path and their case does not fall under the instances studied in this paper.

The outcome of this negotiation leads to the definition of an ideal profile and areas of expertise of the desired candidate. The Department then makes the public announcement detailing the level, i.e., whether the call is for an associate or a full professor, the scientific sector of the position, and, in some cases, a brief description of the profile of the ideal candidate.[4] The intersection of these details leads to a limited number of potential winning candidates, which quite often is just one among those already working in the Department announcing the competition.

The outcome of the competition is determined by a suitably selected committee of professors. One of these professors is directly nominated by the Department among its affiliated full professors. The others are randomly drawn from a list - defined by the Department itself - of professors affiliated with other Universities.[5] Both the list of potential professors and the directly nominated professor included in the final committee are decided by the same Department board that decided to announce the public competition in the first place. The committee then evaluates the candidates' CVs based on some criteria set by the committee itself (and chosen before knowing who are the participants in the competition) and indicates one (or, in some cases, more than one) winning candidate(s). Then, the Department chooses the winning candidate to recruit.

This process is, in principle, competitive since all participants are evaluated on the basis of the same criteria and all have the same chances of being the winner regardless for whether they already work in the announcing Department or not. Yet, as recalled above, in almost all cases the candidate selected by the committee ends up being the scholar already working in the Department announcing the competition. Indeed, despite the committee has the last word, its final decision typically aligns with the Department's interest. This alignment of interests may be easily obtained by means of the committee member directly nominated by the Department and by an appropriate choice of the professors included in the list of potential other committee members. Moreover, if the selected candidate is not in line with the desired profile, the Department may also choose not to hire him/her. Yet, not surprisingly, this event rarely happens, also because it implies a relevant penalty for the Department in the form of a ban from opening new competitions in the same scientific area for at least 1 year.

Given these premises, it follows that the decision about the career advancement of an internal candidate is basically taken before the opening of the position and by the Department board of full, if the position is for a full professor, or full and associate professors, if the position is for an associate professor.

4 The Model

In this section, we sketch a model that stylizes the process that occurs within the Department when decisions about upgrades are taken.

The negotiation is modeled as a collective process. Despite individual attitudes undoubtedly play a role, in this context, the bargaining process could be reasonably modeled as collective. In fact, on the one hand, the resources are limited, meaning that the promotion of one individual excludes others. The outcome of an individual, thus, is not independent of the outcome of his/her peers. On

[4] According to the law, however, the committee cannot base its final decision on the profile specified in the call.

[5] The number of potential members in the list is typically set to twice the required number in the final committee.

the other hand, the decision regarding the opening of the position, and ultimately the upgrade, is also made collectively by a pool of professors. In other words, although individual in nature, the negotiation process eventually involves the entire organization.

Despite we are well aware of the disparate factors at play in such a complex process, for the sake of simplicity and in order to better emphasize the role of the (expected) different bargaining power of men and women, our model will just focus on the gender dimension.

We therefore assume that the individuals involved in the negotiation process, both among those eligible and among the decision-making group, belong to two categories only: male and female scholars, which will be denoted with M and F, respectively.

Moreover, upgrades from assistant professor to associate professor and from associate professor to full professor are modelled in the same way. Therefore, we generically refer to Grade L for the lower rank and Grade H for the higher rank.

The model starts with the central planner, i.e., the Ministry - representing the employer of public Universities' professors - allocating the resources to Universities (which in turn allocate them to Departments). As said, this allocation is based on technical exogenous factors and thus maintains gender neutrality. Such resources are limited and known and will thus represent the constraint in the negotiation process, which we will denote with p.

Once the resources are allocated, the collective bargaining process starts. We denote with S (Supply) the number of Grade L professors eligible - and hence bargaining - for promotion to grade H. Therefore, S_F (S_M) represents the number of female (male) professors eligible for the upgrade. The total number of scholars eligible for promotion is thus $S = S_F + S_M$ and the share of females among the eligible is $\alpha = \frac{S_F}{S}$.

Each of the eligible candidates receives a wage denoted with W_L and aims to get an upgrade to Grade H in order to receive a higher wage, W_H, where $W_H > W_L$. Note that, consistently with the Italian law, given the career level, there are no differences in wages between females and males, i.e. $W_{LF} = W_{LM} = W_L$ and $W_{HF} = W_{HM} = W_H$.

Given the limited amount of resources, only a fraction of S_F and of S_M will undergo a career advancement from assistant to associate professor or from associate to full professor.

We denote both these events with U (upgrade), so U_F (U_M) will represent the number of female (male) professors who are upgraded. The probability of obtaining a promotion for women is therefore $p_F = \frac{U_F}{S_F}$, and the corresponding probability for males is $p_M = \frac{U_M}{S_M}$.

The unconditional probability of career advancement is thus:

$$p = \frac{U_F + U_M}{S_F + S_M} \tag{4.1}$$

and can be rewritten as[6]:

$$p = \alpha p_F + (1-\alpha) p_M \tag{4.2}$$

Under the assumption that all resources are used for upgrades, Equation 4.2 will represent the budget constraint of the bargaining process.

[6] See Appendix A1.

Once U_F units of female eligible are upgraded, the total income of the female group is:

$$\begin{aligned} Y_F &= U_F W_H + (S_F - U_F) W_L \\ &= U_F (W_H - W_L) + S_F W_L \\ &= p_F S_F (W_H - W_L) + S_F W_L, \end{aligned}$$

where the last passage leverages the definition of the probability of being promoted for women so that $U_F = p_F S_F$.

By the same token, the total income for the male group once U_M units of female eligible are upgraded is:

$$\begin{aligned} Y_M &= U_M W_H + (S_M - U_M) W_L \\ &= U_M (W_H - W_L) + S_M W_L \\ &= p_M S_M (W_H - W_L) + S_M W_L, \end{aligned}$$

where, again, the last passage relies on $U_M = p_M S_M$.

The gain each group gets from the upgrades can be defined as:

$$G_F = Y_F - S_F W_L = p_F S_F (W_H - W_L)$$

and

$$G_M = Y_M - S_M W_L = p_M S_M (W_H - W_L).$$

Each of the two competing groups will engage in a bargain aimed at maximizing its gain. Notice that this will necessarily be achieved through the maximization over p_F and p_M, since W_H and W_L are set exogenously and S_F and S_M are fixed and given.[7]

The constrained maximization problem can thus be expressed as follows:

$$\begin{aligned} &\max_{p_F,\, p_M} G_F^{\gamma} G_M^{1-\gamma} \\ &\text{subject to: } p = \alpha p_F + (1-\alpha) p_M. \end{aligned}$$

where we denote with γ the bargaining power of one of the two competing groups, i.e., the female one, and with its complement, $1-\gamma$, the bargaining power of the counterpart, in this case, the pool of male professors.

[7] The theoretical framework presented draws inspiration from the game-theoretical model of wage bargaining proposed in Sap (1993) but deviates from it in several aspects. First, Sap (1993) proposes a 2-step model. In the first, the union determines the wage and negotiates the labor force with the employer. In the second, given the demanded wage, the employer offers the labor force. Our model requires a 1-step only since there is no bargaining between the University and the Ministry and resources are taken as given. Second, in Sap (1993), workers bargain their wages, while in our setting, workers bargain their career upgrades. A last consideration is that in Sap (1993), employers are organized into groups and engage in collective bargaining through unions, which may include specific women's divisions with tailored claims. In the Italian academy, professors are rarely unionized, and there is no dedicated women's division. Nonetheless, this conceptual framework maintains a setting consistent with the differences in power dynamics between genders.

The first-order conditions for the solution of the maximization problem are:

$$\begin{cases} \gamma(p_F S_F)^{\gamma-1} S_F (p_M S_M)^{1-\gamma}(W_H - W_L) + \lambda\alpha & = 0 \\ (1-\gamma)(p_F S_F)^{\gamma} S_M (p_M S_M)^{-\gamma}(W_H - W_L) + \lambda(1-\alpha) & = 0 \\ p - \alpha p_F + (1-\alpha) p_M & = 0 \end{cases}$$

where λ is the Lagrange multiplier. The solution leads to the following relation between p_F and p_M:

$$p_F = \frac{1-\alpha}{\alpha} \frac{\gamma}{1-\gamma} p_M. \tag{4.3}$$

Recall that α and γ represent the share of women among the eligible and their bargaining power. While α is easily observable, γ has no univocal definition and no clear empirical counterpart. Our claim is that this parameter could reasonably be assumed proportional to the representation of women in the pool of professors in charge of the decisions about promotions. Under this assumption, equation 4.3 proves that the probability of promotion for women equals that of men, and hence that of the population, only when $\alpha = \gamma$, i.e., when the distribution of male and female professors is constant across the hierarchical grades. On the other hand, the situation $p_F < p (< p_M)$ is realized when $\gamma < \alpha$, that is, when the share of women among those in charge of deciding for upgrades is lower than the share of women among those eligible for upgrades.

In other words, our model predicts that the well-known "scissor," i.e., the observed gender gap in the probability of career advancement, can be linked, among other things, to the lower presence of women in higher positions.[8]

4.1 Testable Implications

Equation 4.3 can be re-written as[9]:

$$p_F = \frac{\gamma}{\alpha} p \tag{4.4}$$

Based on that, we derive some testable implications on p_F, the probability of career advancement for women. In particular, we formulate the following hypotheses:

H1: p_F is proportional to p, representing the resources available in the Department for professors' promotion;

H2: p_F is inversely related to α, the share of women among the eligible for upgrades in the Department, consistently with a competitive setting;

[8]Notice that our model considers the potential role of unbalance in women's representation only within the pool of professors in charge of the decision to open the selection procedure. Previous contributions such as, e.g., (De Paola and Scoppa, 2015), have shown that gender also plays a role with reference to the composition of the committee that evaluates the candidates. Given the focus of our contribution, which aims at eliciting the role of bargaining power of different genders within the departments, we disregard the potential role of the gender composition of the evaluating committee from the analysis.

[9]Full derivation reported in the Appendix

H3: p_F is directly related to γ, capturing the bargaining power of female professors within the Department.

We claim that a reasonable assumption is that γ is proportional to the relative representation of the female group within the organization where the negotiation process takes place.

Conventional measures of gender (under-) representation in an organization are the Glass Ceiling Index, the Female Ratio, and the Share of Females in decisional boards.

The Glass Ceiling Index (GCI) is among the most commonly used measures of vertical segregation, as it compares the proportion of women in apical positions with their overall representation across all career levels in an organization. It only takes positive values, with value 1 signaling gender parity. Values greater than 1 signal that female representation decreases as the career ladder increases, with ∞ signaling a complete lack of women in the top career positions. Thus, it is reasonable to assume that the bargaining power of females within a Department, γ in our model, is negatively related to the GCI of that Department.

The Female Ratio (FR) measures the proportion of female scholars in the organization. This proportion ranges from 0, denoting the complete absence of females, to ∞, indicating that only females are present, and is 1 when there is an equal number of females and males. Hence, we expect the bargaining power of females to be an increasing function of the FR.

Finally, we expect the bargaining power of each group to be proportional to the degree of representation of the group in the pools deciding for the promotions. In other words, we assume the parameter γ, representing the bargaining power of the female group, to be an increasing function of the shares of females in the pool of professors deciding for the upgrades, and specifically associate and full professors for the upgrades to associate and full professors only for the upgrades to full.

If our conjectures about the relationships between γ and the GCI, the FR and the Share of Females are true, then the third testable implication of our model can be further detailed as follows:

H3a. p_F is negatively related to the GCI of the Department;

H3b. p_F is positively related to the FR of the Department;

H3c. p_F for upgrades to associate is positively related to the Share of Females in the pool of associate and full professors, while p_F for upgrades to full is positively related to the Share of Females in the pool of full professors in the Department.

5 Data and Empirical Strategy

This section describes the data and the empirical strategy used to test the predictions derived from the model sketched in the previous Section.

The dataset for the empirical analysis draws from two different sources. The first one contains information about the Staff Point assigned every year by the Ministry to each University.[10]

Note that the Staff Points are assigned to each University, but specific details regarding the distribution of these resources to each Department are not publicly disclosed. The allocation rules are

[10]Data retrieved from https://www.mur.gov.it/it/aree-tematiche/universita/programmazione-e-finanziamenti/facolta-assunzionali.

autonomously determined by the University and may involve various factors (including, e.g., inter-departmental exchanges). We thus generate the variable "Staff Point (Eq)" under the assumption that staffing resources are distributed *equally* among all Departments of each University. For example, in 2021, the University "Ca' Foscari" received 29.06 staff points and counted 8 Departments. Hence, Staffing Point (Eq) is set for that year to (29.06/8=) 3.6325 for each of the 8 Departments belonging to that University. This variable is the empirical counterpart of p, which is a function of the resources allocated by the Ministry and represents the budget constraint of our model.[11]

The second data source refers to the universe of the over 67,000 unique professors having worked in all Italian Universities between 2012 and 2021.[12] For each professor, the data report name and surname, gender, Department and University of affiliation, scientific area, and academic position (as of December 31, each year), which we categorize as follows: junior assistant professors, tenured assistant professor, tenure-track associate professors, associate professors, and full professors.[13]

In line with the theoretical model, which focuses on *career advancements within* an organization, we discarded all professors who changed (Department and/or University of) affiliation at least once during the entire sample period. We also dropped all observations with a non-permanent position, such as junior assistant professors. Each scholar left is thus either a tenured assistant, associate, or full professor. In what follows, we adopt the convention used in the European Commission's She-Figures reports, where the position of assistant professor is denoted by Grade C, associate professor by Grade B, and full professor by Grade A. Last, we drop all observations with missing affiliation or scientific area, all cases of namesakes to avoid any risk of misidentification, as well as all scholars belonging to private and/or telematic Universities, for which we do not have information about the resources allocated by the Ministry, and micro Universities, i.e., those counting less than 80 professors.[14] This leaves us with an unbalanced panel of 63,632 unique professors working in Italian Universities.

We thus derive, for each Department i and year t, the following quantities:

- N_{it} = number of professors
- $N_{F,it}$ = number of female professors
- $N_{C,it}$ = number of Grade C (assistant) professors
- $N_{FC,it}$ = number of Grade C (assistant) female professors
- $N_{B,it}$ = number of Grade B (associate) professors

[11] A robustness check on this is reported in Section 7.1.

[12] Data retrieved from the MUR website, https://cercauniversita.cineca.it/php5/docenti/cerca.php

[13] The detailed list of possible positions includes: Ordinario, Straordinario, Straordinario a tempo determinato and Ordinario r.e. (which we gather in the category "full professor"), Associato, Associato non confermato, and Associato confermato (gathered in the category "associate professor"), Ricercatore, Ricercatore non confermato (collapsed in the category "assistant Professor"), Ricercatore a tempo determinato di tipo B (according to either 2010 Gelmini Law or 2005 Moratti Law, both full and part time, gathered in the category "tenure-track associate professor) and Ricercatore a tempo determinato di tipo A (both full and part time, belonging to the category "junior assistant professor").

[14] The discarded Universities are: Cattolica del Sacro Cuore, Europea di Roma, IULM, LUISS, LUMSA, Bocconi, Libera Universita' di Bolzano, Valle d'Aosta, Gran Sasso Science Institute, Autonoma di Trento, UKE, Marconi (Tel.), USI, E-Campus (Tel.), UNINETTUNO (Tel.), UNICUSANO (Tel.), Pegaso (Tel.), Campus Bio-Medico, S.Raffaele di Milano, San Raffaele Roma (Tel.), LINK CAMPUS, LIUC, IUL, IMT Lucca, I.U.S.S. - PAVIA , UNITELMA (Tel.), L. Da Vinci (Tel.), MERCATORUM (Tel), G. Fortunato (Tel.), LUM, ROMA "Foro Italico", SUM, SISSA - TRIESTE, Scienze Gastronomiche, Stranieri Perugia, Stranieri Siena, Stranieri Reggio Calabria, HUMANITAS, and UniCamillus.

- $N_{FB,it}$ = number of Grade B (associate) female professors
- $N_{A,it}$ = number of Grade A (full) professors
- $N_{FA,it}$ = number of Grade A (full) female professors
- $U_{B,it}$= number of professors having been upgraded from Grade C (assistant) to Grade B (associate)
- $U_{A,it}$= number of professors having being upgraded from Grade B (associate) to Grade A (full)
- $U_{FB,it}$= number of female professors having been upgraded from Grade C (assistant) to Grade B (associate)
- $U_{FA,it}$= number of female professors having been upgraded from Grade B (associate) to Grade A (full).

Based on these quantities, we are able to derive all the Department-level variables required to empirically test the predictions formulated based on the model sketched in Section 4.

The solution of the model, summarized in 4.4, refers to the probability of career advancement for females, p_F, which will be denoted in turn with p_{FB} for upgrades to associate and with p_{FA} for upgrades to full professorship.

We measure the likelihood of promotion to Grade B for women, p_{FB}, as the share of female professors who were Grade C in year $t-1$ and got an upgrade to Grade B in year t, i.e.:

$$p_{FB,it} = \frac{U_{FB,it}}{N_{FC,it-1}}.$$

The likelihood of promotion to Grade A for females, p_{FA}, is computed accordingly, i.e.:[15]

$$p_{FA,it} = \frac{U_{FA,it}}{N_{FB,it-1}}.$$

Recalling the competition mechanism suggested by Kunze and Miller (2017), according to which the higher the number of peers, the lower the chances of career advancement, we also derive the share of women among those eligible for promotion, α_{it}. Specifically, we obtain $\alpha_{B,it}$ and $\alpha_{A,it}$ for progression to Grade B and to Grade A, respectively, i.e.:

$$\alpha_{B,it} = \frac{N_{FC,it}}{N_{C,it}} \qquad \alpha_{A,it} = \frac{N_{FB,it}}{N_{B,it}}.$$

Last, we obtain the measures of gender unbalance, again at the Department level. Specifically, we compute the Glass Ceiling Index (GCI), i.e.:

$$GCI_{it} = \frac{N_{F,it}}{N_{it}} \frac{N_{A,it}}{N_{FA,it}};$$

the Female Ratio (FR), i.e.:

[15]We thus assume that Grade C (assistant) professors are the *only* eligible for promotion to Grade B (associates) and that Grade B professors are the *only* eligible for promotion to Grade A (full). Accordingly, we discarded the 42 cases of "career jumps", from Grade C to Grade A, observed during the sample period.

$$FR_{it} = \frac{N_{F,it}}{N_{it} - N_{F,it}}.$$

Finally, we obtain the Share of Females in the decision pools. Recalling that promotions to Grade B are deliberated by associates and full professors, we first compute the share of women among them, i.e.:

$$S_{FB,it} = \frac{N_{FB,it} + N_{FA,it}}{N_{B,it} + N_{A,it}}.$$

which will be related to $p_{FB,it}$, the probability of upgrades to Grade B for women. On the other hand, since promotions to Grade A are deliberated by the pool of full professors only, $p_{FA,it}$ will be related to the Share of Females among full professors, i.e.:

$$S_{FA,it} = \frac{N_{FA,it}}{N_{A,it}}.$$

Based on the above quantities, we will then run several specifications of the following regression model:

$$p_{F,it} = \beta_1 + \beta_2 p_{it} + \beta_3 \alpha_{it} + \beta_4 \gamma_{it} + \epsilon_{it} \tag{5.1}$$

where:

- $p_{F,it}$ is the observed probability of career advancement for female scholars at the Department i in year t. When modeling upgrades to Grade B, we will use $p_{FB,it}$, i.e., the observed probability of career advancement to associate professors for women. When modeling upgrades to Grade A, $p_{FA,it}$, the observed probability of career advancement to full professorships for female scholars will be used instead;

- p is a function of the available resources for career upgrades in Department i in year t, which we proxy with the variable Staff Point (Eq). Based on H1, we expect the associated coefficient to be positive, i.e., $\beta_2 > 0$;

- α_{it} measures the fraction of females among the eligible for internal promotion in Department i in year t. When modeling upgrades to Grade B, we will use $\alpha_{B,it}$, i.e., the share of female professors among those eligible for career advancement to associate professorship. When modeling upgrades to Grade A, $\alpha_{A,it}$, will be used instead, i.e., the share of women among those eligible for career advancement to full professorship. Based on H2, we expect the associated coefficient to be negative, i.e., $\beta_3 < 0$;

- γ_{it} captures the bargaining power of women within Department i in year t, which we claim can be proxied by the measures of (under-)representation of women within the Department. Based on H3, we expect $\beta_4 < 0$ if the measure of female representation used is the GCI, while $\beta_4 > 0$ when the FR and SF, i.e., the share of females among the deciding professors, are used instead.

5.1 Descriptive statistics

Table 1 reports the descriptive statistics on the estimation sample, which is an unbalanced panel of almost 600 unique Departments observed over the 9-year period, spanning 2013 to 2021.

Table 1: Descriptive Statistics

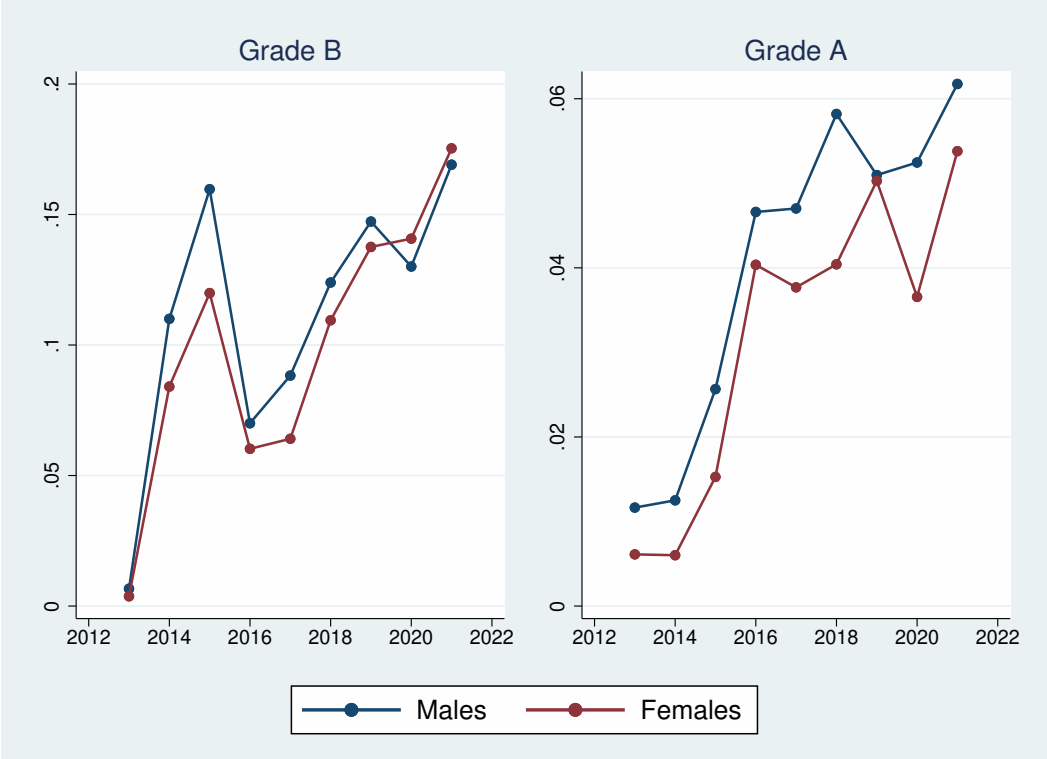
Variable	N	Mean	SD	Min	Median	Max
p_{FB}	4716	0.097	0.172	0	0	1
p_{FA}	4527	0.034	0.087	0	0	1
Staff Point	4716	38.686	37.500	0	27.590	172.870
Staff Point (Eq)	4716	1.758	1.057	0	1.659	7.302
Staff Point (Dept)	4716	1.736	1.193	0	1.534	8.948
α_B	4716	0.511	0.205	0.042	0.5	1
α_A	4674	0.383	0.189	0	0.385	1
GCI	4357	1.873	1.034	0.225	1.561	9.560
FR	4715	0.700	0.446	0.882	0.6	7
S_{FB}	4714	0.325	0.140	0	0.317	0.821
S_{FA}	4714	0.243	0.164	0	0.222	1

Notes: The table reports the summary statistics of all the variables included in the empirical analysis at the Department level.

The probability of career advancement to Grade B for females, p_{FB}, is on average 9.7%, while the corresponding probability of upgrades to Grade A, p_{FA}, is 3.4%. Both probabilities are lower than the corresponding probabilities for males, equal to 11% and 4.5% for Grade B and Grade A, respectively. In both cases, the difference is significantly positive at any conventional confidence level, thus proving the existence of a significant gender gap in career upgrades.

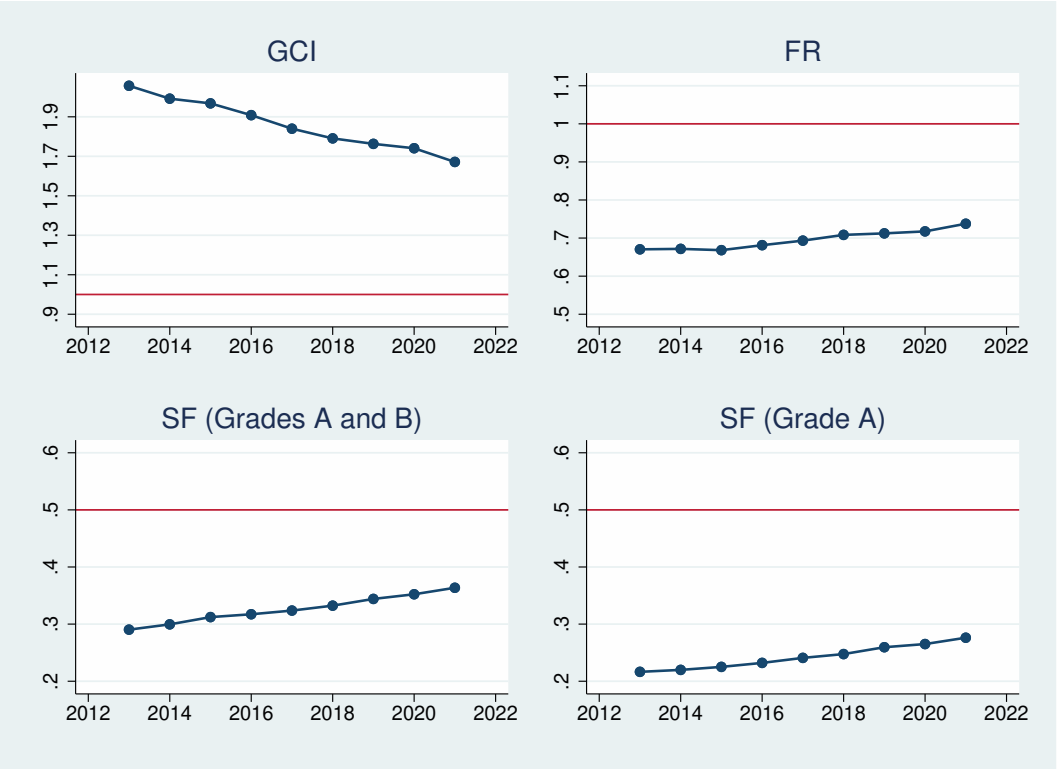
Figure 1 plots the probabilities of career advancement over time, distinguished by level and gender, and further supports this evidence also over time.

Figure 1: Probability of career advancement, by grade and gender



Notes: The Figure reports the average probability of career upgrade for each year in the estimation sample by gender of the scholar.

Figure 2: Measures of female representation, over time



Notes: The Figure reports the average value of each measure of female representation considered for each year in the estimation sample GCI stands for Glass-Ceiling Index, FR for Female Ratio, SF for Share of Females. The red line represents the level indicating gender parity.

All measures of female segregation considered, despite a constant improvement over time (see Figure 2), signal that women are typically underrepresented: the GCI is, on average, higher than 1, while the FR is lower than 1. The same applies to the share of females in the University staff: women represent, on average, 38% of associates and only 24% of full professors, confirming the well-known "scissor" between the genders that widens with the career ladder.

6 Main Results

Table 2 reports the estimates obtained for model 5.1 when the dependent variable is the probability of progression to Grade B (associate) for female professors.

All hypotheses are supported by the data. In particular, in support of H1, the probability of career advancement for women is positively and significantly associated with the resources available in the Department. The estimates show that for every additional Staff Point available to the Department, the probability of career upgrades for women increases slightly more than 2%. Moreover, according to H2, the higher the level of competition, as proxied by the proportion of eligible for advancement to Grade B, α_B, the lower the chances of career advancement for women. Finally, we observe a positive correlation between the probability of upgrades and both the FR and the Share of Females, i.e. S_{FB}, among associates and full professors, in line with H3b and H3c. In other words, the higher the representativeness of females in the Department, the higher the likelihood for females in that Department to get a promotion to Grade B. Moreover, the size of the coefficient for the

Table 2: Advancement to associate professorship

	(1)	(2)	(3)
Staff Point (Eq)	0.026***	0.025***	0.023***
	(0.003)	(0.003)	(0.003)
α_B	-0.149***	-0.214***	-0.212***
	(0.011)	(0.013)	(0.011)
GCI	-0.000		
	(0.002)		
FR		0.058***	
		(0.006)	
S_{FB}			0.237***
			(0.018)
Constant	0.065***	0.058***	0.028***
	(0.010)	(0.008)	(0.009)
Observations	4,327	4,682	4,681
R-squared	0.135	0.145	0.160

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade B for females. Staff Point (Eq) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_B is the share of females among those eligible for promotion to Grade B, while GCI, FR and S_{FB} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among both associates and full professors, respectively. * significant at 10%; ** significant at 5%; *** significant at 1%.

Share of Females is significantly larger than that estimated for the FR. This suggests that what truly influences the probability of achieving a career advancement to grade B is not just the presence of women in the Department *overall*, but rather their presence among those actually in charge of making decisions about promotions to Grade B. On the other hand, the estimates for the GCI are not statistically significant, meaning that the unbalanced presence of women among the highest career level only is not particularly relevant for the likelihood of career progression from assistant to associate professorship.

Table 3 reports the estimates obtained considering the probability of career advancement from Grade B (associate) to Grade A (full) professors. Quite interestingly, the available resources are not statistically significant. In other words, the probability of career advancement to full professorship for women does not seem to be a matter of available resources. Conversely, there is evidence supporting the negative impact of the proportion of women among eligible candidates, α_A, which aligns with the competitive dynamics described by Kunze and Miller (2017). Finally, the results confirm that the probability of career advancement for women is positively correlated with the degree of female representation in the Department. Indeed, both the FR and the Share of Females in the pool of scholars in charge of the decisions concerning career advancement to full are statistically significant and with the expected positive sign, thus supporting H3b and H3c. Also in this case, we observe an estimated coefficient for FR lower in magnitude with respect to S_{FA}, suggesting a stronger impact on the probability of achieving a career advancement to grade A of female presence in the deciding pools rather than in the Department overall. In further support of this, the GCI is now statistically significant and with the expected negative sign, consistently with hypothesis H3a. In other words,

the higher the GCI, capturing a lower presence of women among the highest career level, the lower the chances of women to upgrade to full professorship.

Table 3: Advancement to full professorship

	(1)	(2)	(3)
Staff Point (Eq)	0.001	0.002	0.001
	(0.002)	(0.001)	(0.001)
α_A	-0.054***	-0.079***	-0.077***
	(0.006)	(0.008)	(0.006)
GCI	-0.012***		
	(0.001)		
FR		0.024***	
		(0.004)	
S_{FA}			0.101***
			(0.008)
Constant	0.053***	0.020***	0.013***
	(0.005)	(0.004)	(0.004)
Observations	4,822	5,181	5,181
R-squared	0.069	0.056	0.076

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade A for women. Staff Point (Eq) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_A is the share of females among those eligible for promotion to Grade A, while GCI, FR and S_{FA} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among full professors, respectively. * significant at 10%; ** significant at 5%; *** significant at 1%.

7 Robustness

In this section we prove the robustness of our results to a variety of checks. First, we employ alternative measures of the available resources. Next, we experiment with different model specifications, featuring size and geographical fixed effects and non-linearities in the measures of female representation. We then repeat the analysis dropping micro Departments, i.e., those whose size is not compliant with law requirements. Last, we investigate the robustness of our results at more aggregated (University) or dis-aggregated (scientific area or sub-area within the Department) level.

7.1 Staffing resources

The budget constraint p, exogenously set in our model, represents the available resources that each Department has for career upgrades. As recalled, these resources are primarily sourced from the financial allocations, traditionally represented in Staff Points (Punti Organico), provided annually to each University by the Italian Ministry of University and Research. Since Staff Points are assigned to the University, and specific details regarding the distribution of these resources to each Department are not publicly disclosed, in our baseline exercise, we assumed that staffing resources are distributed *equally* among all Departments of each University. In this section, we try an alternative measure, namely Staffing Resources (Prop.), derived under the assumption that staffing resources are divided *proportionally* to the dimension of each Department. In this case, for instance, the variable Staffing resources (Prop.) for the year 2021 takes value 2.34 for the smallest Department of "Ca' Foscari" ("Molecular Sciences and Nanonsystems", counting 48 professors) and 4.44 for the biggest one ("Economics", counting 91 professors). The results obtained using this measure are reported in columns (1) to (3) of Table 4. Alternatively, in columns (4) to (6) we include the Staffing Resources assigned to the University and cluster the standard errors at the corresponding level. In both cases, results are remarkably robust and again in line with expectations.

Table 4: Advancement to associate professorship: alternative measures of resources

	(1)	(2)	(3)	(4)	(5)	(6)
Staff Points (Prop.)	0.018***	0.018***	0.017***			
	(0.003)	(0.003)	(0.003)			
Staff Points				0.044***	0.032**	0.029**
				(0.012)	(0.013)	(0.012)
α_B	-0.144***	-0.212***	-0.210***	-0.152***	-0.213***	-0.213***
	(0.011)	(0.013)	(0.011)	(0.016)	(0.023)	(0.020)
GCI	-0.001			0.000		
	(0.002)			(0.003)		
FR		0.060***			0.057***	
		(0.006)			(0.011)	
S_{FB}			0.242***			0.238***
			(0.018)			(0.025)
Constant	0.071***	0.060***	0.029***	0.076***	0.069***	0.038***
	(0.010)	(0.008)	(0.009)	(0.010)	(0.008)	(0.007)
Observations	4,327	4,682	4,681	4,327	4,682	4,681
R-squared	0.131	0.143	0.158	0.130	0.138	0.153

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade B for females. Staff Points (Prop.) are the Staff Points assigned to each Department under the assumption that the University allocates them proportionally to the dimension of the Department, Staff Points are the Staff Points assigned to each University, α_B is the share of females among those eligible for promotion to Grade B, while GCI, FR and S_{FB} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among associates and full professors, respectively. Standard errors in parenthesis, clustered at the University level in models (4)-(6). * significant at 10%; ** significant at 5%; *** significant at 1%.

The results in Table 5 refer to the same exercise applied to the probability of career advancement from associate to full. Once again, the data support the importance of female representation, while the available resources are not statistically significant. In other words, regardless of how resources are measured, they do not seem to be a significant determinant of the probability of career advancement to full professorship for women.

Table 5: Advancement to full professorship: alternative measures of resources

	(1)	(2)	(3)	(4)	(5)	(6)
Staff Point (Prop.)	-0.001	-0.001	-0.001			
	(0.001)	(0.001)	(0.001)			
Staff Points				0.001	0.000	-0.002
				(0.008)	(0.008)	(0.008)
α_A	-0.054***	-0.079***	-0.077***	-0.054***	-0.079***	-0.076***
	(0.006)	(0.008)	(0.006)	(0.011)	(0.019)	(0.017)
GCI	-0.012***			-0.012***		
	(0.001)			(0.003)		
FR		0.024***			0.024***	
		(0.004)			(0.006)	
S_{FA}			0.102***			0.102***
			(0.008)			(0.022)
Constant	0.054***	0.021***	0.014***	0.053***	0.021***	0.014***
	(0.005)	(0.004)	(0.004)	(0.010)	(0.005)	
Observations	4,822	5,181	5,181	4,822	5,181	5,181
R-squared	0.069	0.055	0.076	0.069	0.055	0.076

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade A for females. Staff Points (Prop.) are the Staff Points assigned to each Department under the assumption that the University allocates them proportionally to the dimension of the Department, Staff Points are the Staff Points assigned to each University, α_A is the share of females among those eligible for promotion to Grade A, while GCI, FR and S_{FA} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among full professors, respectively. Standard errors in parenthesis, clustered at the University level in models (4)-(6). * significant at 10%; ** significant at 5%; *** significant at 1%.

7.2 Different model specifications

The robustness of our results is now tested with respect to various model specifications. We first augment the model with dummies for geographic regions (Center and South, excluding North as the base category). Next, we introduce dummy variables for the University dimension. In this context, Departments are primarily categorized based on the number of professors employed at the respective University, with the corresponding quartile captured by the variable Size. Alternatively, with the variable Type, Universities are classified according to the number of registered students: Small (up to 10.000 enrolled), Medium (between 10.000 and 20.000 enrolled), Big (between 20.000 and 40.000 enrolled), Mega (40.000 enrolled or more) and Polytechnics.[16]

Results are reported in Tables 6 and 7 for the probability of career advancement to associate and to full professorship, respectively. In both cases, the impact of the University's size appears to be minimal, while, quite interestingly, Departments located in Southern and Island Universities exhibit a lower average probability of advancing to the associate level, though not to full professorship,

[16]This classification is taken from CENSIS, see: https://www.censis.it/

compared to Universities in the North. With that said, all the results discussed in the main specification remain remarkably robust. Financial resources are significant for progression to the associate level but do not influence the upgrades to the top career tier, and both competition and the degree of female representation among the deciding pools are significant factors and whose estimated effects align with predictions.

Next, we experiment with non-linear specification of the measures of female representation. Our baseline results show that the higher the degree of female representation in the Department, the higher the likelihood for female professors of that Department to be actually promoted. We expect, though, that this holds true only up to a certain point. In other words, we expect that the presence of women "helps" the promotion of female colleagues only up to a certain "threshold", after which a further increase in the female representation has a progressively smaller, if any, marginal effect. We test this hypothesis by including in our model specification all measures of female representation considered both in linear and quadratic form. The results are reported in Tables 8 and 9, for associates and full professorship, respectively. In both cases, the results are again in line with expectations, i.e.: a humped-shaped effect for the Female Ratio and for the Shares of Females and an inverse U-shaped effect for the GCI, again significantly correlated to the probability of career advancement to full professorship only. Specifically, based on our estimates, the correlation between upgrades to associate (full) professorship and women's representation in the deciding boards remains positive until women represent around 75% (81%) of the deciding committee. All other results on available resources and degree of peers' competition hold true also in this specification.

Table 6: Advancement to associate professorship: alternative model specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Staff Point (Eq.)	0.022***	0.021***	0.020***	0.024***	0.026***	0.024***	0.022***	0.021***	0.019***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
α_B	-0.149***	-0.214***	-0.212***	-0.149***	-0.214***	-0.211***	-0.151***	-0.214***	-0.212***
	(0.011)	(0.013)	(0.011)	(0.011)	(0.013)	(0.011)	(0.011)	(0.013)	(0.011)
GCI	0.000			-0.000			-0.000		
	(0.002)			(0.002)			(0.002)		
FR		0.058***			0.059***			0.059***	
		(0.006)			(0.006)			(0.006)	
S_{FB}			0.235***			0.239***			0.244***
			(0.018)			(0.018)			(0.018)
Center	-0.009	-0.009	-0.005						
	(0.006)	(0.006)	(0.006)						
South	-0.017***	-0.018***	-0.015**						
	(0.006)	(0.006)	(0.006)						
Size Q2				-0.003	-0.006	-0.007			
				(0.007)	(0.006)	(0.006)			
Size Q3				-0.002	-0.008	-0.010			
				(0.006)	(0.006)	(0.006)			
Size Q4				0.009	-0.004	-0.006			
				(0.007)	(0.007)	(0.007)			
Medium Univ							0.011	0.020**	0.025**
							(0.011)	(0.010)	(0.010)
Big Univ							0.010	0.010	0.012
							(0.010)	(0.010)	(0.009)
Mega Uni							0.020*	0.017*	0.020*
							(0.011)	(0.010)	(0.010)
Polytechnic							0.013	0.027*	0.037**
							(0.016)	(0.016)	(0.016)
Observations	4,327	4,682	4,681	4,327	4,682	4,681	4,327	4,682	4,681
R-squared	0.137	0.147	0.161	0.136	0.146	0.161	0.136	0.147	0.162

Notes: The table reports OLS estimates for model 5.1 for the probability of career advancement to Grade B for females. Staff Point (Eq.) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_B is the share of females among those eligible for promotion to Grade B, while GCI, FR and S_{FB} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among associates and aull professors, respectively. Models (4) to (6) feature the quartile of dimension measured by the number of professors working at the University, while models (7) to (9) dummies for the type of University in terms of enrolled students. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Advancement to full professorship: alternative model specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Staff Point (Eq.)	0.001	0.002	0.001	0.002	0.003*	0.002	0.001	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
α_A	-0.054***	-0.079***	-0.077***	-0.054***	-0.079***	-0.076***	-0.053***	-0.078***	-0.075***
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.007)	(0.008)	(0.007)
GCI	-0.012***			-0.012***			-0.012***		
	(0.001)			(0.001)			(0.001)		
FR		0.024***			0.025***			0.025***	
		(0.004)			(0.004)			(0.004)	
S_{FA}			0.101***			0.103***			0.103***
			(0.008)			(0.008)			(0.008)
Center	0.002	0.001	0.002						
	(0.003)	(0.003)	(0.003)						
South	0.001	-0.002	0.000						
	(0.003)	(0.003)	(0.003)						
Size - Q2				-0.000	0.000	-0.001			
				(0.004)	(0.003)	(0.003)			
Size - Q3				-0.006*	-0.006*	-0.007**			
				(0.003)	(0.003)	(0.003)			
Size - Q4				-0.003	-0.004	-0.006			
				(0.004)	(0.004)	(0.004)			
Medium Univ							0.005	0.006	0.005
							(0.006)	(0.005)	(0.005)
Big Univ							0.001	0.002	-0.001
							(0.006)	(0.005)	(0.005)
Mega Univ							0.001	0.000	-0.002
							(0.006)	(0.005)	(0.005)
Polytechnic							0.000	0.003	0.004
							(0.009)	(0.009)	(0.008)
Observations	4,822	5,181	5,181	4,822	5,181	5,181	4,822	5,181	5,181
R-squared	0.069	0.056	0.076	0.070	0.056	0.077	0.069	0.056	0.077

Notes: The table reports OLS estimates for model 5.1 for the probability of career advancement to Grade A for females. Staff Point (Eq.) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_A is the share of females among those eligible for promotion to Grade A, while GCI, FR and S_{FA} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among full professors, respectively. Models (4) to (6) feature the quartile of dimension measured by the number of professors working at the University, while models (7) to (9) dummies for the type of University in terms of enrolled students. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Advancement to associate professorship: Non-linear specification

	(1)	(2)	(3)
Staff Point (Eq.)	0.026***	0.025***	0.023***
	(0.003)	(0.003)	(0.003)
α_B	-0.149***	-0.230***	-0.214***
	(0.011)	(0.013)	(0.011)
GCI	-0.004		
	(0.007)		
GCI^2	0.001		
	(0.001)		
FR		0.103***	
		(0.011)	
FR^2		-0.017***	
		(0.004)	
S_{FB}			0.450***
			(0.066)
S_{FB}^2			-0.305***
			(0.091)
Constant	0.070***	0.046***	-0.001
	(0.012)	(0.009)	(0.012)
Observations	4,327	4,682	4,681
R-squared	0.135	0.149	0.162

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade B for females. Staff Point (Eq.) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_A is the share of females among those eligible for promotion to Grade B, while GCI, FR and S_{FB} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among associates and full professors, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Advancement to full professorship: Non-linear specifications

	(1)	(2)	(3)
Staff Point (Eq.)	-0.000	0.002	0.001
	(0.002)	(0.001)	(0.001)
α_A	-0.053***	-0.081***	-0.079***
	(0.006)	(0.008)	(0.006)
GCI	-0.032***		
	(0.004)		
GCI^2	0.003***		
	(0.001)		
FR		0.034***	
		(0.008)	
FR^2		-0.004	
		(0.003)	
S_{FA}			0.188***
			(0.021)
S_{FA}^2			-0.139***
			(0.031)
Constant	0.075***	0.017***	0.006
	(0.007)	(0.005)	(0.005)
Observations	4,822	5,181	5,181
R-squared	0.075	0.056	0.080

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade A for females. Staff Point (Eq.) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_A is the share of females among those eligible for promotion to Grade A, while GCI, FR and S_{FA} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among full professors, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

7.3 Dropping Micro Departments

The Italian Law requires each Department to have a minimum dimension, namely no less than thirty-five scholars, or forty for Universities with more than 1,000 professors. [17] We thus repeat our analysis on the sub-sample of Departments having the minimum number of professors as required by the law. The results reported in Tables 10 and 11 confirm the robustness of the evidence provided in the main analysis.

Table 10: Advancement to associate professorship: dropping Micro Departments

	(1)	(2)	(3)
Staff Point (Eq.)	0.025***	0.024***	0.022***
	(0.003)	(0.003)	(0.003)
α_B	-0.150***	-0.223***	-0.217***
	(0.012)	(0.014)	(0.012)
GCI	-0.001		
	(0.002)		
FR		0.064***	
		(0.007)	
S_{FB}			0.238***
			(0.019)
Constant	0.067***	0.057***	0.029***
	(0.010)	(0.009)	(0.009)
Observations	3,871	4,136	4,136
R-squared	0.144	0.158	0.170

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade B for females. Staff Point (Eq.) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_B is the share of females among those eligible for promotion to Grade B, while GCI, FR and S_{FB} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among associates and full professors, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

[17] Some flexibility is allowed, for example, when the vast majority of professors belong to the same scientific area. In that case, the number of professors can be as low as 20 (see art.2, co.2, lett.b of Law 240/2010).

Table 11: Advancement to full professorship: Dropping Micro Departments

	(1)	(2)	(3)
Staff Point (Eq.)	0.000	0.001	0.000
	(0.002)	(0.001)	(0.001)
α_A	-0.051***	-0.079***	-0.077***
	(0.007)	(0.008)	(0.007)
GCI	-0.012***		
	(0.001)		
FR		0.025***	
		(0.004)	
S_{FA}			0.105***
			(0.008)
Constant	0.049***	0.018***	0.011**
	(0.006)	(0.005)	(0.005)
Observations	4,345	4,613	4,613
R-squared	0.071	0.059	0.080

Notes: The table reports the OLS estimates for model 5.1 when the dependent variable is the probability of career advancement to Grade A for females. Staff Point (Eq.) are the Staff Points assigned to each Department under the assumption that the University allocates them equally across Departments, α_A is the share of females among those eligible for promotion to Grade A, while GCI, FR and S_{FA} represent the Glass-Ceiling Index, the Female Ratio and the Share of Females among full professors, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

7.4 Results at different observational levels

Our main analysis takes as an observational unit the Department, as most of the bargaining mechanism is assumed to take place at that level. In this section, we investigate the robustness of our results when the same exercise is repeated at different observational levels. Specifically, we first run the analysis at a more aggregated level, i.e., considering the entire University, rather than the Department, the observational unit. In other words, for each year and each University, we derived the probability of career advancement to Grade B and Grade A for female, p_{FB} and p_{FA} as the share of female professors who were upgraded to the corresponding level within each University. The same applies to the share of women among those eligible for promotion, α_B and α_A, as well as all the measures of gender unbalance, which in this exercise will thus be computed at the University level.

The descriptive statistics for this sample (66 public universities observed over a 9-year period) are provided in Table 12, while Table 13 reports the results for the probability for female professors to progress to associate (Panel A) and full (Panel B).

Table 12: Descriptive Statistics: Universities as observational units

Variable	N	Mean	SD	Min	p50	Max
p_{FB}	522	0.095	0.091	0	0.075	0.500
p_{FA}	522	0.035	0.042	0	0.025	0.400
Staff Point	522	24.747	27.395	0	16.210	172.870
α_B	522	0.483	0.063	0.245	0.491	0.652
α_A	522	0.377	0.069	0.148	0.377	0.658
GCI	522	1.697	0.391	0.989	1.590	4.738
FR	522	0.594	0.136	0.251	0.580	1.179
S_{FB}	522	0.316	0.060	0.114	0.316	0.548
S_{FA}	522	0.227	0.059	0.066	0.230	0.470

Notes: The table reports the summary statistics of all the variables included in the empirical analysis at the University level. Staff Point are resources allocated to each University, α_B and α_A are the share of females among those eligible for promotion to Grade B and A, respectively. Finally, GCI is the Glass-Ceiling Index, FR is the Female Ratio, and S_{FB} and S_{FA} represent the Share of Females among associates and full and among full professors only, respectively.

The results observed in the main analysis are confirmed along all dimensions. Descriptive evidence confirms the gender gap in career advancement to both associate and full Professorships and that women are typically underrepresented at all career levels. Regression analysis shows that the probability of career advancement for women is positively associated with the available resources and with the degree of female representation at higher career levels, while negatively correlated with the share of females among those eligible, again signaling a potential mechanism of competition.

Next, leveraging the information we have on the scientific sector of the scholar, we repeat the analysis at a more dis-aggregated level, i.e., having as the observational unit the scientific area *within* the Department.[18]

Take again "Ca' Foscari" as an example. The 91 professors belonging to the Economics Department in 2021 were divided into 5 different scientific areas (2 in Area 07 - Agriculture, 4 in Area

[18]Professors working in Italian Universities are classified into scientific sectors, in turn grouped in scientific areas. Details can be found here https://www.mur.gov.it/it/atti-e-normativa/decreto-ministeriale-n-639-del-02-05-2024.

Table 13: Universities as observational units

Panel A - Advancement to associate professorship			
	(1)	(2)	(3)
Staff Point	0.031**	0.032**	0.023*
	(0.014)	(0.014)	(0.013)
α_B	-0.137**	-0.283***	-0.284***
	(0.054)	(0.067)	(0.058)
GCI	-0.011		
	(0.009)		
FR		0.115***	
		(0.032)	
S_{FB}			0.395***
			(0.070)
Constant	0.088***	0.070***	0.026
	(0.033)	(0.027)	(0.027)
Observations	522	522	522
R-squared	0.278	0.294	0.319
Panel B - Advancement to full professorship			
	(1)	(2)	(3)
Staff Points	-0.003	0.002	-0.002
	(0.007)	(0.007)	(0.007)
α_A	0.038	0.079*	-0.021
	(0.025)	(0.048)	(0.030)
GCI	-0.018***		
	(0.004)		
FR		-0.018	
		(0.023)	
S_{FA}			0.150***
			(0.036)
Constant	0.029**	-0.010	-0.015
	(0.014)	(0.010)	(0.010)
Observations	522	522	522
R-squared	0.233	0.209	0.235

Notes: The table reports the OLS estimates for model 5.1. Panel A refers to career advancement to Grade B for females, while Panel B refers to career advancement for women to Grade A. Staff Points are the Staff Points assigned to each University, and α_B and α_A are the share of females among those eligible for promotion to Grade B and to Grade A, respectively. Finally, GCI is the Glass-Ceiling Index, FR is the Female Ratio, and S_{FB} and S_{FA} represent the Share of Females among associates and full and among full professors only, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

11 - Philosophy, 21 in Area 12 - Law, 61 in Area 13 - Economics and Quantitative Methods for Economics, and 3 in Area 14 - Sociology). In this exercise, each of these areas is used as a different observational unit so that all variables involved in the analysis are computed at that level. For example, the likelihood of promotion to Grade B for women is computed, for each area, as the share of female professors who in year $t-1$ were assistant in that Department and that area and who got upgraded the following year to Grade B in the same scientific area and in the same Department.

With such a setting, the implicit assumption is that the negotiations are conducted not only within each Department, but actually within each specific area of the Department.

The descriptive statistics for this sample are provided in Table 14, while Table 15 reports the results for the probability for female professors to upgrade to associate (Panel A), and to full(Panel B) professorship. Once again, all the results observed in the main analysis find confirmation.

Table 14: Descriptive Statistics: Areas in each Department as observational units

Variable	N	Mean	SD	Min	p50	Max
p_{FB}	5315	0.091	0.184	0	0	1
p_{FA}	4798	0.044	0.127	0	0	1
Staff Point (Eq.)	5315	0.806	0.724	0	0.602	7.302
Staff Point (Prop.)	5315	1.196	1.039	0	0.919	8.704
α_B	5315	0.571	0.237	0.042	0.545	1
α_B	5128	0.416	0.232	0	0.400	1
GCI	5315	1.697	0.994	0.182	1.403	8.680
FR	5274	0.939	0.884	0.078	0.717	13
S_{FB}	5315	0.380	0.177	0.037	0.357	1
S_{FA}	5315	0.339	0.229	0.029	0.286	1

Notes: The table reports the summary statistics of all the variables included in the empirical analysis when the scientific area within the Department is used as an observational unit. Staff Points (Eq.) are resources allocated to each scientific area within the Department under the assumption that resources are distributed equally first across Departments and then across scientific areas within each Department. Staff Points (Prop.) are resources allocated to each scientific area within the Department under the assumption that resources are distributed proportionally to the size of the Department first and to the size of the scientific area then. Next, α_B and α_A are the share of females among those eligible for promotion to Grade B and A, respectively. Finally, GCI is the Glass-Ceiling Index, FR is the Female Ratio, and S_{FB} and S_{FA} represent the Share of Females among associates and full and among full professors only, respectively.

Table 15: Areas within the Department as observational units

Panel A - Advancement to associate professorship						
	(1)	(2)	(3)	(4)	(5)	(6)
Staff Point (Eq.)	0.010***	0.012***	0.014***			
	(0.004)	(0.004)	(0.004)			
Staff Point (Prop.)				0.012***	0.015***	0.017***
				(0.003)	(0.003)	(0.003)
α_B	-0.179***	-0.216***	-0.222***	-0.173***	-0.211***	-0.215***
	(0.009)	(0.011)	(0.010)	(0.009)	(0.011)	(0.010)
GCI	0.002			0.000		
	(0.002)			(0.002)		
FR		0.022***			0.024***	
		(0.003)			(0.003)	
s_{FB}			0.168***			0.177***
			(0.014)			(0.014)
Constant	0.098***	0.100***	0.064***	0.095***	0.093***	0.054***
	(0.010)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)
Observations	5,315	5,274	5,315	5,315	5,274	5,315
R-squared	0.128	0.137	0.150	0.130	0.140	0.154
Panel B - Advancement to full professorship						
	(1)	(2)	(3)	(4)	(5)	(6)
Staff Point (Eq.)	-0.018***	-0.021***	-0.016***			
	(0.006)	(0.006)	(0.006)			
Staff Point (Prop.)				-0.023***	-0.026***	-0.022***
				(0.004)	(0.004)	(0.004)
α_A	-0.123***	-0.161***	-0.144***	-0.132***	-0.165***	-0.148***
	(0.009)	(0.011)	(0.009)	(0.009)	(0.011)	(0.009)
GCI	-0.018***			-0.014***		
	(0.003)			(0.003)		
FR		0.010***			0.009***	
		(0.002)			(0.002)	
S_{FA}			0.058***			0.047***
			(0.009)			(0.009)
Constant	0.106***	0.087***	0.066***	0.109***	0.093***	0.075***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	4,678	4,530	4,678	4,678	4,530	4,678
R-squared	0.077	0.077	0.079	0.082	0.083	0.083

Notes: The table reports the OLS estimates for model 5.1 when scientific sub-areas within each Department are used as observational units. Panel A refers to career advancement to Grade B, while Panel B refers to career advancement to Grade A. Staff Points (Eq.) are resources allocated to each scientific area within the Department under the assumption that resources are distributed equally first across Departments and then across scientific areas within each Department. Staff Points (Prop.) are resources allocated to each scientific area within the Department under the assumption that resources are distributed proportionally to the size of the Department first and to the size of the scientific area then. Next, α_B and α_A are the share of females among those eligible for promotion to Grade B and to Grade A, respectively. Finally, GCI is the Glass-Ceiling Index, FR is the Female Ratio, and S_{FB} and S_{FA} represent the Share of Females among associates and full and among full professors only, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

The same occurs when we further dissect based on the scientific sub-area of the professor. Sub-areas are homogeneous areas of research in which scientific areas are organized. For instance, professors belonging to Area 13 - Economics and Quantitative Methods are further organized into four sub-areas, namely: (i) 13/A - Economics; (ii) 13/B - Finance; (iii); 13/C - Economic History; and (iv) 13/D - Quantitative Methods for Economics. Having again "Ca' Foscari" in 2021 as an example, we know that of the 61 professors in Area 13 in the Department of Economics, 20 belong to sub-area 13/D, and 41 in 13/A. For this analysis, we thus consider each of these sub-areas as a distinct observation and compute all the variables involved in the analysis at the corresponding level. This essentially presumes that discussions regarding career progression occur within distinct sub-areas of each Department.

Table 16: Descriptive Statistics: Scientific sub-areas in each Department as observational units

Variable	N	Mean	SD	Min	p50	Max
p_{FB}	6407	0.078	0.203	0	0	1
p_{FA}	4729	0.060	0.188	0	0	1
Staff Point (Eq.)	6407	0.320	0.378	0	0.211	4.732
Staff Point (Prop.)	6407	0.524	0.611	0	0.318	5.264
α_B	6407	0.662	0.269	0.053	0.667	1
α_A	5754	0.455	0.322	0	0.467	1
GCI	6407	1.291	0.720	0.167	1.111	8.561
FR	6061	1.354	1.392	0.060	1	15
S_{FB}	6407	0.479	0.236	0.023	0.444	1
S_{FA}	6407	0.513	0.302	0.038	0.5	1

Notes: The table reports the summary statistics of all the variables included in the empirical analysis when scientific sub-areas within each Department are used as an observational units. Staff Points (Eq.) are resources allocated to each scientific sub-area within the Department under the assumption that resources are distributed equally first across Departments and then across scientific sub-areas within each Department. Staff Points (Prop.) are resources allocated to each scientific sub-area within the Department under the assumption that resources are distributed proportionally to the size of the Department first and to the size of the scientific sub-area then. Next,α_B and α_A are the share of females among those eligible for promotion to Grade B and A, respectively. Finally, GCI is the Glass-Ceiling Index, FR is the Female Ratio, and S_{FB} and S_{FA} represent the Share of Females among associates and full and among full professors only, respectively.

Table 16 reports the descriptive statistics for this sample and Table 17 the results for upgrades to associate (Panel A) and to full (Panel B).

The results also in this case remain largely unchanged. For upgrades to associate professorship the only observed change is for the estimates of GCI, which now are statistically significant and positive, while estimates for all the other variables maintain their expected sign and statistical significance. The same holds for upgrades to full professorship, where the only observed change is for the effect of available resources, which now is statistically significant with a negative sign. This negative correlation might result from the fact that, given the resources attributed to each Department, the higher the number of sub-subareas, the lower the resources assigned to each scientific sub-subarea. In certain instances, especially within large and varied departments, these resources can become quite minimal. Despite this scarcity of resources, promotions eventually occur also in these Departments, resulting in the negative association observed.

Table 17: Sub-Areas within the Department as observation units

Panel A - Advancement to associate professorship						
	(1)	(2)	(3)	(4)	(5)	(6)
Staff Point (Eq.)	0.017**	0.030***	0.033***			
	(0.007)	(0.007)	(0.007)			
Staff Point (Prop.)				0.014***	0.026***	0.032***
				(0.005)	(0.005)	(0.004)
α_B	-0.218***	-0.259***	-0.244***	-0.215***	-0.255***	-0.237***
	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.009)
GCI	0.014***			0.012***		
	(0.003)			(0.003)		
FR		0.018***			0.019***	
		(0.002)			(0.002)	
S_{FB}			0.116***			0.126***
			(0.011)			(0.011)
Constant	0.122***	0.135***	0.101***	0.122***	0.130***	0.091***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	6,407	6,061	6,407	6,407	6,061	6,407
R-squared	0.141	0.152	0.155	0.142	0.154	0.158
Panel B - Advancement to full professorship						
	(1)	(2)	(3)	(4)	(5)	(6)
Staff Point (Eq.)	-0.018***	-0.021***	-0.016***			
	(0.006)	(0.006)	(0.006)			
Staff Point (Prop.)				-0.023***	-0.026***	-0.022***
				(0.004)	(0.004)	(0.004)
α_A	-0.123***	-0.161***	-0.144***	-0.132***	-0.165***	-0.148***
	(0.009)	(0.011)	(0.009)	(0.009)	(0.011)	(0.009)
GCI	-0.018***			-0.014***		
	(0.003)			(0.003)		
FR		0.010***			0.009***	
		(0.002)			(0.002)	
S_{FA}			0.058***			0.047***
			(0.009)			(0.009)
Constant	0.106***	0.087***	0.066***	0.109***	0.093***	0.075***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	4,678	4,530	4,678	4,678	4,530	4,678
R-squared	0.077	0.077	0.079	0.082	0.083	0.083

Notes: The table reports the OLS estimates for model 5.1 when scientific sub-areas within each Department are used as observational units. Panel A refers to career advancement to Grade B, while Panel B refers to career advancement to Grade A. Staff Points (Eq.) are resources allocated to each scientific sub-area within the Department under the assumption that resources are distributed equally first across Departments and then across scientific sub-areas within each Department. Staff Points (Prop.) are resources allocated to each scientific sub-area within the Department under the assumption that resources are distributed proportionally to the size of the Department first and to the size of the scientific sub-area then.α_B and α_A are the share of females among those eligible for promotion to Grade B and to Grade A, respectively. Finally, GCI is the Glass-Ceiling Index, FR is the Female Ratio, and S_{FB} and S_{FA} represent the Share of Females among associates and full and among full professors only, respectively. Standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

8 Conclusion

This study contributes to the existing literature on gender gaps in promotions by taking the case of career advancements to associate and to full professorships for scholars working in Italian Universities.

Italian Academia represents the ideal setting for the analysis. First, salaries are non-negotiable, gender-neutral, and *de-facto* can only increase with career upgrades. Hence, in this respect, career upgrade negotiations can be considered comparable to salary negotiations. Second, career upgrades come with an increase in remuneration but not necessarily with longer working hours, as opposed to many private-sector jobs.

We focus on the so-called *internal* career advancements, i.e., those occurring within each Department, and model this outcome as the result of a collective process. The focus on careers developing within the same Department is justified by the fact that they not only represent the vast majority (slightly more than 97.33% in the last decade), but also they are the ones in which personal interactions with peers and higher-rank colleagues are likely to matter the most. The negotiation viewed as a collective process is justified based on several factors. First, the available resources are limited, so a scholar's career upgrade also depends on the outcomes of their colleagues. Additionally, in Italian Universities decisions about career advancements are taken collectively by a panel of professors. Furthermore, the literature recognizes the influence of gender-related biases in negotiations, both individually and collectively. Against this background, despite we recognize that there is a relevant individual component, we find it reasonable to model negotiation as a collective process.

Our contribution is twofold. First, we propose a simple theoretical model that sketches the collective negotiation for promotions between two groups, one of men and one of women, with different bargaining power. The solution of the model demonstrates that the likelihood of career progression for each of these groups is: (i) a positive function of the resources allocated for promotions, (ii) inversely proportional to the level of representation of each group among the eligible candidates, aligning with a competitive environment; and (iii) increasing with the bargaining power of each group. A reasonable claim we propose is that bargaining power directly depends on the group's relative representation.

Second, we empirically test the predictions of the model based on a novel and suitably built dataset. For each existing Department of the Italian Universities, we obtain information about the monetary resources as allocated by the Ministry of the University, as well as data on the actual frequency of females' career advancements to both associate and full professorship, the proportion of females eligible for such advancements, and different metrics of female representation in the Department. We claim that these metrics, specifically the Glass-Ceiling Index, the Female Ratio, and the Share of Females in the boards of professors in charge of the decisions about promotions, could well serve as a proxy of females' bargaining power.

The testable assumptions derived from the model are largely supported by the empirical analysis. In particular, the probability of career advancement to both associate and full professorship for women is negatively and significantly associated with the share of females among those eligible for advancement. In other words, consistently with the competitive dynamics described in Kunze and Miller (2017), the more the peers push for advancement, the lower the chances of actually getting a career advancement. Next, the probabilities of upgrade correlate as expected with the measures

of female representation considered. Higher values of Female Ratio and higher Shares of Females among the pool of professors in charge of deciding about promotions are strongly and positively associated with the likelihood for women to get promoted to both associate and full professors. Quite interestingly, the estimated effect for the Female Ratio is remarkably lower compared to the one estimated for the Share of Females in the deciding pool. In other words, the presence of females in the Department *overall* or among the *highest* career level only is not enough: in order to have an impact, females must be sufficiently represented exactly where decisions are taken. In line with this, the GCI, capturing the unbalance between male and female full professors, has the expected negative sign and turns out to be significant for progression to full professorship only, while no effect is found when upgrades to associate are considered.

These findings align with the literature on the role played by women's representation in their participation in the labor market, and in their career advancement opportunities and emphasize the necessity of tackling gender disparities in negotiation power to reduce inequities in career progressions. As noted by Baranski et al. (2023)), "women's preferences in male-dominated decision-making environments, such as boards, committees, or teams, can be under-weighted. Accordingly, increasing the representation of women in higher positions could reduce gender gaps in opportunities, wages, and promotions".

Finally, we find that the probability of career advancement to associate professorship for women increases with the available resources, while they are not a significant determinant of the probability of advancement to full professorship.

The results summarized above are found to be robust to a variety of checks, such as experimenting with different samples, in which micro-Departments are disregarded, or with different model specifications, featuring size and geographical fixed effects and non-linearities in the measures of female representation. Similarly, results remain largely unchanged when the analysis is repeated at more aggregated (University) or dis-aggregated (scientific area or sub-area within the Department) levels.

Notice that all empirical analyses are carried out at an aggregated level (either University, Department, area, or sub-area within the Department), not at the individual level, consistently with the theoretical framework where negotiation is modeled as a collective process. Hence, factors such as individual bargaining attitudes or outside options, i.e., the opportunity of being promoted in other universities, which are likely to be remarkably different between male and female scholars, are not taken into account. These and other factors behind the *individual* scholar's eventual career progression are left for further research.

Appendix

A1. Derivation of Equation 4.2

The overall probability of career advancement defined in equation 4.1:

$$p = \frac{U_F + U_M}{S_F + S_M}$$

can be rewritten as follows:

$$
\begin{aligned}
p &= \frac{U_F + U_M}{S_F + S_M} \\
&= \frac{U_F}{S} + \frac{U_M}{S} \\
&= \frac{S_F}{S_F}\frac{U_F}{S} + \frac{U_M}{S}\frac{S_M}{S_M} \\
&= \frac{S_F}{S}\frac{U_F}{S_F} + \frac{S_M}{S}\frac{U_M}{S_M} \\
&= \frac{S_F}{S}\frac{U_F}{S_F} + \frac{S - S_F}{S}\frac{U_M}{S_M} \\
&= \alpha p_F + (1-\alpha) p_M
\end{aligned}
$$

A2. Derivation of Equation 4.4

The overall probability of career advancement, as defined in Equation 4.3:

$$p_F = \frac{1-\alpha}{\alpha}\frac{\gamma}{1-\gamma}p_M$$

can be rewritten by explicitly expressing p_M by using Equation 4.2:

$$p_M = \frac{p - \alpha p_F}{1-\alpha}.$$

By substituting this expression into Equation 4.3 and performing some algebraic manipulations, we can straightforwardly derive

$$p_F = \frac{\gamma}{\alpha}p.$$

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