Gender Differences in Attitudes Towards Competition: Evidence from the Italian Scientific Qualification

Maria De Paola [a,b], ***Michela Ponzo*** [c], ***Vincenzo Scoppa*** [a,b,*]

[a] *Department of Economics, Statistics and Finance, University of Calabria*

[b] *Institute for the Study of Labor (IZA), Bonn*

[c] *Department of Economics and Statistics, University of Naples "Federico II"*

This version: 31 August 2014. Preliminary version

We rely on a natural experiment involving the Italian promotion system for associate and full professor positions to investigate gender differences in competitive behavior. After controlling for productivity and a number of individual and field characteristics, we find that females have a lower probability of entering into competition of about 4-5 percentage points. This gap becomes larger in fields in which women are under-represented. The attitude to shy away from competition is peculiar to women in the lower tail of the distribution of scientific productivity, while females in the upper tail behave similarly to males. We also find that conditional on entering into the competition, females are as likely as males to be promoted.

JEL classification: J71; M51; J45; J16; D72, D78

Keywords: Gender Discrimination; Attitudes towards competition; Academic Promotions; Natural Experiment.

[*] E-mail addresses: m.depaola@unical.it (M. De Paola); michela.ponzo@unina.it (M. Ponzo); v.scoppa@unical.it (V. Scoppa). We are very grateful to Antonio Bilotta for helping us with the downloading of data. We would like to thank Marco Alberto De Benedetto, Filippo Domma, Francesca Gioia, Sabrina Giordano, Riccardo Lucchetti, Raffaella Santolini, Stefano Staffolani, Francesca Vocaturo, and seminar participants at University of Ancona and University of Calabria for useful comments and suggestions.

1. Introduction

Gender gaps in economic and social outcomes are pervasive: females earn significantly lower wages, have greater difficulties in getting a job, have low promotion chances and less access to highly paid jobs and managerial positions ("glass ceiling"). They also experiment lower political representation (Altonji and Blank, 1999).

This is particularly true in Italy. According to the Survey on Household Income and Wealth (Bank of Italy), the wages earned by females in the private sector – controlling for education, age and experience – are about 20-25% lower than males. Women are underrepresented both in the public and in the private sector. Only 20% of seats in the parliament are held by women and only 3% of the 50 largest companies' board directors are women. As far as the academia is concerned, women account for 45% of assistant professors, 34% of associate professors and only 21% of full professors (De Paola and Scoppa, 2014, forthcoming).

The traditional explanations for the existence of gender gaps are based on differences in productivity or on discrimination. According to these explanations, females obtain worse outcomes either because they invest less in human capital, work less hours, are less committed to jobs, or, alternatively, because they suffer from taste or statistical discrimination.

A recent strand of the literature moves beyond the traditional theories by considering that females might have different psychological attitudes and different preferences with respect to males (Bertrand, 2010; Croson and Gneezy, 2009). Many studies show that females are more averse to risk, have a lower degree of self-confidence and are more averse to receive negative feedbacks. It seems also that females are less competitive and less able in negotiations. These psychological differences may be responsible for a significant share of gender gaps in economic outcomes.

Gender differences in attitudes toward competition have received particular attention. A small but rapidly growing literature shows that females are more reluctant to engage in competitions (even those with higher abilities) and when in competition they tend to perform worse than males (Niederle and Vesterlund, 2011).

Most of this literature is based on laboratory experiments. These experiments allow researchers to have full control of important determinants of the phenomenon under study, but have the disadvantages of selecting specific categories of participants (typically, college students), with relatively low stakes, and of putting participants in situations that might be far from real-life contexts, affecting the external validity of the analysis.

In one of the most relevant laboratory experiments on this topic, Niederle and Vesterlund (2007) asked participants (college students) to solve a series of additions under a competitive (tournament) and non-competitive (piece-rate) reward system. When asked to choose among incentive schemes, 73 percent of male participants chose the tournament scheme against only 35 percent of females, although males and females performed similarly in the proposed tasks. Buser, Niederle and Oosterbeek (2014) show that, among secondary school students in the Netherlands, the laboratory experimental measure of competitiveness prosed by Niederle and Vesterlund (2007) is strongly and positively correlated with choosing math and

science academic courses. In their study, competitiveness explains a large part of the gender gap in track choice. In another laboratory experiment consisting in solving mazes, Gneezy, Niederle and Rustichini (2003) find that males and females perform similarly in non-competitive environments, but females are much less effective than males in competitive contexts, especially if they have to compete against males. Similar results are found by Gneezy and Rustichini (2004) who measure the performance of 9-10 years old boys and girls in a short distance race: whereas males improve their performance in competitive settings, the opposite happens for females.

More contrasting results emerge in field experiments. Whereas some works confirm that in real life situations women underperform relative to men in competitive settings, several other studies do not find any gender difference in performance (see Ors, Palomino and Peyrache, 2013; Lavy, 2012; Jurajda and Munich, 2011; De Paola, Gioia and Scoppa, 2014). Very little evidence exists on female preferences for competition in real life situations. De Paola, Gioia and Scoppa (2014), in a field experiment designed to neutralize gender differences in self-confidence, in risk attitudes and in preferences for feedbacks on relative performance, find that females are as likely as males to enter competition. A recent paper by Bosquet et al. (2014), based on academic promotions in French, investigate gender gaps in promotion rates and in the probability of undertaking the promotion procedure. They focus on the economics field and find no gender differences in the probability of being promoted (conditional on having entered into the competition), but a substantial lower probability of females in entering competition.

We follow a similar investigation strategy and rely on a natural experiment involving the Italian academic promotion system for associate and full professor positions. Compared to the Bosquet at al.'s paper that deals only with a single discipline, we are able to investigate gender gaps in the probability of entering competition and in the probability of success in all academic fields and to shed some new light on the heterogeneity that characterizes these fields. The relatively low proportion of women in Sciences and Engineering is often the topic of public debate (see for example, Powell 2007, National Academies 2007). For instance, women make up 13% of the Physics professors worldwide. In Italy the proportion of women among full professors ranges from 6% in "Numerical Analysis" to 43% in "Antiquities, Philology, Literary Studies and Art History". Given these large differences, we think it is important to try to understand which are the determinant factors, also at the aim of developing strategies that can help at reaching a more balanced gender composition in academia.

Currently, in Italy, individuals aiming to be promoted to associate or full professor positions have first to participate in a national-wide competition, "Abilitazione Scientifica Nazionale" (ASN in brief). Evaluations are conducted separately in 184 scientific sub-fields and the members of evaluation committees for competitions in each sub-field are randomly assigned (among a wide list of candidate evaluators). Each committee evaluates candidates' CV and publications and decides which candidates reach a minimum threshold level, awarding the "National Scientific Qualification". No teaching lecture or oral presentation is required to candidates. The qualification is valid for four years. During this period universities can hire

among those who have obtained the qualification. Instead, candidates who have not obtained the qualification are excluded from the national evaluations taking place in the following two years.

The framework of the Italian Qualification system allows us to investigate gender differences in the propensity to enter competitions aimed at reaching top positions in academia, neutralizing some factors typically associated to promotion settings: unobserved ability in job promotion interviews; differences in willingness to change hours of work or type of tasks; differences in willingness to move in another town (deriving from the success of competition if the new position will be available in a different University).[1]

As explained above, the ASN does not involve neither exams nor interview and committees make their decisions on the basis of candidates' CVs. Then, the role played by unobserved ability in teaching and discussing research results is unlikely to affect our results. In addition, Italian academics have similar obligations and constraints at all hierarchical levels, carry out similar tasks and promotions do not imply longer working hours. This implies that gender differences in taking part into the competition can hardly be explained considering constraints deriving from family care and domestic responsibility. Finally, taking part in the ASN represents only a first step to obtain a full or associate professor position and there is no clear reason for females preferring to not take part in this competition. The decision to move to another town will be required only if, once obtained the ASN, a University different from that currently employing the individual will propose him/her a place; given the low mobility characterizing the Italian University system, this eventuality is not the most frequent: typically individuals obtaining the ASN will be promoted by the same University currently employing them.

In order to investigate the probability of entering the evaluation procedure we have matched data on individuals effectively applying for promotion with data on potential applicants. We consider as potential applicants all the individuals holding a position in the Italian University system either as assistant professors ("*ricercatori*") – potential competitors for an associate professor position – or as associate professors – potential competitors for a full professor position. Using these data we have estimated the probability of applying for obtaining the qualification, controlling for some measures of scientific productivity, some individual characteristics and dummy variables to capture differences among scientific sub-fields and type of academic position.

After controlling for these variables, we find that females have a lower probability of entering the competition of about 4-5 percentage points. This holds true both for competition to associate and full professor positions.

We find significant heterogeneous effects across fields and in relation to the gender composition of each field. When we look at macro fields, we find that women are less likely than men to enter competitions for promotion in Medicine, in Humanities and Social Sciences, while we do not find any statistical significant gender difference in all the other fields, including Mathematics, Natural Science and Engineering, maybe because women who self-select in scientific fields are more prone to competition.

[1] For an analysis of the Italian ASN see also Bagues et al. (2014).

Exploiting the fact in Italy within the same macro field there are sub-fields characterized by a very heterogeneous female presence among professors, we also investigate whether women willingness to enter competitive environments changes in relation of female presence in the sub-field. When we split our sample in relation to the share of female full professors characterizing each sub-field, we find that in fields with a low presence of female professors, females have a probability of entering in the competition about 7 percentage points lower compared to male counterparts. In contrast, in sub-fields with a high percentage of females among full professors, this difference amounts at about 4 percentage points.

As suggested by a number of recent works, the female tendency to shy away from competition might be related to their inclination to underestimate their own ability or to a higher degree of risk aversion. These attitudes could lead women, especially those whose scientific productivity is not very high, to be less inclined than men to compete for promotion. As reported by Sandberg (2013), women tend to apply for a promotion only when they meet all the requirements, while men apply also when they are far from the threshold. As far as risk-aversion is concerned, a number of papers show that women are more risk averse than men (see Bertrand, 2010, for a summary). The ASN, involving a penalty in case of failure, might then be less attractive for women, especially for those characterized by lower productivity, whose chances of success are more uncertain.

To focus on these aspects we have analyzed the gender gap in competitive attitudes in relation to individual scientific productivity. We find that the gender gap in the probability of entering competition holds true only for individuals in the lower tail of the distribution of scientific productivity: in this sample, females have a probability of entering competition about 10 percentage points lower than males. In contrast, for individuals with higher levels of productivity we do not find any statistically significant gender difference. Females with a relatively low scientific productivity are especially likely to shy away from competition in fields in which the use of bibliometric indexes of productivity is less widespread, maybe because in these fields the requirements to be met for being promoted are less clear increasing the role played both by self-confidence and risk aversion in the individual decision to apply for entering into the competition.

Finally, we have analyzed the probability of success conditional on having applied. In general our estimation show that females are as likely as males to succeed in the competition. This holds true also for the sub-fields characterized by a small fraction of females among full professors: in these fields the dummy female attracts a negative coefficient (-0.05) but the statistical significance is very low (*p*-value=0.19). The same holds true for the Humanities field in which females are less likely to compete than males. An exception is represented by the Medicine's field in which females' lower propensity to enter competition is supported by a large gender gap in the probability of success: in this field females face a lower probability of obtaining the qualification of about 11 percentage points compared to males.

The paper is organized as follows. Section 2 presents the Italian academic promotion system and describes the data used in our analysis. In section 3 we investigate whether females have a lower probability to enter competition. In Section 4 we analyze whether there are heterogeneous effects in relation to fields and

to the proportion of females among full professors in each sub-field. Section 5 is devoted at investigating differences according to individual abilities. In section 6 we carry out an analysis of the probability of success in the competition conditional of having applied for it. Section 7 concludes.

2. Institutional Background and Data

The rules governing careers in the Italian Universities have changed over time. The system currently governing promotions to associate and full professor positions has been introduced in the Italian academic system in 2012, following a major reform of the University system in 2010 (the so-called "Law Gelmini", after the name of the former University Minister). The reform was aimed at increasing transparency and meritocracy through a centralized national competition called National Scientific Qualification.[2] Academics aiming for promotion to associate or full professor positions are required to qualify in national competitions held at the sub-field level.

The Italian academia is organized in 14 different areas or fields (for example, "Physics", "Medicine", "Economics and Statistics"); within each field there are different sub-fields (for example, "Applied Physics", "Econometrics", "Private Law") for a total of 184 sub-fields. For each sub-field a committee of five members (four full Professors from Italian Universities and one foreign member from OECD countries) is randomly selected (among the full professors in each field who volunteered for the task and reached some scientific productivity standards).[3]

Committee members evaluate candidates to both associate and full professor positions and select those deserving the "qualification" (awarded under the requirement of a qualified majority of four votes). There are no limits to the number of qualifications awarded in each field. Candidates who fail to obtain the qualification cannot participate in the ASN taking place in the following two years.

Among individuals who have obtained the ASN, University Departments can autonomously choose the full and associate professors to hire. The effective hiring of successful candidates depends on the number of vacancies opened by Italian Universities that currently have a limited amount of financial resources, especially to fill full professor positions.

The system is similar to that currently in place in Spain and France. However, while in the French and Spanish qualification system candidates are evaluated both on their CVs and on the basis of one or several oral presentations (teaching lecture or oral presentation of own candidate's research), in Italy committees awarding the qualification evaluate candidates exclusively on the basis of their CVs. The process does not involve any direct interaction between committees' members and candidates.

[2] Previously , in Italy promotion were decided at the local level. Each university willing to fill a vacancy initiated a competition. The system is described in De Paola and Scoppa (2014).

[3] The drawing is carried out by the officials of the Ministry of Education, University and Research, through a computerized random procedure certified by a notary.

Committees have full autonomy on the criteria to be used in the evaluation. However, some criteria were suggested by the Ministry of Education, University and Research in relation to the research productivity of candidates in the previous ten years, as measured by the some bibliometric indicators. In bibliometric fields (scientific fields)[4] candidates deserving qualification should have a score above the median (calculated among professors of the targeted position) in at least two of these three criteria: a) the number of articles published in scientific journals; b) the total number of citations; c) the h-index. In Social Sciences and in Humanities (non-bibliometric fields), successful candidates should pass the median in at least one of the following indicators: a) the number of articles published in scientific journals; b) the number of articles published in high quality journals[5]; c) the number of books.

The procedure for obtaining the National Scientific Qualification we consider in this study has been launched in 2012 (the deadline for applications was the 20th November 2012) and sub-fields evaluation procedures have been completed between the end of 2013 and the first months of 2014.

For our analysis we use data from different sources. From the website of the Italian Ministry of Education, University and Research we have collected the lists of all individuals holding a position in the Italian University system either as associate professors (16,137 potential candidates for full professor positions) or as assistant professors (26,723 potential candidates for associate professor positions).[6]

We have used the same source to obtain information on gender (inferred from first name), the affiliation of potential candidates and of both potential and effective committee members, years of experience (since the year 2000), if they have tenure.

From the National Scientific Qualification's web-page we have collected data on the evaluation procedures.[7] For each sub-field, we observe the list of effective candidates. Therefore, for each sub-field, we matched the list of applicants to the list of potential candidates. Using these data we built a dummy variable, *Application*, equal to one when a potential candidate has applied for a position (and zero otherwise).

In doing this, we disregard candidates who have applied for a position in sub-field that is different from their current sub-field (about 10% of candidates applied for other sub-fields) and we do not consider applications of assistant professors for a full professor position.[8] Furthermore, we do not consider all the external candidates applying for a qualification, that is, those are not currently assistant or associate professors in Italian Universities.

[4] Bibliometric fields include Mathematics, Physics, Chemistry, Earth Sciences, Biology, Medicine, Agricultural and Veterinary Sciences, Civil Engineering and Architecture (with the exception of Design, Architectural and Urban design, Drawing, Architectural Restoration, and Urban and Regional Planning), Industrial and Information Engineering, and Psychology.

[5] The set of journals to be considered as high quality in each field has been determined by an evaluation agency with the help of several scientific committees.

[6] See the website: http://cercauniversita.cineca.it/php5/docenti/cerca.php

[7] See the website: http://abilitazione.miur.it/public/pubblicacandidati.php

[8] Our results remain substantially unchanged when we do not exclude candidates applying for a position in a sub-field that is different from their current one but which is included in the same macro field including their current sub-field. Same results are also obtained when we consider associate professors applying for qualification both to associate and full professor.

From the ASN website there is available also information on some indicators of candidates' scientific productivity. Unfortunately, we are not able to use this information in our analysis, since the same detailed information are not available for potential candidates who decided to not take part in the qualification procedure. Then, in order to gather information on the scientific productivity of potential candidates working in the Italian University system we have decided to use the "Publish or Perish" software based on Google Scholar. Due to the huge amount of work related to data collection, we have chosen to draw a stratified random sample of 20% of the whole population (using as strata the subfields, positions, gender, decision to apply) ending up with a sample of 8,523 observations.

For each individual in this restricted sample we have collected data on the number of publications, citations, *h*-index and *g*-index.[9] Using these data we have undertaken a principal component analysis to obtain a comprehensive measure of individual scientific productivity (only the first component was considered), which we call *Productivity*.

Using the affiliations of both evaluators and potential candidates we build an indicator of professional networks between potential candidates and potential committee members, *Potential Connections*, taking the value of one when at least one professor in the set of eligible evaluators works (or has worked in the past) in the same university in which the potential candidate is employed and zero otherwise. Similarly, we proceed considering the effective committee members and build a dummy variable, *Connections*, taking the value of one when at least one of the committee members works (or has worked in the past) in the same university employing the potential candidate and zero otherwise.

We are also able to have information on candidates' seniority in the academia, since starting from year 2000 we know for each candidate when he/she was hired by one Italian university. We use this information to build the variable *Experience*, that is, the number of years since the individual has been hired.[10] Using the geographical location of the University in which each individual is affiliated we build 5 geographical dummies (North-West, North-East, Centre, South, Islands).

Furthermore, in the Italian University system, professors hired at any level have to spend an initial period of 3 years ("No Tenure") after which they are hired permanently (conditional on satisfactory performance).[11] Although almost everyone obtains tenure, the indicator variable "No tenure" is useful as a measure of seniority.

Descriptive statistics for both the full sample of potential candidates (Panel A) and potential candidates included in our restricted sample (Panel B) are reported in Table 1. In the appendix of this paper we report separate descriptive statistics for potential candidates to associate (Table A1) and full professor positions (Table A2).

[9] The h index (Hirsch index) is based on the distribution of citations received by a given researcher's publications. A scientist has index h if h of his/her N papers have at least h citations each, and the other (N− h) papers have no more than h citations each. Given a set of articles ranked in decreasing order of the number of citations that they received, the g-index is the (unique) largest number such that the top g articles received (together) at least g^2 citations.

[10] We impute 5 more years of experience to assistant professors who in the year 2000 are already tenured and impute 10 more years of experience to associate professors who in the year 2000 are already tenured.

[11] The minimum threshold to obtain the tenure is very low.

The descriptive statistics of the full and the restricted sample are almost identical, implying that our restricted sample is a satisfactory representation of the whole universe. The percentage of female potential candidates is about 41%, higher in competitions to associate professors (44%) than in competitions to full professors (34%). About 52% of potential candidates has applied for the promotion procedure (53% and 50% respectively for competitions to associate and full professors). About 42% of individuals are from Northern Universities, 28% are from Centre and 30% are from South and Islands. 18% has no tenure (less than 3 years in their current position). About 64% of potential candidates has connections with at least one of the eligible evaluators, while 18% of them has effective connections with one member of the committee.

On average, potential candidates have 10 years of tenure, for potential candidates to associate professor positions tenure is shorter (about 7.7 years) than for candidates to full professor positions (about 15 years). As shown in Panel B, candidates have published on average 34 papers, receiving 443 total citations, have an h-index of 7 and a g-index of 13. On average only 21% of full professors already working in Italian Universities are females.

Table 1. Descriptive Statistics

Panel (a). Whole Sample

	Mean	St. Dev.	Min	Max	Obs.
Application	0.516	0.500	0	1	42860
Female	0.411	0.492	0	1	42860
Ass. Prof. Competition	0.623	0.485	0	1	42860
North-West	0.235	0.424	0	1	42860
North-East	0.189	0.392	0	1	42860
Centre	0.283	0.451	0	1	42860
South	0.181	0.385	0	1	42860
Islands	0.112	0.315	0	1	42860
No tenure	0.179	0.383	0	1	42860
Potential Connections	0.637	0.481	0	1	42860
Effective Connections	0.179	0.383	0	1	42860
Experience	10.388	6.244	0	22	42860
Scientific Field	0.644	0.479	0	1	42860
Perc. Female Full Prof.	0.213	0.135	0	0.739	42860

Panel (b). Our Sample with Productivity Measures

	Mean	St. Dev.	Min	Max	Obs.
Application	0.518	0.500	0	1	8523
Female	0.409	0.492	0	1	8523
Ass. Prof. Competition	0.625	0.484	0	1	8523
North-West	0.237	0.425	0	1	8523
North-East	0.186	0.389	0	1	8523
Centre	0.285	0.451	0	1	8523
South	0.180	0.384	0	1	8523
Islands	0.113	0.316	0	1	8523
No tenure	0.182	0.386	0	1	8523
Potential Connections	0.641	0.480	0	1	8523
Effective Connections	0.176	0.381	0	1	8523
Experience	10.358	6.275	0	22	8523
Scientific Field	0.641	0.480	0	1	8523
Perc. Female Full Prof.	0.214	0.134	0	0.739	8523
Papers	33.932	36.351	0	202	8523
Citations	443.616	823.484	0	4965	8523
h-index	7.661	7.414	0	35	8523
g-index	13.693	13.843	0	66	8523

Notes: Website Ministry of Education for data on assistant and associate professors. Website ASN for data on application for Qualification. “Publish or Perish” software based on Google Scholar for data on Scientific Productivity.

3. Gender Differences in the Probability of Taking Part to the Competition

To investigate whether females are less likely than males to enter in the competition process governing academic promotions in Italy we estimate the following model:

$$[1] \qquad \Pr(Application_{ij} = 1 \mid X) = \Phi(\beta_0 + \beta_1 Female_i + \beta_2 Productivity_i + \beta_3 W_i + \lambda_j + \mu_j)$$

where *i* is an index for each individual and *j* is an index for sub-fields. The dependent variable $Application_{ij}$ is a dummy variable equal to one for a potential candidate who effectively applied for the relevant position at the National Qualification in sub-field *j* and it is equal to zero for a potential candidate who did not apply.

We model the probability of application for the competition as a function of the candidate gender, using the dummy $Female_i$, a vector W_i of individual characteristics (including scientific productivity, years of experience, potential and effective connections, dummies for the geographical location of the University in which the individual currently works). λ_j are 184 dummies for sub-fields and μ_j represents the type of academic position (full or associate professor).

The effect of our interest is the impact of *Female*: ceteris paribus (in particular taking as constant individual productivity and other characteristics) the marginal effect of *Female* shows whether females have a different probability, compared to males, to apply for obtaining a qualification for associate or full professor. More in general, provided that we have good measures of individual productivity and we take into account other possible determinants of the propensity to apply for obtaining the qualification, the marginal effect of *Female* represents evidence of existing differences among males and females in taking part in the competition.

Equation [1] is estimated using a Probit model and the corresponding marginal effects are reported in Table 2. In all the estimates, standard errors are corrected for heteroskedasticity and allowed for clustering at sub-field level. In the first specification we estimate the difference in the probability of application between males and females on the universe of potential candidates (42,860 observations) including among controls only the dummy for type of academic position (notice that we do not have information on scientific productivity for the full sample). Estimates show that a female has a lower probability of applying for promotion of 5.2 percentage points (significant at the 1 percent level). Since on average the probability of applying for promotion is about 52%, females exhibit a reduction of about 10% in the probability of competition participation. In column (2) we include all the controls for individual characteristics that we have available for the full sample of potential candidates and 184 sub-field dummies. After controlling, for *Experience*, *Experience Squared*, *No Tenure* and both *Potential* and *Effective Connections*, a female has a lower probability of enter the competition of 6.7 percentage points. Similar estimates emerge in column (3) where we also include dummies for each University (93).

We also find that potential candidates without tenure have a lower probability of applying (14 percentage points less), while the probability of application is concave with respect to the years of experience

(initially increasing and then decreasing after about 10 years). Individuals with colleagues in the list of eligible evaluators are about 6 percentage points more likely to apply.

To further check that the restricted sample for which we collected data on individual scientific productivity is a representative sample of the universe of potential candidates, in columns (4), (5) and (6) of Table 2 we replicate on the restricted sample the same specifications reported in the first three columns. We obtain estimates that are very similar to those obtained for the whole sample of potential candidates. Once we control for the full set of individual characteristics and for sub-field and university dummies (in column 6) we find that in the restricted sample a female has a lower probability of entering the competition of 7.4 percentage points.

Table 2. Probit Estimates of the Probability of Entering the Competition

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample	Full sample	Full sample	Restricted Sample	Restricted Sample	Restricted Sample
Female	-0.052***	-0.067***	-0.066***	-0.055***	-0.077***	-0.077***
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)
Associate Prof. Comp.	0.031***	-0.076***	-0.075***	0.028***	-0.072***	-0.073***
	(0.008)	(0.009)	(0.009)	(0.008)	(0.013)	(0.013)
No tenure		-0.137***	-0.141***		-0.117***	-0.116***
		(0.011)	(0.011)		(0.021)	(0.022)
Potential Connections		0.059***	0.056***		0.069***	0.071***
		(0.007)	(0.008)		(0.014)	(0.015)
Effective Connections		-0.006	-0.003		-0.013	-0.004
		(0.009)	(0.009)		(0.016)	(0.016)
Experience		0.021***	0.021***		0.030***	0.030***
		(0.002)	(0.002)		(0.005)	(0.005)
Experience Sq.		-0.002***	-0.002***		-0.002***	-0.002***
		(0.000)	(0.000)		(0.000)	(0.000)
Geographical dummies (5)	NO	YES	YES	NO	YES	YES
Subfield dummies (184)	NO	YES	YES	NO	YES	YES
University dummies (93)	NO	NO	YES	NO	NO	YES
Observations	42860	42860	42860	8523	8523	8523
Pseudo R-squared	0.002	0.079	0.084	0.002	0.083	0.093

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is *Application*. Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

In Table 2 we have not considered among independent variables individual scientific productivity, a crucial determinant of the probability of applying. Then, in Table 3, in order to avoid any bias that may derive from the fact that candidate's gender may be related to individual productivity, we include among regressors the comprehensive measure of scientific productivity, *Productivity*.[12]

In the first three columns of Table 3 we report the same specifications of Table 2 but we add among controls our measure of scientific productivity. Estimates show that even after controlling for productivity, females are less likely than males to take part into the competition. However, since productivity is typically lower for females, the magnitude of the *Female* coefficient turns out to be smaller. Once we control for the full set of individual characteristics and dummies for sub-fields and for universities (column 3) we find that

[12] In a preliminary regression (results not reported) we notice that, controlling for individual characteristics, subfield dummies and type of academic position, females turn out to have a lower scientific productivity than males (coefficient on *Female* is -0.312; t-stat=-9.54).

being a female reduces by 4.3 percentage points the probability of entering the competition. Given that the probability of applying for qualification is about 50% in our sample, this amounts to a lower probability of about 8% for females.

Since in our data individual experience is censored (we do not observe if an individual has been hired before 2000) and years of experience could differ between males and females, to avoid possible biases we estimate the specification reported in column (3) only on the sample of individuals hired after year 2000 (5324 observations). Results, reported in column (4), are very similar to those shown in column (3): females have a lower probability of applying of 4.7 percentage points

In columns (5) and (6) we re-estimate specification (3), separately for competitions to associate and full professor positions. We find that females are especially reluctant to enter competitions to full professor positions (5.8 percentage points less than males instead of 4.3 for associate professor competition). However, when we estimate the regression on the whole sample using an interaction term between *Female* and *Associate Prof. Comp* we find that the gender difference between positions is not statistically significant.

Table 3. Probit Estimates of the Probability of Competing controlling for Productivity

	(1)	(2)	(3)	(4)	(5) Ass. Prof. Competition	(6) Full Prof. Competition
Female	-0.043***	-0.044***	-0.043***	-0.047***	-0.043***	-0.058***
	(0.009)	(0.009)	(0.009)	(0.012)	(0.010)	(0.015)
Productivity	0.105***	0.120***	0.121***	0.124***	0.129***	0.122***
	(0.007)	(0.008)	(0.008)	(0.011)	(0.013)	(0.011)
Associate Prof. Comp.	0.099***	0.021	0.021	0.103***		
	(0.010)	(0.015)	(0.015)	(0.021)		
No tenure		-0.128***	-0.126***	-0.094***	-0.146***	-0.000
		(0.021)	(0.022)	(0.028)	(0.033)	(0.033)
Potential Connections		0.047***	0.051***	0.065***	0.042**	0.055**
		(0.014)	(0.015)	(0.018)	(0.018)	(0.025)
Effective Connections		-0.020	-0.015	0.016	-0.015	-0.027
		(0.016)	(0.016)	(0.020)	(0.021)	(0.032)
Experience		0.027***	0.028***	0.066***	0.046***	0.049***
		(0.005)	(0.005)	(0.013)	(0.009)	(0.011)
Experience Sq.		-0.002***	-0.002***	-0.004***	-0.003***	-0.002***
		(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Scientific Area dummies (14)	YES	NO	NO	NO	NO	NO
Geographical dummies (5)	NO	YES	NO	NO	YES	YES
Subfield dummies (184)	NO	YES	YES	YES	YES	YES
University dummies (93)	NO	NO	YES	YES	NO	NO
Observations	8523	8523	8511	5324	5331	3183
Pseudo R-squared	0.085	0.150	0.159	0.177	0.160	0.173

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is Application. Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

As expected, the candidate's scientific productivity strongly contributes to the probability of entering the competition: an increase of one standard deviation in *Productivity* (SD=1.85) produces an increase in the probability of taking part in the competition of about 22.4 percentage points with a *t*-stat of 15.1 (column 3). *Potential Connections* have a relevant role in explaining the probability of applying for qualification (5 percentage points more), while *Effective Connections* do not produce any effect: this probably because while professors in the eligible list were known before the deadline for application, effective committee members

were selected and announced only after the deadline.[13] The number of years of experience has a non-linear relationship: at the beginning the probability of application increases with years of experience but declines after a maximum of 7.4 years. In scientific fields potential candidates are much less likely to apply (20 percentage points less), probably because in these fields reaching the bibliometric indicators suggested by the Ministry of Education, University and Research was more demanding.[14] Individuals from Northern Universities are more likely to apply (3-4 percentage points more) (with respect to Centre-South) whereas those from Islands are much less likely to apply (about 10 percentage points less) (estimates not reported).

4. Heterogeneous Effects across Fields

The data at hand allow us to investigate whether gender differences in entering competition are heterogeneous across academic fields and to analyze whether these differences change in relation to female presence in the field.

As explained in Section 2, in Italy the academic system is organized in 14 different fields. At the aim of analyzing heterogeneous effects across fields we have run separate regressions for each of the 14 fields. We found that females are less likely to compete than males only in the fields of Medicine, Humanities and Law. In Table 4 we report the results obtained when estimating specification (3) of Table (3) pooling together similar fields in order to obtain 5 macro-fields: Mathematics and Natural Sciences (Mathematics, Physics, Chemistry, Earth Sciences, Biology), Engineering (Civil Engineering, Industrial and Information Engineering and Architecture), Medicine (Medicine and Agricultural and Veterinary Sciences), Humanities (Literature and History) and Social Sciences (Economics, Law, Sociology and Political Sciences).

We find statistically significant gender differences in the probability of entering the competition in Medicine (8.9 percentage points), in Humanities and in Social Sciences (about 5 percentage points), while no significant differences emerge in Mathematics, Natural Sciences and Engineering. These findings suggest that women working in Scientific fields are typically more likely to enter into the competition compared to women in non-scientific fields, maybe because as suggested by Buser et al. (2014) women who self-select in scientific fields are more prone to competition.

[13] Once known the effective members of the evaluation committee, candidates have only the possibility to withdraw from the competition. Unfortunately, we do not have information on withdrawals.

[14] In scientific fields the differences in productivity (as measured by bibliometric indicators) between younger and older cohorts of professors are less pronounced, while in non-scientific field older cohorts of professors are characterized on average by a quite low research productivity.

Table 4. Heterogeneous Effects across Fields. Probit Estimates of the Probability of Entering Competition

	(1)	(2)	(3)	(4)	(5)
	Mathematics & Natural Sciences	Engineering	Medicine	Humanities	Social Sciences
Female	-0.023	-0.010	-0.089***	-0.050**	-0.046***
	(0.018)	(0.023)	(0.018)	(0.021)	(0.018)
Productivity	0.145***	0.149***	0.051***	0.120***	0.057
	(0.016)	(0.025)	(0.019)	(0.009)	(0.035)
Associate Prof. Comp.	0.075*	0.037	0.015	0.045	-0.044*
	(0.041)	(0.034)	(0.031)	(0.030)	(0.024)
No tenure	-0.083**	-0.055	-0.167***	-0.136***	-0.172***
	(0.040)	(0.054)	(0.052)	(0.041)	(0.046)
Potential Connections	0.069***	0.111**	0.047	0.012	-0.019
	(0.027)	(0.048)	(0.031)	(0.027)	(0.031)
Effective Connections	-0.051*	-0.017	0.043	-0.041	-0.011
	(0.027)	(0.038)	(0.036)	(0.032)	(0.043)
Experience	0.028***	0.059***	0.031***	0.001	0.028***
	(0.008)	(0.011)	(0.011)	(0.009)	(0.010)
Experience Sq.	-0.002***	-0.003***	-0.002***	-0.000	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Geographical dummies (5)	YES	YES	YES	YES	YES
Subfield dummies (184)	YES	YES	YES	YES	YES
Observations	2168	1282	1450	2009	1590
Pseudo R-squared	0.207	0.182	0.086	0.168	0.088

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is *Application*. Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

Scientific fields are typically male dominated. To better investigate whether women probability of entering competition is different in male dominated fields we exploit the fact that in Italy each field is organized in a number of different sub-fields that are quite heterogeneous in terms of female share of full professors. For instance, within the Social Sciences the fraction of female full professors ranges from 13% (Econometrics) to 45% (Commodity Science). Also in fields such as Mathematics, typically characterized by a severe under-representation of women, there is a quite high variability, with the fraction of female full professors taking values in the range 6%-32% (respectively, Numerical Analysis and Operational Research). Then, to analyze whether female preferences for competition are related to female presence in the field we have considered the fraction of female full professors in each sub-field. As shown in Table 5, when we split our sample in relation to the fraction of female professors characterizing each sub-field, we find that in fields below the 25^{th} percentile (less than 11 percent of females), females have a probability of entering the competition 6.2 percentage points lower compared to male counterparts. On the other hand, in the other sub-fields in which the share of females is more balanced, this difference amounts to about 4 percentage points. In column (4) we estimate our regression on the whole sample using an interaction term between *Female* and a dummy variable taking the value of one for sub-fields with a fraction of female full professors lower than 11%; we find that the gender differences in competitive behavior according to the share of female professors in the field is not statistically significant. Instead, when we run the specification reported in column (4) separately for competitions to full and associate professor positions we find that this differences is statistically significant (*p*-value=0.064) only for competitions to associate professor positions (results not reported and available upon request).

These results suggest that the absence of gender differences in the probability of entering competition in scientific fields in not related to a lower female presence in these fields; if anything a lower female presence among full professors in the field discourages younger women to compete for top positions.

Table 5. Heterogeneous Effects according to the Female Fraction of Full Professors. Probit Estimates of the Probability of Entering Competition

	(1)	(2)	(3)	(4)
	<11%	>=11% & <=30%	>30%	Whole
Female	-0.062**	-0.041***	-0.042***	-0.039***
	(0.025)	(0.011)	(0.016)	(0.009)
Productivity	0.128***	0.117***	0.116***	0.120***
	(0.012)	(0.013)	(0.014)	(0.008)
Associate Prof. Comp.	0.020	0.030	0.009	0.021
	(0.031)	(0.024)	(0.023)	(0.015)
No tenure	-0.121**	-0.108***	-0.177***	-0.128***
	(0.047)	(0.030)	(0.042)	(0.021)
Potential Connections	0.097***	0.017	0.066**	0.047***
	(0.032)	(0.019)	(0.026)	(0.014)
Effective Connections	-0.059**	-0.029	0.028	-0.020
	(0.027)	(0.023)	(0.030)	(0.016)
Experience	0.027***	0.031***	0.022**	0.027***
	(0.009)	(0.007)	(0.009)	(0.005)
Experience Sq	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Female*(<11%Females Full Prof.)				-0.028
				(0.026)
Observations	2037	4175	2311	8523
Pseudo R-squared	0.183	0.142	0.138	0.150

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is *Application*. In all specifications we control for sub-field dummies (not reported). Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

5. Confidence, Risk Aversion and Attitudes Toward Competition

Females' tendency to shy away from competition might be related to differences in expectations, difference in taste for competition or differences in other psychological traits typically influencing competition-entry, such as female tendency to underestimate their own abilities and to be more risk-averse than men.[15] Both risk aversion and self-confidence are especially relevant for the decisions taken by individuals whose scientific productivity is not particularly high and that could not meet all the requirements suggested for promotion. It is common wisdom that women tend to apply for a promotion only when they met all the requirements, while men apply also when they are far from reaching that line. In addition, individuals characterized by a relatively low scientific productivity have a higher probability of failure and then a higher probability of incurring in the penalty that excludes them from the ASN's competitions that will be held in the following two years.

[15] In some recent laboratory experiments, researchers have tried to understand the role played by such differences in psychological traits undertaking a number of strategies aimed at neutralizing their effects. For example, a number of papers try to measure beliefs and risk aversion and use them as control variables in regressions (Dargnies, 2009; Balafoutas and Sutter, 2012; Sutter and Rutzler, 2010, Healy and Pate, 2011; Shurchkov 2011). Other works neutralize risk aversion by asking experiment's participants to make a choice characterized by the same risk as the tournament. In the same vein, beliefs are manipulated by changing the task performed by participants (Niederle and Vesterlund, 2007; Wozniak et al., 2010) or providing them information on their relative performance (Cason et al., 2010; Wozniak et al., 2010).

To focus on this aspect we have analyzed the gender gap in competitive attitudes in relation to individual scientific productivity. We consider as a measure of scientific productivity our indicator *Productivity* and split our sample considering separately potential candidates belonging to the first quartile (below the 25th percentile), potential candidates in the second and third quartile and potential candidates in the fourth quartile (above the 75th percentile). Results are reported in Table 6. We find that the gender gap in the probability of entering the competition holds true only for individuals below the 25th percentile of the scientific productivity distribution (column 1): among this sample of individuals females show a lower probability of entering the competition of about 10 percentage points This is quite a large effect: given that the probability of applying for qualification for "low productivity" males is about 44%, it translates in a lower probability of applying of about 22% for "low productivity" females.

On the other hand, for individuals with higher productivity (columns 2 and 3) the gender gap in entering competition is drastically reduced: the probability of applying is about 2 percentage points lower for females, but this effect is not significant at conventional levels (p-values are around 0.15-0.20). In column (4) we consider the full sample and include an interaction between *Productivity* (demeaned) and *Female*. We find that the interaction variable is positive and significant: a female with average productivity has a lower probability of entering the competition of about 3.9 percentage points, but this difference shrinks to about 0.7 percentage points for individuals with higher productivity (one SD higher than the mean), whereas rises to about 8.5 percentage points for individuals with lower productivity (one SD lower than the mean).

Table 6. Heterogeneous Effects according to Scientific Productivity. Probit Estimates of the Probability of Entering Competition

	(1) < 25th	(2) > 25th & <75th	(3) >75 th	(4) Whole
Female	-0.101***	-0.022	-0.027	-0.039***
	(0.024)	(0.016)	(0.022)	(0.009)
Productivity	0.870***	0.229***	0.065***	0.113***
	(0.114)	(0.022)	(0.010)	(0.008)
Female*Productivity				0.026**
				(0.011)
Observations	1980	4232	2033	8523
Pseudo R-squared	0.172	0.199	0.126	0.151

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is *Application*. In all specifications we control for individual characteristics and sub-field dummies (not reported) as in specification 3 of Table 3. Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

A possibility that is worthwhile to investigate is whether females are more reluctant to enter competition when the requirements to be met for being promoted are less clear. In fact, in this case the role of both self-confidence and risk aversion in the decision to compete might be more relevant.

We exploit the fact that in the Italian University, academic fields are classified in fields in which scientific productivity is evaluated in relation to bibliometric indicators (109 sub-fields, essentially scientific fields) and fields in which the productivity is evaluated according to other less quantitative indicators (75 sub-fields).

We investigate if there is a gender difference in the probability of applying for promotion in bibliometric and non-bibliometric fields. We find that females apply less especially in non-bibliometric fields in which productivity is more hard to measure (columns 1, 2 and 3): females apply for competition 3.7 percentage points less in bibliometric fields and 5.7 percentage points less in non-bibliometric fields.

Within the bibliometric and non bibliometric fields we have also considered individuals with different levels of productivity (see columns 4, 5, 6 and 7 of Table 7). We split our sample considering separately potential candidates with a scientific productivity below and above the 75th percentile. We do not find statistically significant gender differences for potential candidates in the fourth quartile of the scientific productivity distribution neither for bibliometric fields nor for non-bibliometric fields. Instead, for the population of potential candidates with a scientific productivity below the 75th percentile we find that females are less likely to compete than males and that this difference in higher in non-bibliometric fields.

Table 7. Heterogeneous Effects: bibliometric and non bibliometric indicators of productivity. Probit Estimates of the Probability of Entering the Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Biblio Fields	Non Biblio Fields	Whole	Biblio Fields <=75 th	Biblio Fields >75 th	Non Biblio Fields <=75 th	Non Biblio Fields >75 th
Female	-0.037***	-0.057***	-0.066***	-0.041***	-0.023	-0.064***	-0.018
	(0.011)	(0.013)	(0.014)	(0.014)	(0.028)	(0.017)	(0.028)
Productivity	0.133***	0.050**	0.051**	0.240***	0.043***	0.458***	-0.021
	(0.008)	(0.020)	(0.020)	(0.014)	(0.011)	(0.057)	(0.016)
Productivity*Biblio Fields			0.081***				
			(0.021)				
Female*Biblio Fields			0.034*				
			(0.018)				
Observations	5346	3156	8523	4002	1280	2377	763
Pseudo R-squared	0.179	0.091	0.154	0.180	0.149	0.125	0.118

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is *Application*. In all specifications we control for individual characteristics and sub-field dummies (not reported) as in specification 3 of Table 3. Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

6. Gender Differences in the Probability of Success

Women tendency to apply less than men for competitions leading to top academic position might depend on their expectations: they might decide to not apply if they expect to be less successful than their male counterparts. We do not have any direct information on candidates' expectations. However, previous work on the Italian promotion system has shown substantial gender discrimination in promotion (De Paola and Scoppa, 2014). In this section we provide some suggestive evidence on gender differences in the probability of obtaining the qualification (see also Bagues, Sylos-Labini and Zinovyeva, 2014).

The probability of obtaining the National Qualification is a combination of the probability of applying for the competition and the probability of succeeding in getting the Qualification conditional on having applied. Since it is likely that the variables that affect the probability of promotion are the same variables that affect the individual's decision to apply, it is not possible to implement a selection model.

Then, in this section we estimate a Probit model of the probability of success in the competition on the sample of individuals who have applied for (4,266 observations).

Table 8 reports marginal effects of Probit estimates. In column (1) we control for scientific productivity, individual characteristics and subfield dummies and we do not find any difference in the probability of success between males and females. In column (2) we include among controls university dummies. Results are almost identical. In columns (3) and (4) we run separate regressions for competitions to position of associate and full professor. We find no gender difference for positions to associate professor and, surprisingly, a small positive impact of *Female* on the probability of success (conditional on being a candidate) for full professor positions (but weakly significant, *p*-value=0.16).

As expected, research productivity has a strong impact on the likelihood of succeeding in the competition. An increase of one standard deviation in *Productivity* (SD=2.09) leads to an increase in the probability of success of about 23 percentage points. We also show that *Connections* play a very relevant role: the probability of success increases of about 8.2 percentage points. when a colleague of the department is in the evaluation committee. Using interaction terms, we do not find differences in the impact of connections between males and females (results not reported).

Estimates showing that females are as likely as males to succeed in the competition hold true also when we analyze separately different sub-fields characterized by a different fraction of females among full professors. Also in fields where there are few females among full professors, women are as likely as men to succeed in the competition (estimates not reported). In addition, we do not find differences across fields with the exception of Medicine in which females' lower propensity to compete is accompanied also by a large gender gap in the probability of success (in this field females face a lower probability of obtaining the qualification of about 8.3 percentage points).

Table 8. The Probability of Success in the Competition among Applicants. Probit Estimates

	(1)	(2)	(3)	(4)
Female	0.002	-0.000	-0.025	0.056
	(0.020)	(0.020)	(0.026)	(0.040)
Productivity	0.111***	0.112***	0.125***	0.143***
	(0.009)	(0.009)	(0.014)	(0.016)
Associate Prof. Comp.	0.020	0.025		
	(0.026)	(0.027)		
No tenure	-0.105***	-0.107***	-0.028	-0.060
	(0.032)	(0.034)	(0.055)	(0.060)
Potential Connections	0.074***	0.089***	0.107***	0.066
	(0.019)	(0.020)	(0.028)	(0.044)
Effective Connections	0.073***	0.082***	0.104***	0.063
	(0.022)	(0.021)	(0.031)	(0.047)
Experience	-0.015*	-0.016**	0.022	0.002
	(0.007)	(0.008)	(0.014)	(0.019)
Experience Squared	-0.000	-0.000	-0.003***	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Observations	4221	4200	2557	1420
Pseudo R-squared	0.206	0.218	0.238	0.287

Notes: The Table reports marginal effects of Probit estimates (evaluated at the mean values of the explanatory variables in the sample). The dependent variable is *Success*. In all specifications we control for sub-field dummies (not reported). Standard errors (corrected for heteroskedasticity and allowed for clustering at subfield level) are reported in parentheses. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

7. Concluding Remarks

Recent theories in labor economics have argued that one of the main factors explaining the very relevant gaps in labor market outcomes between gender is the difference in gender attitudes towards competition, with women shying away from competitive settings or performing worse when they compete. However, most of the existing evidence come from laboratory experiments (typically employing college students as participants and using small stakes) and it is doubtful if individuals' behavior in real setting situations is similar to their behavior observed in a laboratory.

To shed some lights on gender differences in competitiveness in real life situations we have relied on a natural experiment involving the Italian promotion system for associate and full professor positions. Considering all the assistant and associate professors working in Italian Universities (at the deadline for the application for the National Qualification procedure), we have investigated the existence of gender gaps in the probability of taking part into the competition.

After controlling for productivity and a number of individual and field characteristics, we find that females have a lower probability of entering the competition of about 4-5 percentage points. This gap becomes larger in academic fields in which women are under-represented.

We also find that the tendency to shy away from competition is peculiar to women in the lower tail of the distribution of scientific productivity, while females in the upper tail behave slightly different than males. Interestingly, the gender difference is moderate in bibliometric fields – in which scientific productivity is more easily measurable – while it becomes quite relevant in non-bibliometric fields.

We have also found that conditional, on entering the competition, females are as likely as males to succeed in the Qualification process. This holds true in almost all fields (with the exception of Medicine).

All in all, the differences in competitive attitudes between males and females, although statistically significant, does not seem to explain a very relevant portion of the existing gender gaps in outcomes.

References

Altonji, J. and Blank, R., (1999), "Race and gender in the labor market" in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*. Volume 3C, 3143–259, Amsterdam: North-Holland.

Antonovics, K., Arcidiacono, P., Walsh, R., (2009), "The effects of gender interactions in the lab and in the field", *Review of Economics and Statistics* 91 (1), 152–163.

Arulampalam, W., Booth, A., and Bryan, L. (2007). Is there a glass ceiling over Europe? Exploring the gender pay gap across the wages distribution. *Industrial and Labor Relations Review*, 60, 163–186.

Azmat, G., Petrongolo, B, (2014), "Gender and the Labor Market: What Have We Learned from Field and Lab Experiments?", IZA DP No. 8135, April 2014.

Bagues, M. and Esteve-Volart, B. (2010). Can Gender Parity Break the Glass Ceiling? Evidence from a Repeated Randomized Experiment. *Review of Economic Studies*, 77, 1301-1328.

Bagues, M., Sylos-Labini, M., & Zinovyeva, N. (2014). "Do gender quotas pass the test? Evidence from academic evaluations in Italy", Scuola Superiore Sant'Anna, LEM Working Paper Series, 14.

Balafoutas, L. and Sutter, M., (2012), "Affirmative Action Policies Promote Women and Do Not Harm Efficiency in the Laboratory," *Science*, 335 (6068), pp. 579–582.

Becker, G. (1957). *The Economics of Discrimination*, Chicago: University of Chicago Press.

Bertrand M, Hallock KF. (2001), "The gender gap in top corporate jobs", *Industrial and Labor Relation Review*, 55:3–21.

Bertrand, M., (2011), "New Perspectives on Gender", *Handbook of Labor Economics*, vol. 4b, Amsterdam: North-Holland.

Bagues. M, Sylos Labini M. and Zinovyeva N. (2014), Do gender quotas pass the test? Evidence from academic evaluations in Italy, mimeo.

Blackaby, D., Booth, A., and Frank, J. (2005). Outside offers and the gender pay gap. *Economic Journal*, 115, F81–F107.

Blau, F., and Kahn, M. (2003). Understanding international differences in the gender pay gap. *Journal of Labor Economics*, 21, 106–144.

Booth, A. (2009). Gender and Competition. *Labour Economics*, 16, 599–606.

Bosquet, C.; Combes, P.; Garcia-Peñalosa, C. (2014), Gender and Competition: Evidence from Academic Promotions in France", Working Paper.

Buser, T., Niederle, M., & Oosterbeek, H. (2014). Gender, Competitiveness and Career Choices. The *Quarterly Journal of Economics*.

Cason T., Masters W., Sheremeta R. (2010), "Entry into winner-take-all and proportional-prize contests: an experimental study", *Journal of Public Economics*, 94, pp. 604–11.

Checchi, D. (1999). Tenure. An Appraisal of a National Selection Process for Associate Professorship. *Giornale degli Economisti*, 58, 137-181.

Combes, P, Linnemer L. and Visser M. (2008). Publish or peer-rich? The role of skills and networks in hiring economics professors. *Labour Economics*, 15, 423–441,

Cotton, C., McIntyre, F. and Price, J. (2013), "Gender Differences in Repeated Competition Evidence from School Math Contests", *Journal of Economic Behavior and Organization*, Vol. 86, 2013.

Croson, R., and U. Gneezy, (2009), "Gender Differences in Preferences." *Journal of Economic Literature*, 47 (2), pp. 448–74.

Datta Gupta, N., Poulsen, A., & Villeval, M. C. (2013). "Gender matching and competitiveness: experimental evidence", *Economic Inquiry*, 51(1), 816-835.

De Paola, M., and Scoppa, V., (2014). "Gender Discrimination and Evaluators' Gender: Evidence from the Italian Academia", *Economica*, forthcoming.

De Paola, M., Gioia F. and Scoppa, V. (2014), "Are Females Scared of Competing with Males? Results from a Field Experiment." IZA Discussion Paper No. 8021.

De Paola, M., Scoppa, V., and Lombardo, R. (2010). Can Gender Quotas Break Down Negative Stereotypes? Evidence from Changes in Electoral Rules. *Journal of Public Economics*, 94, 344-353.

Delfgaauw, J. Dur, R., Sol, J. and Verbeke, W., (2013), "Tournament Incentives in the Field: Gender Differences in the Workplace, *Journal of Labor Economics*, Vol. 31, No. 2, pp. 305-326

Ginther, D. and Hayes, K. (2003). Gender Differences in Salary and Promotion for Faculty in the Humanities, 1977-1995. *Journal of Human Resources*, 38 (1), 34-73.

Ginther, D. and Kahn, S. (2004). Women in Economics: Moving Up or Falling Off the Academic Ladder. *Journal of Economic Perspectives*, 18(3), 193-214.

Gneezy U., Leonard L., List J. (2009), "Gender differences in competition: evidence from a matrilineal and a patriarchal society", *Econometrica*, 77:1637–64

Gneezy, U., Niederle, M., Rustichini, A., (2003), "Performance in competitive environments: gender differences", *Quarterly Journal of Economics*, 118, 1049–1074.

Gneezy, U., Rustichini, A., (2004), "Gender and competition at a young age", *American Economic Review*, 94 (2), 377–381.

Goldin, C., and Rouse, C. (2000). Orchestrating impartiality: the impact of blind auditions on female musicians. *American Economic Review*, 90(4), 715–741.

Hilmer, C., and Hilmer, M. (2010). Are There Gender Differences in the Job Mobility Patterns of Academic Economists? *American Economic Review*. 100, 353-357.

Jurajda S, Munich D. (2011), "Gender gap in performance under competitive pressure: Admission to Czech Universities", *American Economic Review: Papers & Proceedings* 2011, 101:3, 514–518.

Lavy, V. (2008). Do Gender Stereotypes Reduce Girls' Human Capital Outcomes? Evidence from a Natural Experiment. *Journal of Public Economics*. 92(10-11), 2083-2105.

Lavy, V. (2012). "Gender Differences in Market Competitiveness in a Real Workplace: Evidence from Performance-based Pay Tournaments among Teachers", *Economic Journal*……

Manning, A. and Saidi, F. (2010). Understanding the Gender Pay Gap: What's Competition Got to Do with It? *Industrial & Labor Relations Review*, 63(7),

McDowell, J. M., Singell L. and Ziliak J. P. (1999). Cracks in the Glass Ceiling: Gender and Promotion in the Economics Profession. *American Economic Review, Papers and Proceedings*, 89(2), 392-396.

Niederle M, Vesterlund L. (2010), "Explaining the gender gap in math test scores: the role of competition", *Journal of Economic Perspectives*, 24(2):129–44.

Niederle, M., Vesterlund, L. (2007), "Do women shy away from competition? Do men compete too much?" *Quarterly Journal of Economics*, 122 (3), 1067–1101.

Niederle, M., Vesterlund, L. (2011), "Gender and Competition", *Annual Review of Economics*, 3, 601-630.

Ors, E., Palomino, F. Peyrache, E., (2013) "Performance Gender Gap: Does Competition Matter?", *Journal of Labor Economics*, Vol. 31, 3, pp. 443-499.

Paserman D. (2010), "Gender differences in performance in competitive environments: evidence from professional tennis players", Work. Pap., Boston Univ.

Perotti, R. (2002). The Italian University System: Rules vs. Incentives. Presented at the first conference on "Monitoring Italy". ISAE, Rome.

Price, C. (2010). "Do Women Shy Away From Competition? Do Men Compete Too Much? A (Failed) Replication", Working Paper University of Southern Indiana.

Shurchkov O. (2011), "Under pressure: gender differences in output quality and quantity under competition and time constraints", *Journal of the European Economic Association*, 10(5), 1189-1213.

Sutter M, Rutzler D. (2010), "Gender differences in competition emerge early in life", IZA Discussion Paper, No. 5015, Bonn, Germany.

Wozniak D., Harbaugh W., Mayr U. (2010), "Choices about competition: differences by gender and hormonal fluctuations, and the role of relative performance feedback", Working Paper, University of Oregon.

APPENDIX. Descriptive Statistics. Breakdown for Type of Position

Table A1. Descriptive Statistics. Potential Candidates for Associate Professor Positions

	Mean	St. Dev.	Min	Max	Obs.
Application	0.526	0.499	0	1	5331
Female	0.449	0.497	0	1	5331
North-West	0.238	0.426	0	1	5331
North-East	0.182	0.386	0	1	5331
Centre	0.289	0.453	0	1	5331
South	0.173	0.378	0	1	5331
Islands	0.117	0.322	0	1	5331
No tenure	0.221	0.415	0	1	5331
Potential Connections	0.648	0.478	0	1	5331
Effective Connections	0.176	0.381	0	1	5331
Experience	7.706	5.181	0	17	5331
Scientific Field	0.640	0.480	0	1	5331
Productivity	-0.263	1.611	-1.746	8.580	5331
Papers	28.833	31.337	0	202	5331
Citations	355.714	691.634	0	4965	5331
h-index	6.747	6.619	0	35	5331
g-index	12.082	12.458	0	66	5331

Table A2. Descriptive Statistics. Potential Candidates for Full Professor Positions

	Mean	St. Dev.	Min	Max	Obs.
Application	0.504	0.500	0	1	3192
Female	0.342	0.475	0	1	3192
North-West	0.235	0.424	0	1	3192
North-East	0.192	0.394	0	1	3192
Centre	0.277	0.448	0	1	3192
South	0.191	0.393	0	1	3192
Islands	0.105	0.306	0	1	3192
No tenure	0.117	0.322	0	1	3192
Potential Connections	0.635	0.482	0	1	3192
Effective Connections	0.175	0.380	0	1	3192
Experience	14.787	5.379	0	22	3192
Scientific Field	0.641	0.480	0	1	3192
Productivity	0.374	2.139	-1.746	8.580	3192
Papers	42.447	42.103	0	202	3192
Citations	590.424	988.711	0	4965	3192
h-index	9.187	8.360	0	35	3192
g-index	16.383	15.523	0	66	3192