

Connections in Scientific Committees and Applicants' Self-Selection: Evidence from a Natural Randomized Experiment*

Manuel Bagues [†] Mauro Sylos-Labini [‡] Natalia Zinovyeva [§]

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Abstract

We examine how the presence of connections in scientific committees affects researchers' decision to apply for a promotion and their chances of success. We exploit evidence from Italian academia, where in order to be promoted to an associate or full professorship, researchers are firstly required to qualify in a national evaluation process. Prospective candidates are significantly less likely to apply when the committee includes, through luck of the draw, a colleague or a coauthor. This pattern is driven mainly by researchers with a weak research profile. At the same time, applicants tend to receive more favorable evaluations from connected evaluators. Overall, the evidence suggests that connected researchers benefit both from a positive bias in evaluations and from access to better information about their chances of success, which helps them to optimize the timing of their application and avoid costly errors. Our study shows that connections are an important determinant of application decisions in academia and, more generally, it highlights the relevance of self-selection for empirical studies on discrimination.

Keywords: discrimination, self-selection, academic labor markets

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[†]Aalto University and IZA, Helsinki, Finland; email: manuel.bagues@aalto.fi

[‡]University of Pisa, Italy; email: mauro.syloslabini@unipi.it

[§]Aalto University, Helsinki, Finland; email: natalia.zinovyeva@aalto.fi

1 Introduction

In academia we are routinely evaluated by our peers. The quality of our research is assessed whenever we apply for a position, a promotion, a grant, or, more frequently, whenever we submit an article for publication. Appropriate attribution of merit in these scientific evaluations is crucial in order to ensure an efficient allocation of resources, to create correct incentives for individual researchers and, ultimately, to speed up the progress of science (Merton 1957, Stephan 1996). Yet, meritocracy is often not an easy goal to achieve. A number of studies have documented that the presence of an academic connection in a scientific committee or in an editorial board tends to increase researchers' chances of success (Brogaard, Engelberg and Parsons 2014, Combes, Linnemer and Visser 2008, Laband and Piette 1994, Durante, Labartino and Perotti 2011, Li 2011, Perotti 2002, Sandström and Hällsten 2008).¹ The higher success rate of connected candidates may sometimes reflect the existence of information asymmetries. Evaluators may prefer candidates whose quality they observe more accurately, particularly in the context of a tournament. More worryingly, connected candidates may also benefit from nepotism or from evaluators' bias in favor of certain types of research (e.g. Zinovyeva and Bagues 2015).

In this paper we argue that, beyond their direct impact on evaluations, connections in scientific committees might also be useful at the application stage. Connected researchers might be better informed about their potential chances of success and they might use this information to make better application decisions, avoiding costly errors. This informational advantage may amplify the premium enjoyed by connected researchers during the evaluation process and, eventually, it may lead to more successful academic careers. The impact of connections on application decisions might be particularly relevant when there exists a large degree of uncertainty about the potential outcome of evaluations and failure is costly.

We study the impact of connections on application decisions and evaluation out-

¹A related literature also shows that connections may have a direct impact on researchers' productivity. For instance, star scientists contribute to the individual research productivity of their former coauthors (Azoulay, Graff Zivin and Wang 2010, Oettl 2012).

comes using the exceptional evidence provided by the Italian system of national qualification evaluations. Since 2012, in order to be promoted to associate and full professor, applicants are required to qualify first in an evaluation which is annually conducted at the national level. Successful applicants can then apply for a position at the university level. Candidates who fail to qualify have to wait for two years before they can apply again. Given the penalization faced by unsuccessful applicants, candidates who anticipate that their chances of success are slim may prefer to postpone their application until they have sufficiently strengthened their curriculum.

This set up has several features which are convenient for the purposes of analysis. In first place, it is wide-ranging. Its evaluations are conducted in every academic field and at two different stages of the career ladder, associate and full professorships. Second, committee members are randomly selected from a pool of eligible evaluators. This provides a credible and transparent empirical strategy. Third, researchers need to pre-register their application before the composition of the committee is known, allowing us to observe a list of prospective candidates independently of whether they finally apply or not. Finally, we observe the curriculum vitae of all potential candidates and evaluators as well as evaluators' reports in two consecutive rounds of evaluations. We use this information to disentangle how connections influence researchers' application decisions and these applications' chances of success.

Our database includes information on around 69,000 applications of researchers who pre-registered in 2012 for the first round of the national qualification evaluation. When the identity of committee members was announced, around 10,000 applications were withdrawn. The remaining 59,000 applications were evaluated by a five-member evaluation committee and 40% managed to qualify. We consider two possible links between pre-registered candidates and eligible evaluators: prior coauthorship of an academic article (*coauthors*) or common current affiliation (*colleagues*).

We find that the withdrawal rate is significantly higher among pre-registered candidates who, by luck of the draw, are assigned to a committee that includes a coauthor or a colleague. The probability that they withdraw their application after the composition

of committees is announced is 3 percentage points (22%) higher than in the case of non connected pre-registered candidates. This pattern is driven by connected researchers with a weak research profile. At the same time, while connected researchers are less likely to apply, we find that their chances of success unconditional on applying are significantly larger. Their success rate is 4.5 p.p. (13%) higher relative to other comparable researchers who pre-registered for the evaluation. Moreover, information from 300,000 individual evaluations (five per applicant) shows that, within each committee, connected candidates tend to receive more favorable evaluations from their coauthors and colleagues, relative to the assessments they receive from other committee members. This connection premium is similar across different levels of research quality.

We propose a simple theoretical framework that helps to understand why connected candidates are less likely to apply but they are more likely to succeed. Within this framework, there are three possible explanations. First, evaluators may generally favor acquainted applicants but they may be negatively biased against some connections (*'love or hate' hypothesis*). The disadvantaged connections may anticipate their handicap and decide to withdraw their application while, at the same time, the success rate of connected candidates tends to be higher. Second, evaluators may perhaps assess more accurately the quality of connected applicants (Cornell and Welch 1996, Bagues and Perez-Villadoniga 2013). High quality connected candidates would benefit from lower information asymmetries, while weak ones would prefer not to apply (*informed evaluators hypothesis*). Third, connected researchers may have access to more precise information about their chances of success. In a context where failure is costly, the reduction in information asymmetries may lead to a lower application rate among connected researchers, even if connected candidates benefit from a positive bias in evaluations (*informed applicants hypothesis*). For this to occur, the cost of failure should be positive but small, so that in the absence of additional information candidates would prefer applying to abstaining.

The first two hypotheses, the *'love or hate' hypothesis* and the *informed evaluators hypothesis*, imply that connected researchers who chose not to apply would have

received a relatively less favorable evaluation from connected evaluators, had they decided to apply. On the contrary, the *informed applicants hypothesis* implies that some connected researchers decided not to apply because they were better informed about their own chances of success, not because they expected a lower assessment from connected evaluators. We try to disentangle these possible explanations by examining how researchers who withdrew their application perform in the following round of the national qualification evaluations, which took place one year later and were assessed by the same committees. Approximately 37% of researchers who withdrew their application in the first round reapply again. We find that connected candidates are more likely to reapply and, among those who reapplied, they tend to be more successful. They also tend to receive more favorable evaluations from their connections in the committee relative to the assessments that they receive from other evaluators, suggesting that their previous withdrawal decision was not driven by the fear of a less favorable evaluation. Instead, the presence of a connection in the committee seems to have helped these researchers to optimize the timing of their application and, eventually, to be more successful.

Our paper contributes to the literature in several ways. Our study illustrates that academic networks are not only useful in terms of their direct impact on productivity and on evaluations, they also provide access to information that helps to make better professional choices. The information shared by connections may be useful in contexts where applications are costly and the outcome of the evaluation is subject to uncertainty, such as applying for a grant, for a position, or selecting the outlet where a paper should be submitted. This informational feature of connections might also partly explain the large success of some mentoring programs (e.g. Blau et al. 2010).

Our results have also important methodological implications for the empirical analysis of connections. If prospective applicants can observe the identity of evaluators and they can decide whether to apply or not taking into account this information, self-selection may bias in a non-trivial way empirical studies that rely only on the

observable characteristics of actual applicants.² On the one hand, the existence of a connection premium may induce connected candidates to be negatively selected. On the other hand, our study shows that the informational advantage of the favored group may also lead to a positive selection. Which of the two effects dominates may vary depending on the context. For instance, in the context that we consider in this paper, not taking into account candidates' self-selection would lead to overestimate the impact of connections on success by around 26%. To deal with self-selection, empirical studies may need to consider all prospective applicants, independently of whether they apply or not.

The endogenous self-selection of candidates may be also relevant for the interpretation of audit and correspondence studies. In these studies, fictitious applicants look identical "on paper" except for some particular characteristic such as gender or race. As pointed out by Heckman and Siegelman (1993) and Neumark (2012), an evaluator's decision to select applicants from a certain group may reflect either taste discrimination or statistical discrimination. Our analysis suggests that, even if the two groups are identical in the overall population, they are likely to differ among applicants due to self-selection, inducing statistical discrimination.³

²There a number of studies in the literature estimating how the presence of a connection in a scientific committee affects candidates' chances of success. Due to data availability, these studies typically rely only on information on the observable productivity of researchers who apply. Combes et al. (2008) analyze the French system of national qualification evaluations. They observe that, in Economics, applicants with a colleague in the committee are approximately 50% more likely to qualify than other candidates with similar observable characteristics. Several authors have also analyzed the role of connections in the decentralized system of promotions that was in place in Italy before 2012. According to work by De Paola and Scoppa (2015), local candidates were three times more likely to succeed than external candidates with a similar h-index. Using also an identification strategy based on observables, Abramo, D'Angelo and Rosati (2015) find that each additional year spent in the same institution as the president of the committee was associated to a 20% increase in the odds of success of candidates. Abramo and D'Angelo (2015) also study the role of connections in the 1st National Scientific Qualification using only information about the final set of applicants. More recently, Fisman, Shi, Wang, and Xu (2016) examine the election of fellows of the Chinese Academies of Sciences and Engineering, and document that applicants who share hometown ties with evaluators tend to be more successful.

³Incidentally, this might perhaps explain the results in Milkman, Akinola and Chugh (2015), who conduct an audit study in which fictional prospective students contact professors in order to discuss research opportunities prior to applying to a doctoral program. Faculty are significantly less responsive to students with a foreign-sounding name even if, by construction, their messages were otherwise identical. A possible explanation, within the framework of our study, is that employers prejudge native prospective students to be better informed about their fit and, as a result, they foresee that they will be positively selected among students who decide to contact the faculty.

Our study also spotlights an important dimension that has been previously overlooked in policy debates about the optimal design of scientific evaluations. Policy makers may want to consider more carefully whether prospective applicants should receive information about the identity of evaluators. For instance, in the context of the qualification exams that we study in this paper, allowing pre-registered candidates to withdraw their application once the committee composition is announced amplifies the benefits of connections, allowing some connected candidates with a weak research profile to withdraw their application and avoid a costly and time-consuming failure.

Finally, our paper documents that evaluation biases may persist in a context with a large degree of transparency. The Italian system of national qualification evaluations was designed with the objective of reducing favoritism. The members of the national evaluation committees are selected randomly from a pool of eligible professors who satisfy some minimum requirements of research quality, committees can have no more than one professor from a given university, and they include a foreign expert. To foster public scrutiny, the evaluation agency publishes online the CVs of all applicants, including their bibliometric indicators such as number of publications, citations or h-index. At the end of the evaluation, it also publicizes the final evaluation reports drafted by each member of the evaluation committee. Our analysis shows that, even in this highly transparent context, connected candidates receive significantly better evaluations.⁴

The paper is organized as follows. We start by proposing a simple model of application behavior that helps to clarify how connections in committees may affect candidates' decision to apply. In section 3, we explain the structure of the evaluation process. In section 4, we describe the data used in the empirical analysis and in section 5 we present our main findings. In section 6 we briefly summarize the findings and we discuss possible interpretations and implications.

⁴The connection premium would have been probably larger in a less transparent system. For instance, Zinovyeva and Bagues (2015) find that in the Spanish system of national qualification evaluations, where evaluation reports are not publicized, the (exogenous) presence of a colleague or a coauthor in the committee increases candidates' chances of qualifying by around 50%. Similarly, the work of Perotti (2002) suggests that the impact of connections was significantly higher in the evaluation system that was previously in place in Italy.

2 Theoretical framework

To provide some theoretical underpinning of the mechanisms at play, we propose a simple conceptual framework analyzing how the presence of a connection in a committee may affect prospective candidates' decision to participate in an evaluation process. The model aims to capture several features of scientific evaluations. First, applications tend to involve some costs, either in the form of specific investments or opportunity costs. Given these costs, prospective candidates need to weigh up carefully their probabilities of success in order to decide whether they should apply or not. Second, the outcome of the evaluation may depend on the identity of the evaluator. Some evaluators may be more demanding than others. They may also have a preference in favor (or against) acquainted candidates. Third, there might be relevant information asymmetries both on the evaluators' and on the researchers' side. Evaluators may observe imperfectly the quality of candidates and, likewise, candidates may not be perfectly informed about evaluators' standards. The existence of a connection between an evaluator and candidate may reduce these information asymmetries.

According to the model, the impact of connections on application decisions is ambiguous. If evaluators are positively biased towards connected researchers, this would increase the likelihood that these researchers apply. However, if connections also convey information on evaluation standards to potential applicants or if they provide information to evaluators on the quality of candidates, the impact of connections on applications can be either positive or negative. The direction of this effect depends on the quality of the researcher, the level of information asymmetries and the cost associated to failure.

2.1 Set up

Let us consider an individual i of quality q_i who has to decide whether to submit an application to evaluator j . The net gain of applying and qualifying is equal to G while the cost of applying and failing is equal to C , where both G and C are positive. The payoff for the individual if he does not apply is equal to zero. The payoff function of

the candidate can be described as follows:

$$\text{Payoff}_{ij}^{cand} = \begin{cases} G, & \text{if candidate } i \text{ applies and qualifies,} \\ -C, & \text{if candidate } i \text{ applies and fails,} \\ 0, & \text{if candidate } i \text{ does not apply.} \end{cases}$$

If the candidate applies, the evaluator assesses the application and her payoff function is as follows:

$$\text{Payoff}_{ij}^{eval} = \begin{cases} q_i + B_{ij}, & \text{if candidate } i \text{ is granted a qualification,} \\ U_j, & \text{if candidate } i \text{ is not granted a qualification,} \end{cases}$$

where B_{ij} reflects the potential existence of subjective bias and U_j is the outside option of the evaluator or, equivalently, the threshold that the candidate needs to achieve in order to be granted a qualification.

There are two sources of uncertainty in the model. First, the potential applicant does not know precisely how large the threshold U_j is. He has some distributional prior information, $U_j \sim N(0, 1)$ and, additionally, he receives a private signal about the actual draw of U_j :

$$z_{ij} = U_j + \epsilon_{ij}, \quad \epsilon_{ij} \sim N(0, \gamma_{ij}^2),$$

where γ_{ij}^2 reflects the degree of accuracy of the signal that the individual receives. The second source of uncertainty comes from the fact that the evaluator observes only imperfectly the true quality of the candidate. She knows the distribution of quality among prospective candidates, that for the sake of simplicity is $q_i \sim N(0, 1)$, and she also receives a private signal about the actual quality of the candidate:

$$y_{ij} = q_i + \eta_{ij}, \quad \eta_{ij} \sim N(0, \sigma_{ij}^2),$$

where σ_{ij}^2 is the accuracy of the signal. While the candidate and the evaluator do not observe the signals received by each other, prior beliefs and the accuracy of the signals are common knowledge.

Let us derive the application decision of the prospective applicant by means of backward induction. First, consider the second stage, at which the evaluator decides whether to promote or fail the candidate. For simplicity, let us assume that the evaluator only takes into account the observed signal and the prior distributional information, and she does not try to infer the quality of the applicants based on their application decisions.⁵ The evaluator promotes the candidate whenever his expected quality is higher than the outside option:

$$E(q_i + B_{ij}|y_{ij}) = \frac{y_{ij}}{1 + \sigma_{ij}^2} + B_{ij} > U_j \Rightarrow \text{promote candidate } i. \quad (1)$$

Now let us consider the first stage, at which the candidate decides whether to apply. The candidate forms a judgment about how his application will be perceived by the evaluator. This judgment takes into account both the candidate's own quality and the accuracy of the signal that the evaluator will observe:

$$E(q_i|y_{ij})|q_i \sim N\left(\frac{q_i}{1 + \sigma_{ij}^2}, \frac{\sigma_{ij}^2}{(1 + \sigma_{ij}^2)^2}\right).$$

At the same time, the candidate also forms a posterior distribution about the grading standards of the evaluator, based on the private signal that he receives:

$$U_j|z_{ij} \sim N\left(\frac{z_{ij}}{1 + \gamma_{ij}^2}, \frac{\gamma_{ij}^2}{1 + \gamma_{ij}^2}\right).$$

Given the decision rule of the evaluator in the second stage (equation (1)), the prospective candidate expects to qualify with the following probability:

$$Pr(E(q_i + B_{ij}|y_{ij}) > U_j|q_i, z_{ij}) = \Phi\left(\frac{\frac{q_i}{1 + \sigma_{ij}^2} + B_{ij} - \frac{z_{ij}}{1 + \gamma_{ij}^2}}{\sqrt{\frac{\sigma_{ij}^2}{(1 + \sigma_{ij}^2)^2} + \frac{\gamma_{ij}^2}{1 + \gamma_{ij}^2}}}\right), \quad (2)$$

where $\Phi(\cdot)$ is the cumulative density function of a standard normal distribution. Assuming risk neutrality, individual i will be willing to apply as long as, based on the

⁵There are two possible ways to interpret this simplifying assumption. Formally, we may think of a context where committee members evaluate researchers without knowing whether they are applying or not. Alternatively, we may consider naive evaluators, who are unaware of the fact that candidates' decision to apply may reveal information about their quality.

available information, the expected net return from applying is positive:

$$\begin{aligned} & Pr(E(q_i + B_{ij}|y_{ij}) > U_j | q_i, z_{ij}) * G - [1 - Pr(E(q_i + B_{ij}|y_{ij}) > U_j | q_i, z_{ij})] * C > 0 \\ & Pr(E(q_i + B_{ij}|y_{ij}) > U_j | q_i, z_{ij}) > \frac{C}{G+C}. \end{aligned} \quad (3)$$

Substituting the expression for the probability of success (2) in the application rule (3) and rearranging appropriately the terms, we can see that prospective candidates apply whenever they receive a sufficiently low signal z_{ij} about the evaluation threshold U_j .

$$z_{ij} < z_{ij}^* \Leftrightarrow \text{candidate } i \text{ applies,}$$

where $z_{ij}^* = \left[\frac{q_i}{1+\sigma_{ij}^2} + B_{ij} - \Phi^{-1}\left(\frac{C}{G+C}\right) \sqrt{\frac{\sigma_{ij}^2}{(1+\sigma_{ij}^2)^2} + \frac{\gamma_{ij}^2}{1+\gamma_{ij}^2}} \right] (1 + \gamma_{ij}^2)$ and $\Phi^{-1}(\cdot)$ is the normal inverse cumulative density function.

Given this application rule, when the evaluator's grading standards are equal to U_j , the probability that a prospective candidate of quality q_i applies is:

$$Pr(z_{ij} < z_{ij}^* | U_j, q_i) = \Phi \left(\frac{\left[\frac{q_i}{1+\sigma_{ij}^2} + B_{ij} - \Phi^{-1}\left(\frac{C}{G+C}\right) \sqrt{\frac{\sigma_{ij}^2}{(1+\sigma_{ij}^2)^2} + \frac{\gamma_{ij}^2}{1+\gamma_{ij}^2}} \right] (1 + \gamma_{ij}^2) - U_j}{\gamma_{ij}} \right). \quad (4)$$

2.2 Comparative statics

We use expression (4) to analyze the three channels through which connections might have an impact on application behavior: evaluation bias, lower uncertainty about the candidate's quality, and lower uncertainty about the evaluator's standards.

Case 1: connections and evaluation bias. First, let us consider the case when there is an evaluation bias (connections affect B_{ij}) but connections do not reduce information asymmetries (σ_{ij}^2 and γ_{ij}^2 are constant). Since $\Phi(\cdot)$ is a monotonically increasing function, the probability of applying increases in B_{ij} for all candidates. If connections do only involve a positive (negative) evaluation bias, we should observe an increase (decrease) in the probability that connected candidates apply.

Case 2: connections convey information on candidates. The situation is different if connections reduce information asymmetries. As we show below, depending on candidates' quality, connections in the committee might either encourage or discourage candidates from applying. Consider the possibility that connected candidates are better informed about evaluators' preferences (connections reduce γ_{ij}^2). For simplicity, let us assume that there is no evaluation bias ($B_{ij} = 0$), the evaluator can perfectly observe candidate quality ($\sigma_{ij}^2 = 0$), and $C = G$. The probability that the candidate applies is equal to:

$$Pr(z_{ij} < z_{ij}^* | U_j) = \Phi \left(\frac{q_i(1 + \gamma_{ij}^2) - U_j}{\gamma_{ij}} \right).$$

The derivative of this expression with respect to γ_{ij} is:

$$\frac{\partial Pr(z_{ij} < z_{ij}^* | U_j)}{\partial \gamma_{ij}} = -\phi \left(\frac{q_i(1 + \gamma_{ij}^2) - U_j}{\gamma_{ij}} \right) \frac{q_i(1 - \gamma_{ij}^2) - U_j}{\gamma_{ij}^2},$$

where $\phi(\cdot)$ is the probability density function of a standard normal distribution. The sign of this derivative depends on the values of q_i , γ_{ij}^2 and U_j . A reduction in the uncertainty regarding the evaluation threshold would induce a relatively good candidate ($q_i > \frac{U_j}{1 - \gamma_{ij}^2}$) to apply more and a relatively weak candidate ($q_i < \frac{U_j}{1 - \gamma_{ij}^2}$) to apply less.

Case 3: connections convey information on evaluation standards. Consider now the case when evaluators observe more accurately the quality of connected candidates (connections reduce σ_{ij}^2). Again, for simplicity let us assume that the candidate can perfectly observe grading standards ($\gamma_{ij}^2 = 0$), there are no evaluation biases ($B_{ij} = 0$), and $C = G$. The probability that a prospective candidate applies is equal to:

$$Pr(z_{ij} < z_{ij}^* | U_j) = \begin{cases} 1, & \text{if } \frac{q_i}{1 + \sigma_{ij}^2} - U_j > 0, \\ 0, & \text{if } \frac{q_i}{1 + \sigma_{ij}^2} - U_j < 0. \end{cases}$$

The candidate would only apply if, given his quality, he expects that the evaluator will observe a high enough signal. A more precise signal would increase the candidate's willingness to apply if candidate quality is above average ($q_i > 0$). On the

contrary, below average quality candidates are less likely to apply when the signal is more informative.

In sum, the nature of the connections might determine whether there is an increase or a decrease in the prospective candidate's willingness to apply. If connections in committees are mainly associated with a positive evaluation bias, we would expect that connected candidates are negatively selected into the application. However, if connections decrease information asymmetries between the candidate and the evaluator, the effect of connections on applications is ambiguous. When evaluator better observe the quality of their connections, relatively weak candidates would be less likely to apply when they have a connection in the committee and, by doing so, they would avoid the cost of failure. On the contrary, candidates who excel in dimensions that are observed more accurately by connected evaluators would be more likely to apply. A similar pattern would be observed when connections convey more precise information on evaluation standards, while the overall level of uncertainty about the evaluation standard is not very high.

3 Background

Most Italian universities are public and the recruitment of full and associate professors is regulated by national laws.⁶ Before 2010, recruitment procedures were managed locally by each university. In 2010, a two-stage procedure similar to those already in place in other European countries was approved (e.g. France and Spain).⁷ In the first stage, candidates to associate professor and full professor positions are required to qualify in a national-level evaluation known as the National Scientific Qualification (*Abilitazione Scientifica Nazionale*). Evaluations are conducted separately in 184 scientific fields designed by the Ministry of Education. A positive assessment is valid for four years while a negative one implies a ban on participating in further national

⁶According to *OECD Education at a glance* (2013), in 2011 about 92% of students in tertiary education were enrolled in 66 public universities and the remaining 8% in 29 independent private institutions.

⁷Law number 240/2010, also known as “Gelmini reform” after the name of the minister of Education.

evaluations during the following two years. Qualified candidates can participate in the second stage, which is managed locally by each university.

3.1 The National Scientific Qualification

The first National Scientific Qualification was performed between 2012 and 2014.⁸ The timeline of the process is described in Figure 1. The call for eligible evaluators was published in June 2012. The deadline for professors to volunteer to be an evaluator was August 28. Once the list of eligible evaluators was settled, the Ministry publicized their identities and their CVs. In the meantime, the call for candidates' applications was issued in July. Candidates had to pre-register online by November 20. The submission package included the CV and up to 20 selected publications. Researchers were able to pre-register to multiple fields and positions.

Once the application deadline was closed, committee members were selected by random draw from pool of eligible evaluators in the corresponding field. These lotteries were held between late November 2012 and February 2013. The same committee had to evaluate candidates for associate and full professorships. Following their appointment, and before the list of pre-registered applicants was known, each evaluation committee had to draft and to publish online a document describing the general criteria that would be used to grant positive evaluations. In order to elaborate the document, committee members have to meet, discuss their individual criteria and find a compromise. Perhaps depending on the level of agreement between the evaluators, this document may be more or less informative about the criteria to be used for evaluation.⁹ At this point, pre-

⁸A detailed description of the process is available at <http://abilitazione.miur.it/public/index.php?lang=eng>, retrieved on February 2014.

⁹For instance, in Econometrics the committee announced that “(i)n order to assess the scientific maturity of the candidates, the Committee will give prominent weight to the evaluation of their scientific publications, especially those published in top journals. The publications will be evaluated on the basis of their originality, innovativeness, methodological rigor, international reach and impact, and relevance for the field. In order to evaluate journal articles, the Committee may use the classification of journals provided by ANVUR and the bibliometric indicators provided by Web of Science and Scopus. The Committee may also use information regarding the impact of each individual publication and the total number of citations received by the candidate.” A committee in Political Economy stated that “a sufficient condition to obtain a qualification for associate professorship is to satisfy at least one of the following conditions (based on the publications in the previous 10 years): 1) have at least 2 articles in A-journals as defined by the evaluation agency, 2) have at least 3 articles in scientific journals included in the database Web of Science, Social Science Citation Index, Economics, 3) have

registered candidates could still withdraw their application. The deadline to withdraw the application expired two weeks after the committee composition had been decided and the committee had publicly announced the evaluation criteria. By the end of this period, evaluation committees were informed about the final list of candidates and the examination took place. Below we explain in more detail how committee members were selected and the evaluation process.

3.2 Selection of committees

The pool of eligible evaluators includes full professors in the corresponding field who have volunteered for the task and satisfy some minimum quality requirements. There are 184 officially defined fields. Fields in math, engineering, and natural and life sciences require a research production which is above the median for full professors in the field and which is present in at least two of the following three dimensions: (i) the number of articles published in scientific journals covered by ISI Web of Science, (ii) the number of citations, (iii) and the H-index.¹⁰ In the social sciences and the humanities, eligible evaluators are required to have a research production above the median in at least one of the following three dimensions: (i) the number of articles published in high quality scientific journals (in what follows, A-journals),¹¹ (ii) the overall number of articles published in any scientific journals and book chapters, and (iii) the number of published books.

Eligible evaluators may be based in Italy (hereafter ‘Italian’) and may also be affiliated to a university from an OECD country (hereafter ‘international’). International and Italian eligible evaluators have to satisfy the same research requirements but their remuneration differs. While ‘Italian’ evaluators work *pro bono*, OECD evaluators receive €16,000 for their participation.

at least 5 articles in scientific journals included in database Scopus, Economics, Econometrics and Finance.”

¹⁰More precisely, this rule applies to Mathematics and IT, 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.

¹¹An evaluation agency and several scientific committees determined the set of high-quality journals in each field.

Evaluation committees include five members. Four members are randomly drawn from the pool of eligible Italian evaluators, under the constraint that no university can have more than one evaluator within the committee. The fifth member is typically selected from the pool of eligible international evaluators. Exceptionally, whenever the pool of international professors includes less than four professors, all five committee members are drawn from the pool of eligible evaluators based in Italy. Randomization is conducted in a way that leaves little room for manipulation. Eligible evaluators in each field are ordered alphabetically and are assigned a number according to their position. A sequence of numbers is then randomly selected. The same sequence is applied to select committee members in a number of different fields.

Evaluators are in charge for two rounds of the national scientific qualification. If an evaluator resigns, a substitute evaluator is selected randomly from the corresponding group of eligible evaluators.

3.3 The evaluation

The evaluations are (officially) based only on candidates' CVs and publications. There are no oral or written tests or interviews. Committee members meet periodically to discuss their assessments and cast their votes. A positive assessment requires a qualified majority of four positive votes (out of five committee members). Only kinship relationships between evaluators and candidates are officially subject to a conflict of interest rule. In these cases, the evaluator cannot participate in the deliberation and the voting decision. Notably, coauthors and colleagues are not affected by conflict of interest rules.

Committees have full autonomy on the exact criteria to be used in the evaluation. Nonetheless, it is important to point out that an independent evaluation agency (ANVUR), appointed by the Ministry, collected and publicized information on the research productivity of all candidates in the previous ten years. This productivity was first measured by the same three bibliometric indicators employed to select evaluators and it was then normalized by taking into account the amount of time passed since

first publication and also the number of job interruptions (this last typically related to parental leave). The ANVUR also calculated the median research productivity of Italian associate and full professors in each bibliometric dimension. Committees are not obliged, though encouraged, to use this information.

At the end of the process, committees provide each candidate with (i) the final outcome of the evaluation (pass or failure), (ii) a collective report explaining the criteria used by the committee and how they reached their final decision and (iii) five individual reports explaining each evaluators' position. Figure (2) provides a sample of an individual evaluation report.

3.4 Following the evaluation

Applicants who received a positive evaluation could apply for a position at the university level. The number of opening was relatively limited, at least, initially. By December 2015 only 29% of qualified candidates had been promoted at the university level.

Candidates who failed to qualify had to skip two evaluation rounds before they could apply again. Candidates who did not apply could apply the following year to be evaluated by the same committee or to wait for the future evaluation rounds with different committees.

In practice, the system experienced a lot of changes after the second evaluation round and the third round was delayed for several years. The new call for candidates was announced only in the fall of 2016.

4 Data

We consider all evaluations held within the first two rounds of the *National Scientific Qualification*. The database includes examinations for associate and full professorships in 184 academic fields. We describe below the available information on (i) the pool of eligible and actual evaluators; (ii) the pool of pre-registered and actual applicants and

(iii) the final outcome of the evaluation.¹²

4.1 Evaluators

Around six thousand professors, all based in Italy, volunteered and qualified to be in the pool of eligible evaluators. The number of professors in the pool of eligible evaluators based abroad was slightly above one thousand. In the average field, the pool of eligible evaluators includes 32 Italian professors and eight international professors.

Table 1 provides some descriptive information on eligible evaluators. The average CV includes around 131 research outputs, mostly journal articles (73), book chapters (22), and conference proceedings (20). The average CV also includes 0.42 patents. As a proxy for the quality of journal articles, we have collected information on the quality of the journals in which they were published. In social sciences and humanities we use the official list of A-journals that was compiled by the Italian evaluation agency. This list includes approximately 7,000 academic journals. In sciences, we consider the *Article Influence Score* (AIS) of journals.¹³

Approximately 8% of Italian evaluators drawn in the initial lottery resigned and were replaced by other (randomly selected) eligible evaluators. The resignation rate was slightly higher among international evaluators (10%).¹⁴

4.2 Applications

More than 46,000 researchers pre-registered in the first round of the national scientific qualification. This accounts for around 61% of assistant professors and 60% of associate professors in Italy.¹⁵ One third of candidates registered in several fields (e.g: qualifi-

¹²We collected the CVs of prospective candidates and evaluators and the final evaluations from the webpage of the Ministry of Education. To avoid problems with homonymity, we have excluded 14 candidates that had the same name and surname as other candidates within the same field and rank.

¹³This indicator is available for all publications in the Thomson Reuters Web of Knowledge. It is related to *Impact Factor*, but it takes into account the quality of the citing journals, the propensity to cite across journals and it excludes self-citations. The average journal is normalized to have AIS equal to one.

¹⁴In two fields where the international member of the committee resigned, the pool of international evaluators included originally just four members. In these two cases, given that the pool of remaining eligible evaluators was lower than four, the replacement was selected from the Italian pool.

¹⁵Source: Our own calculations using information from the Italian Ministry of Education on the identity of all assistant (*Ricercatori*) and associate professors (*Associati*) in Italy on December 31

cation to full professorship in Political Economy and qualification to full professorship in Applied Economics) or in different categories of the same field (e.g.: qualification to full and associate professorships in Political Economy). In total there were 69,020 pre-registered applications, approximately 375 per field.

In the upper panel of Table 2, columns 1 and 2 provide information on the characteristics of the initial set of pre-registered applications. The average CV has 16 pages and it reports 64 research outputs, mostly journal articles (37). It includes also some books (2), book chapters (7), conference proceedings (10), and patents (0.24). A typical paper is coauthored by six authors, with only 34% of papers being single authored. The candidate reports to be the first author in 22% of the occasions. Columns 3 and 4 distinguish between candidates to a position of full and associate professor. Not surprisingly, candidates to full professor positions have a relatively longer publication record: 89 vs. 53 publications. In social sciences and humanities, the average candidate for a position of full professor has published six articles in A-journals; applicants to associate professorships have published only three. In sciences, the average AIS of papers published by candidates for a position of full professor is around 1.31; it is similar for candidates to associate professorships. We have also constructed a proxy for the timing of the application. We use the application code number, which reflects the ordering of application, and we normalize this variable uniformly between 0 and 1 for applicants within the same list. This measure might perhaps be correlated with candidates' quality or with their self-confidence.

Some applications were withdrawn by applicants when the identity of evaluators and the general evaluation criteria were revealed. For the final set of applications, the evaluation agency of the Ministry of Education constructed and published online information on candidates' research production during the 10 previous years measured along three bibliometric dimensions described earlier. The evaluation agency also compared candidates research output with the median in the corresponding field and position. This information, is summarized in the lower panel of Table 2. Around 38% of the

2012.

final candidacies were above the median in each of the three dimensions. On the other end of the scale, 16% were below the median in every dimension.

4.3 Connections

We consider two types of links between candidates and evaluators: coauthorships and affiliation to the same institution. Approximately 12% of candidates were assigned to a committee including a colleague and around 7% to a committee including a coauthor.¹⁶ In about a third of the cases the coauthor also belongs to the same university.

In the National Scientific Qualification, coauthors and colleagues are not formally subject to a conflict of interest rule. Nonetheless, committees might autonomously decide to self-impose their own additional restrictions. According to our analysis of the evaluation reports, evaluators voluntarily abstained in the presence of a colleague or a coauthor in only three fields (out of a total 184).¹⁷

As shown in Table 2, columns 5-7, candidates with a connection in the evaluation committee, either a colleague or coauthor, tend to have a significantly better research profile relatively to the rest of candidates. Connected candidates excel both in terms of quantity and quality of research.

4.4 Evaluations

Table 3 provides information on the outcome of the evaluation process. The upper panel provides information on the first round of evaluations. Out of the initial set of 69,020 pre-registered applications, approximately 14% were withdrawn and did not receive an evaluation, 49% failed the evaluation and 37% were successful. Success is strongly correlated with candidates' observable research productivity. As shown in Figure 3, among actual candidates whose quality was below the median in every dimension only 4% managed to succeed, compared to a 63% success rate among candidates who excelled in all three dimensions.

¹⁶Information on connections is only available for evaluators based in Italy.

¹⁷These three fields are Ecology (sector 05/C1), Pediatrics (06/G1) and Management (13/B2). As a result, 84 candidates in these fields received only four evaluation reports.

Each committee member writes an individual evaluation report for each application. Overall there are approximately 295,000 individual reports.¹⁸ The average report includes around 176 words and provides a description of the research production of the candidate, some discussion about its quality and its fit with the field. It also indicates the evaluator’s final assessment on whether the candidate deserves qualification. We have conducted a text analysis of these reports in order to identify the final assessment. On most occasions, the final assessment was decided unanimously by all five evaluators (86%). Over all, 45% of votes were favorable to the candidate and 55% were negative.

Those candidates who had withdrawn the application in the first round of evaluations had a chance to participate in the second round of evaluations, which was conducted the following year and was evaluated by the same committees. Around 37% of these candidates chose to reapply. Out of the group of those who had reapplied, 58% managed to qualify.¹⁹

Candidates who qualify in the National Scientific Qualification can later apply for a promotion at the university level. Out of all researchers who pre-registered for the first round of evaluations and who qualified for the corresponding position either in the first or the second round, by December 2015 about 35% had been promoted to an associate professor position and 11% had been promoted to a full professor position.

5 Empirical analysis

We study the role of two specific types of academic connections: colleagues and coauthors. We analyze the effect of these connections upon researchers’ application decisions and upon evaluators’ assessments and, using the conceptual framework presented in section 2, we examine which of the three mechanisms considered – bias, informed evaluators or informed applicants – are consistent with the evidence.

Our two measures of connections, coauthors and colleagues, may capture different

¹⁸Due to a technical problem, we are missing information on evaluation reports of 202 applications.

¹⁹In this second round, we have obtained information on the final assessment for all candidates, with the exception of one field where the committee had not published their evaluations as on December 2015. We have also collected individual evaluation reports in all fields that had completed evaluations by May 2015 (116 out of 184 fields).

dimensions. Colleagues are in general expected to be close in social terms but not necessarily intellectually. They might have private information on candidates' contribution to professional service and, sometimes, they might be perhaps directly affected by the outcome of the evaluation. Coauthors are probably closer both in the social space and the ideas space. Nonetheless, in what follows, given that we find that empirically the impact of coauthors and colleagues is practically identical, we report jointly the impact of both types of connections.²⁰

5.1 The impact of connections on applications

According to the conceptual framework presented in section 2, if evaluators are biased in favor of connected candidates, this is expected to encourage candidates with a connection in the committee to apply. Moreover, we would expect connected candidates to be negatively selected among applicants. On the other hand, if connections reduce information asymmetries, their impact would depend on the relative quality of candidates, particularly in dimensions that are observed more accurately by connected evaluators. Weak (strong) candidates would be less (more) likely to apply when the committee includes a connection.

As shown in Table 2, researchers who have a connection in the evaluation committee tend to have a stronger research profile and, presumably, might also differ in some unobserved dimensions. In order to estimate the causal impact of connections on researchers' application decisions, we identify exogenous variations in the availability of a connection in the committee exploiting the random selection of its members. We compare the application behavior of researchers who initially have similar chances of having a connection in the committee but, due to the random draw, differ in terms of the actual number of connections that they end up having in the evaluation committee:

$$y_{i,c} = \beta_0 + \beta_1 \text{Connections}_{i,c} + \mathbf{D}_{i,c} \beta_2 + \mu_c + \epsilon_{i,c}, \quad (5)$$

where $y_{i,c}$ is a dummy variable that takes value one if researcher i applies for a quali-

²⁰Results disaggregated by coauthor and colleague are available upon request.

fication in exam c (e.g.: qualification for an associate professorship in Econometrics). $\mathbf{D}_{i,c}$ represents a set of indicator variables for the number of connections that researcher i expects to have in committee c before the random selection takes place.²¹ $Connections_{i,c}$ indicates the number of committee members selected in the initial random draw who have coauthored with the candidate or who are affiliated to the same institution (typically zero or one). Note that a few evaluators (9%) resigned and were replaced by other (randomly chosen) eligible evaluators and, as result, the number of connections in the initial committee might differ slightly from the final composition of the committee at the time of the evaluation. Therefore, in the baseline specification coefficient β_1 captures the so-called intention-to-treat effect (ITT).

In order to increase the accuracy of the estimation, we include in the equation a set of exam fixed effects (μ_c), accounting for possible differences in the average success rate across different fields and positions. In some additional specifications, we also control for the set of predetermined individual characteristics and quality indicators listed in Table 2 (\mathbf{X}_i). In all regressions, standard errors are clustered at the field level, thus reflecting that evaluations within each field are done by the same committee.

The key identifying assumption of the analysis is that the composition decided by the initial random draw should not be correlated with any relevant observable or unobservable characteristic of researchers. The way in which the randomization was implemented suggests that there was little room for manipulation. Nonetheless, we explicitly test the randomness of the assignment. We estimate a specification similar to equation (5), but we consider as dependent variables all observable predetermined characteristics of individual i (x_i). We perform this estimation on the sample of researchers who had pre-registered for the evaluation. As shown in Table 4, the results from these

²¹If there were no restrictions on the randomization procedure, the expected number of connections in the committee would be equal to the proportion of connected evaluators in the pool of eligible evaluations times the number of evaluators in the committee (which in the Italian case is equal to five). In practice, the rule of the draw limited to one the number of evaluators from the same university that can sit in the same committee. In order to take this restriction into account, we have computed the expected committee composition using one million simulated draws. We have then rounded the expected number of connections to two decimal places and created indicator variables for each value. All results are practically identical if we control for the expected number of connections using a linear specification instead of a set of dummies.

randomization tests are consistent with the assignment being random. Researchers who obtain, through luck of the draw, a connection in the evaluation committee are statistically similar to other researchers. There are 10 coefficients that capture the correlation between the random shock to committee composition and researchers' characteristics, and only one of these coefficients is statistically significant at the 10% level. The existence of random assignment is confirmed by the corresponding F-test for the joint significance of the estimates.

The upper panel of Table 5 reports the main estimates from equation (5). Researchers are significantly less likely to apply when they are assigned, through luck of the draw, to a committee that includes a connection. The presence of a coauthor or a colleague in the initial committee decreases the probability of applying by 2.7 p.p. (column 1). As expected, these estimates are unchanged when we control for predetermined individual characteristics and observable productivity (column 2).

In column 3, we measure the presence of connections in final committees formed after a few randomly selected evaluators resigned and were replaced. In order to account for the potentially endogenous replacement of some of the evaluators, we instrument the final composition of committees using the initial composition that was determined by the random draw. The instrumental variable (IV) estimate is slightly larger in absolute terms than ITT but the magnitudes are statistically similar in the two cases. The presence of a connection in the committee decreases by 3.0 p.p. the probability that the pre-registered candidate goes ahead with his application. This amounts to a 3.5% decrease in the application rate relative to a baseline application rate of 86% or, equivalently, a 22% increase in the probability of withdrawal relative to a baseline withdrawal rate of 14%.

We also analyze how application decisions vary depending on researchers' observable quality (columns 4-6). We split the sample in three groups based on researchers' publication record. In science, technology, engineering, mathematics and medicine (STEM&M fields), we classify prospective applicants based on their total Article Influence Score and in social sciences and humanities we use the number of A-journal

publications. The impact of connections on applications is driven by the decisions of researchers with weaker research profile. Connections do not have any significant impact on the application decisions of researchers in the top tercile but, for researchers in the lowest tercile, the presence of a coauthor or a colleague in the committee decreases the likelihood to apply by about 6.2 p.p (7.8%). (Or, equivalently, it increases the probability to withdraw by 30.8%, relative to an average withdrawal rate of 20% among this subset of researchers.)

5.2 The impact of connections on researchers' chances of success

We compare the success rate of connected and unconnected researchers in the first round of national qualification evaluations, exploiting the random assignment of evaluators to committees. We estimate equation (5) using as dependent variable an indicator which takes value one if pre-registered candidate i qualifies in examination c and value zero if the candidate failed or withdrew the application. As shown in column 1 of panel B in Table 5, the presence of a coauthor or a colleague in the committee increases by 3.9 p.p. the probability of success of pre-registered candidates (or by 11% relative to the baseline success rate of 34%). The inclusion of individual controls increases threefold the explained variation in the dependent variable – the adjusted R-squared increases from 11% to 31% – but, as expected, it does not affect significantly the point estimates (column 2). The estimates are slightly larger, around 4.5 p.p., although statistically similar, when we instrument the final composition of the committee using the initial one (column 3). We also examine how the impact of connections on success varies depending on researchers' observable research productivity (columns 4-6). Good researchers benefit more from connections. Researchers in the top (bottom) tercile experience a 5.3 p.p. (3.0 p.p.) increase in their success rate when the committee includes a coauthor or a colleague.

Connected candidates are significantly less likely to apply but they have significantly higher unconditional success rates. This necessarily implies that their chances

of failing an exam, and therefore receiving a 2-year ban on reapplying, are substantially lower. In fact, as shown in column 7, the probability that candidates with a coauthor or a colleague in the committee apply and receive a negative assessment is 7.5 p.p. lower. Candidates with a weaker research profile benefit more from this decrease in failure rates. In the bottom tercile, the failure rate of connected candidates is 9.2 p.p. lower than the failure rate of other candidates, compared to a decrease of 6.1 p.p. for connected candidates in the top tercile (columns 4-6).

In sum, the extent to which candidates are affected by the presence of a connection in the committee depends on the quality of these same candidates. Top candidates face a larger increase in success rates. On the other hand, candidates with a relatively weaker research profile experience a larger decrease in application rates.

5.2.1 Individual evaluation reports

We now turn to the information provided by evaluators' individual assessments. We compare the assessments received by the same candidate from different evaluators:

$$y_{i,j,c} = \beta_0 + \beta_1 \text{Connection}_{i,j} + \mu_i + \lambda_j + \epsilon_{i,j,c}, \quad (6)$$

where $y_{i,j,c}$ is a dummy variable that takes value one if evaluator j voted in favor of candidate i 's application in qualification exam c . $\text{Connection}_{i,j}$ is a dummy variable indicating whether the candidate and the evaluator have coauthored in the past or they are based in the same institution. A set of application fixed effects (μ_i) controls for potential differences in the characteristics of candidates. In our preferred specification we also include evaluators' fixed effects (λ_j), which capture any potential differences in grading standards across evaluators. Coefficient β_1 captures the differences in the assessments received by each candidate from connected and unconnected evaluators, which might reflect the potential existence of differences in their evaluation criteria or in the available information.

Candidates are 3.9 p.p. (9%) more likely to get a positive vote from a colleague or a coauthor, relative to the assessments they receive from other committee members

(Table 6, column 1). These results are unaffected when we include evaluators' fixed effects (column 2). We also examine how the connection premium varies depending on the observable research output of candidates (columns 3-6). The premium is always positive, and it is slightly larger for candidates of lower quality.

The nature of the decision-making may actually have biased down these estimates. A high fraction of committees reach unanimous decisions, suggesting that there may be less disagreement reflected in these final verdicts than there would have been at interim stages. Nonetheless, given that these estimates are significantly positive, the evidence does not support the hypothesis that evaluators tend to be less favorable towards their coauthors and colleagues.

5.3 Mechanism

The presence of a coauthor or a colleague in the committee decreases the probability that researchers with a weak research profile apply. At the same time, connected candidates are relatively more likely to succeed and they are more likely to receive a positive vote from their connection.

According to our theoretical framework, this pattern is consistent with three possible hypotheses. First, while connected evaluators may tend in general to favor their acquaintances (e.g. Combes et al. 2008, Perotti 2002 or Zinovyeva and Bagues 2015), in some particular cases they may be negatively biased against some of their connections (*'love or hate' hypothesis*). These researchers may anticipate that the connected evaluator is biased against them and decide to withdraw the application.²² Second, it may reflect a reduction in information asymmetries on the evaluators' side (*informed evaluators hypothesis*). Evaluators may observe more accurately the quality of connected researchers. This decrease in information asymmetries benefits high quality connected applicants but it decreases the chances of success of connected researchers with relatively poor quality. If these researchers anticipate their disadvantage, they

²²This hypothesis is probably more plausible in the case of colleagues than in the case of coauthors. For instance, in some universities faculty members may be associated to different chairs that hold long-standing rivalries.

may prefer not to apply. Finally, another possibility is that connected researchers enjoy a connection premium in assessments but they are also better informed about the evaluation criteria of connected committees (*informed candidates hypothesis*). The availability of more accurate information might discourage some connected researchers from applying.

The first two explanations, the *'love or hate' hypothesis* and the *informed evaluators hypothesis*, imply that connected researchers who chose not to apply would have received relatively less favorable evaluations, had they decided to apply. On the other hand, according to the *informed candidates hypothesis*, connected researchers with a weak research profile would still have benefited from connections in case they had applied, but this advantage is not sufficient to compensate the expected cost of failure, which became less uncertain thanks to the presence of a connection in the committee. We try to disentangle these possible explanations by using information on researchers' performance in the second round of the qualification exams, which took place the following year. In this second round, only those researchers who had not participated in the previous evaluation were allowed to apply. Most importantly, the composition of committees did not change between the first and the second round. Therefore, if connected researchers' reason to withdraw their application in the first round was that they anticipated some disadvantage in evaluations, these expectations should also play a role in the second round of evaluations.

Around 37% of researchers who withdrew their application in the first round decided to participate in the second round. Interestingly, researchers with a coauthor or a colleague in the committee have a 4.1 p.p. (11%) higher probability of reapplying relative to other researchers who withdrew their application in the first round and, among those who reapplied, are 9.4 p.p. (17%) more likely to succeed (Table 7, columns 1 and 2). These results have to be interpreted with some caution given that they reflect the behavior of a selected sample of researchers but the evidence seems to suggest that, at least in the case of reapplicants, the decision to withdraw the application in the first round was not driven by these candidates experiencing a disadvantage

due to the better observability of their (poor) quality by evaluators or by the existence of a negative bias against them.²³ This interpretation is confirmed by the analysis of individual evaluations within committees. We observe that connected researchers who reapply tend to receive more favorable reports from their connections than from other committee members (Table 6, column 6). Overall, the evidence indicates that the withdrawal was mainly intended to improve the timing of the application.

5.4 Selection bias

We have documented that researchers take into account the composition of committees in their application decisions. In particular, the presence of a connection in a committee leads to positive selection, probably driven by connected researchers' having access to better information about their chances of success. This endogenous selection might introduce a bias in studies that estimate the impact of connections using only information on actual applicants. The consistency of such estimates relies on the assumption that the set of observable controls fully accounts for any systematic differences in the quality of connected and unconnected candidates.

Next we try to quantify the size of this selection bias in the case of Italian evaluations. Using information from final applicants, we compare the assessments received by connected and unconnected researchers using an identification strategy based on observables:

$$y_{i,c} = \beta_0 + \beta_1 \text{Connections}_{i,c} + \mathbf{D}_{i,c} \beta_2 + \mathbf{X}_i \beta_5 + \mu_c + \epsilon_{i,c}, \quad (7)$$

where the dependent variable is an indicator that takes value one if the candidate qualifies and \mathbf{X}_i includes all observable predetermined characteristics, including applicants' research production.

Candidates with a connection in the committee are 6.6 p.p. (16.6%) more likely to qualify than other final candidates with comparable observable research outputs (Table

²³Connected researchers are positively selected among the pool of applicants who withdrew their application in the first round. This might introduce an upward bias in the estimates.

8, column 1). Results are similar if we consider instead the total number of positive votes received by the candidate (column 2): the presence of a coauthor or a colleague in the committee is associated with the increase in the number of favorable votes by 0.32 (15%). The premium associated with connections does not vary depending on the research quality of candidates (columns 3-5).

As expected, the estimates provided by this ‘naive’ identification strategy based on observables overestimate the impact of connections on candidates’ chances of success. These estimates are 26% larger (16.6% vs. 13.2%) than the causal estimates that exploit the random assignment of evaluators to committees (see panel B in Table 5).

5.5 Longer-term effects of connections

One of the potential advantages of not applying when failure is likely is the possibility of applying in the following round. Next we investigate the net impact of connections on the chances of success of connected candidates in the longer term using information from the second round of national qualification evaluations.

In what follows we consider jointly the first and the second round of qualification exams. First, we examine the impact on applications. We estimate equation (5) using as left-hand variable an indicator that takes value one if candidate i applied either in the first or in the second round (Table 9, panel A). On average, connections decrease application rates over the two rounds by 1.2 p.p. This is roughly one third of the impact on applications in the first round, indicating that the effect of connections on applications is mostly explained by connected candidates postponing their application for one year. As we have shown in the previous sections, for the subsample of re-applicants the role of connections seems to be mainly associated with the existence of a positive bias and the reduction of uncertainty regarding the evaluation standard. However, we cannot exclude that for candidates who do not re-apply in the second round connections are associated to other dominant forces, including the ones highlighted by the *love and hate* story or the *informed evaluator* story.

We also examine the impact of connections on overall success rates over both evalu-

ation rounds (panel B). The positive impact of connections is larger when we also take into account their impact in the second round. Considering both rounds, connected researchers are 6.2 p.p. (17%) more likely to qualify, compared to 4.5 p.p. (13%) in the first round. The difference between the mid- and short-term effect is especially large for candidates with relatively low research productivity (5.3 p.p. vs 3.0 p.p.).

Next, we analyze the impact on failure rates (panel C). The presence of a connection in the committee decreases the failure rate of connected candidates by 7.4 p.p. This effect is similar to the impact of connections on candidates' failure rate in the first round, and again it is larger for candidates with relatively lower research quality (9.0 p.p. vs 6.1 p.p.).

5.6 Promotions at the university level

Qualification in the national evaluation was a necessary but not a sufficient condition to obtain a promotion. Successful candidates have still to apply for a promotion at the university level.

We examine whether, beyond their impact at the qualification stage, connections in the national evaluation committee have any effect on promotions at the university level. We estimate equation (5) using as left-hand side variable an indicator for candidates who were promoted.²⁴ A connection in the national committee increases the promotion probability by 1.3 p.p. (10.4%) (Table 9, panel D). The effect is mainly driven by researchers with relatively low research productivity. For this group, the connection premium is 2.1 p.p (or 55.9%).

Altogether, our results indicate that committee composition and evaluation outcomes in the national evaluations do impose binding constraints on promotions at the university level. These constraints are especially salient for relatively weak candidates. It follows that policies aiming to reduce the advantages enjoyed by candidates connected to the members of the national committees would have real effects on the

²⁴We use official registry of tenured professors in universities as on December 2015 to identify promoted candidates. We identify changes in rank either from assistant to associate professor or from associate to full professor.

quality of promoted candidates.

6 Conclusions

In this paper we study how prospective candidates benefit from connections in scientific committees exploiting the exceptional evidence provided by scientific evaluations in Italy. The impact of connections depends crucially on the research quality of prospective candidates. Candidates with a strong research profile benefit from connections mostly by having higher chances of success. Researchers in the top tercile in terms of their research output are 5 p.p. more likely to succeed when the committee includes a coauthor or a colleague. Weaker researchers also benefit from connections but, mainly, by not making costly errors in application decisions. Researchers in the bottom tercile are 6 p.p. less likely to apply when the evaluation committee includes a coauthor or a colleague and their chances of success are 3 p.p. higher. As a result, the probability that they fail the evaluation is 9 p.p. lower. Evidence from a subsequent round of evaluations suggests that, by postponing their application, weak researchers with a connection in the committee benefit also from higher success rates in the future. Overall, the evidence is consistent with the existence of a bias in favor of connected candidates and also with the notion that connections reduce information asymmetries.

Our analysis demonstrates that, beyond their impact on evaluations, connections in committees are also a source of information that help researchers to make better application decisions. The analysis also provides strong evidence that self-selection is an important concern for empirical studies that analyze evaluation biases. If prospective candidates can anticipate committee composition, this may affect their decision to apply. The direction of self-selection is difficult to predict and it will depend on the strength of evaluation biases, the degree of information asymmetries, and the quality of candidates. Selection might bias estimates if the econometrician can only observe the identity of actual candidates. This methodological problem is not limited to the analysis of connections in academia; it might be also relevant more generally in studies assessing evaluation biases related to gender, ethnic group, or social ties (e.g. Fernandez

and Weinberg 1997; Goldin and Rouse 2000; Petersen, Saporta and Seidel 2000, 2005). In such studies, ideally it would be convenient to consider not only actual applicants but also prospective ones.

Finally, our study also provides information that might be useful for the design of scientific evaluations. The system of national evaluations that was recently introduced in Italy is characterized by a large degree of transparency aimed at increasing meritocracy. However, publicizing CVs and evaluation reports is not sufficient to completely eliminate the connection premium. We still find that connected researchers are 4.5 p.p. (13%) more likely to qualify, although this figure is much lower than the connection premium observed in other countries where qualification exams are less transparent. Moreover, the design of the system provides an additional advantage for connected candidates. Allowing candidates to withdraw their application after committee members have been selected helps connected candidates to take more informed application decisions and avoid costly failures.

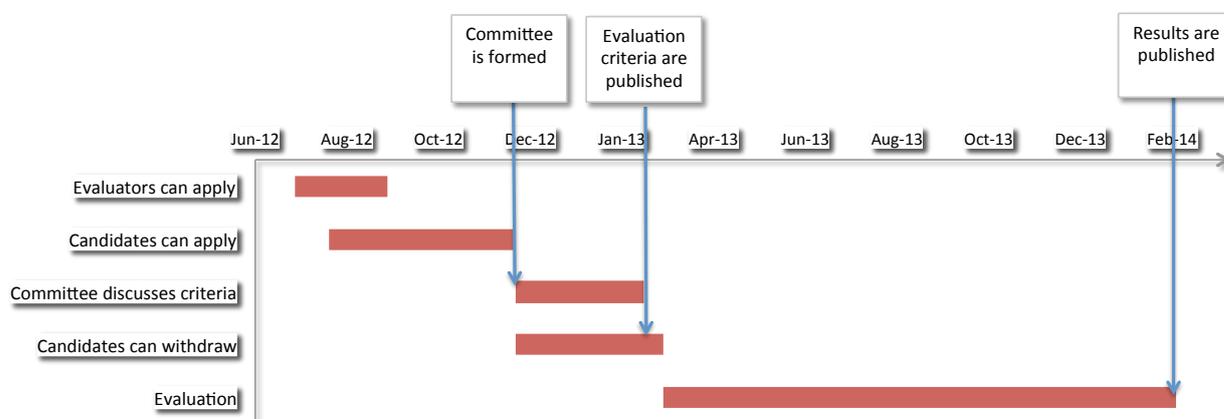
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Figure 1: Timeline of the evaluation

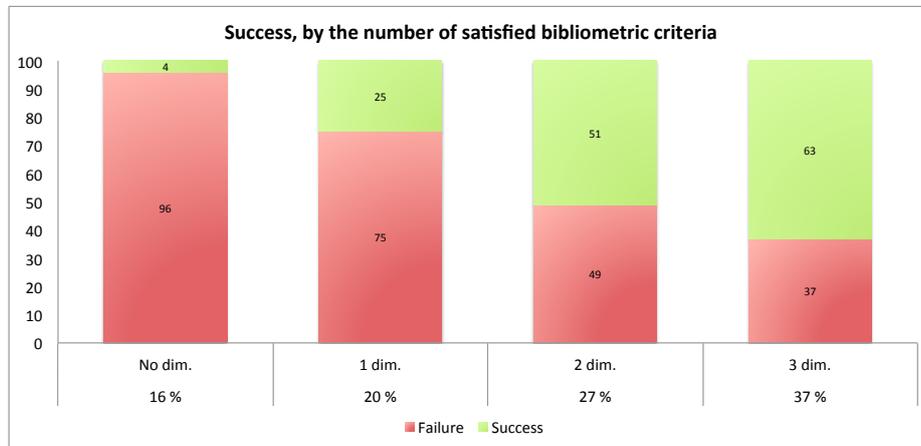


Note: The timeline is for Economics, discipline 13/A1.

Figure 2: Sample Individual Evaluation

The candidate PINCO PALLO has been Ricercatore universitario at the Università di PISA since 2006. His scientific work is concerned with the development of democracy, including a monograph on the role of public opinion in political thought and a series of contributions concerning English and Anglo-American thought and developments from the 17th through 19th centuries, with special reference to Edmund Burke. The candidate is a member of the "Re-Imagining Democracy in the Mediterranean, 1750-1860" project, based at the University of Oxford. The candidate has a significant number of international conference participations, among which those in which the English have invited him to speak about Burke are perhaps the most indicative of a strong international reputation. In terms of specific contributions, the "silent guest" metaphor is particularly significant in explaining how Burke plays out in the history of Italian political thought. The candidate scores above the median on two of the three indicators of impact and has substantial relevant teaching experience. On the basis of the application submitted, the candidate merits approval of the request for the abilitazione scientifica.

Figure 3: Success rate and bibliometric measures



Note: Actual candidates have been classified in four groups, depending on the number of dimensions where their productivity is above the median in the corresponding category.

Table 1: Descriptive statistics – Eligible evaluators

	1	2	3	4
	Mean	Std. Dev.	Min	Max
<i>Based in Italy (N=5,876):</i>				
Female	0.20	0.40	0	1
All publications	131	104	4	957
- Articles	73	85	0	920
- Books	8	10	0	139
- Book chapters	22	26	0	455
- Conference proceedings	20	37	0	401
- Patents	0.42	2.44	0	88
- Other	7	23	0	675
Average Article Influence Score	1.18	0.73	0.1	9.65
A-journal articles	11	16	0	207
<i>Based abroad (N=1,365):</i>				
Female	0.12	0.32	0	1

Notes: Article Influence Score is defined for publications by professors in STEM&M fields. A-journal articles are defined for publications by professors in the social sciences and humanities.

Table 2: Descriptive statistics – Applications

	1	2	3	4	5	6	7
			Position		Coauthor or colleague		
			FP	AP	Yes	No	
Initial set of applications (N=69,020)							
	Mean	St.Dev.	Mean	Mean	Mean	Mean	p-value
<i>Individual characteristics:</i>							
Female	0.38	0.49	0.31	0.41	0.39	0.38	0.002
Age	44	8	49	43	0.05	-0.01	0.000
Permanent university position:	0.55	0.5	0.74	0.47	0.74	0.52	0.000
- same field	0.75	0.43	0.77	0.74	0.79	0.74	0.000
<i>Quality indicators:</i>							
CV length (pages)	16	67	20	14	0.08	-0.02	0.000
All Publications:	64	67	89	53	0.08	-0.02	0.000
- Articles	37	51	53	30	0.07	-0.01	0.000
- Books	2	5	3	2	0.01	-0.00	0.509
- Book chapters	7	12	10	6	0.06	-0.01	0.000
- Conference proceedings	10	20	14	8	0.07	-0.01	0.000
- Patents	0.24	1.65	0.35	0.19	0.00	-0.00	0.936
- Other	7	22	8	7	-0.02	0.00	0.004
Average number of coauthors	6	18	6	6	0.01	-0.00	0.229
First-authored	0.22	0.2	0.22	0.22	-0.02	0.00	0.069
Last-authored	0.12	0.16	0.15	0.11	0.03	-0.01	0.002
Average Article Influence Score	1.31	0.97	1.31	1.30	-0.01	0.00	0.296
A-journal articles	4	7	6	3	0.09	-0.01	0.000
Application order	0.5	0.29	0.5	0.5	0.46	0.51	0.000
Final set of applications (N=59,150)							
<i>Production in the previous 10 years:</i>							
Social Sciences and Humanities:							
- Articles	20	17	25	18	0.16	-0.02	0.000
- A-journal articles	3	4	3	2	0.09	-0.01	0.000
- Books	2	3	3	2	0.02	-0.00	0.367
Sciences:							
- Articles	37	45	46	32	0.06	-0.01	0.000
- Citations	60	102	77	52	0.05	-0.01	0.000
- H-index	11	7	13	10	0.09	-0.02	0.000
Above the median in 3 indicators	0.38	0.48	0.42	0.36	0.46	0.36	0.000
Below the median in 3 indicators	0.16	0.36	0.13	0.17	0.12	0.17	0.000

Notes: Article Influence Score is defined for publications by professors in STEM&M fields. A-journal articles are defined for publications by professors in the social sciences and humanities. Columns 5-6 provide information for the subset of applicants who had a connection in the committee and the subset who did not. Column 7 reports the p-value for the t-test of difference in means between the two groups. In columns 5-6 productivity indicators and age are normalized at the exam level.

Table 3: Descriptive statistics – Outcomes

	1	2	3	4	5	6	7
			Position		Coauthor or colleague		
			FP	AP	Yes	No	p-value
Initial set of applications (N=69,020)							
Withdraws	0.14	0.35	0.16	0.13	0.17	0.14	0.000
Fails	0.49	0.50	0.48	0.50	0.34	0.52	0.000
Qualifies	0.37	0.48	0.36	0.37	0.49	0.34	0.000
Final set of applications (N=59,150)							
Qualifies	0.43	0.49	0.43	0.43	0.59	0.40	0.000
Unanimous decision	0.86	0.35	0.84	0.86	0.86	0.86	0.813
Individual evaluations (N=294,656)							
Length (in words)	176	277	203	164	193	175	0.000
Positive votes	0.45	.50	0.46	0.44	0.64	0.44	0.000
Set of withdrawn applications (N=9,870)							
Reapplies in 2013	0.37	0.48	0.32	0.40	0.44	0.36	0.000
Set of reapplicants in 2013 (N=3,647)							
Qualifies	0.58	0.49	0.59	0.57	0.67	0.55	0.000

Notes: We observe 99.7% of individual evaluations (294,656 out of 295,666 evaluations).

Table 4: Randomization test

	1	2	3	4	5
Dependent variable:	Female	Age	Perm.pos. same field	Perm.pos., other field	Appl. order
Connection in committee	0.005 (0.006)	0.026* (0.014)	0.002 (0.008)	0.002 (0.005)	-0.000 (0.004)
Observations	69,020	69,020	69,020	69,020	69,020
	6	7	8	9	10
Dependent variable:	CV length	Publ.	A-journal articles	Total AIS	Coauthors
Connection in committee	-0.025 (0.017)	0.001 (0.019)	-0.005 (0.011)	-0.011 (0.018)	-0.015 (0.019)
Observations	69,020	69,020	69,020	69,020	69,020

Notes: OLS estimates. All regressions include exam fixed effects and set of dummy variables for the expected number of connections in the committee (192 dummies). Dependent variables in columns 2, 5-10 are normalized at the exam level.

Standard errors are clustered at the committee level. *** denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table 5: The effect of connections on first-round outcomes

	1	2	3	4	5	6
	All	All	All	Research productivity:		
				High	Medium	Low
	ITT	ITT	IV	IV	IV	IV
A.			Applies in the 1 st round			
Connection in committee	-0.027*** (0.005)	-0.027*** (0.005)	-0.030*** (0.005)	-0.009 (0.006)	-0.019** (0.008)	-0.062*** (0.011)
Individual controls	No	Yes	Yes	Yes	Yes	Yes
Observations	69,020	69,020	69,020	21,443	21,800	25,777
Adjusted R-squared	0.045	0.118	0.119	0.146	0.120	0.138
Mean, no connections	0.862	0.862	0.862	0.935	0.869	0.799
Connection effect, %	-3.1	-3.2	-3.5	-0.9	-2.2	-7.8
B.			Qualifies in the 1 st round			
Connection in committee	0.039*** (0.007)	0.041*** (0.006)	0.045*** (0.006)	0.053*** (0.010)	0.047*** (0.009)	0.030*** (0.009)
Individual controls	No	Yes	Yes	Yes	Yes	Yes
Observations	69,020	69,020	69,020	21,443	21,800	25,777
Adjusted R-squared	0.111	0.307	0.307	0.336	0.274	0.255
Mean, no connections	0.344	0.344	0.344	0.548	0.387	0.149
Connection effect, %	11.3	12.0	13.2	9.7	12.1	19.9
C.			Fails in the 1 st round			
Connection in committee	-0.066*** (0.007)	-0.068*** (0.006)	-0.075*** (0.007)	-0.061*** (0.010)	-0.066*** (0.009)	-0.092*** (0.012)
Individual controls	No	Yes	Yes	Yes	Yes	Yes
Observations	69,020	69,020	69,020	21,443	21,800	25,777
Adjusted R-squared	0.109	0.237	0.237	0.295	0.220	0.205
Mean, no connections	0.518	0.518	0.518	0.387	0.482	0.650
Connection effect, %	-12.7	-13.2	-14.5	-15.9	-13.6	-14.1

Notes: Columns 1 and 2 report results from an OLS estimation where the right-hand side variable is the initial composition of the committee determined by the random draw. Columns 3-6 report results from estimations where the final composition of the committee has been instrumented using its initial composition.

In columns 4-6, researchers are classified according to their research productivity, as measured by the total Article Influence Score in STEM&M fields and by publications in A-journals in the social sciences and humanities.

All regressions include exam fixed effects and a set of dummy variables for the expected number of connections in committee. Columns 2-6 also include a set of dummies for position and university, and the set of individual controls listed in the upper panel of Table 2

Standard errors are clustered at the committee level. *** denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table 6: Evaluators' individual voting

	1	2	3	4	5	6
Sample:	All final candidates		Research productivity:			Re-applicants
			High	Medium	Low	in 2 nd round
Connection	0.039*** (0.005)	0.039*** (0.005)	0.030*** (0.005)	0.043*** (0.006)	0.047*** (0.008)	0.034*** (0.011)
Candidate fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Evaluator fixed-effects	No	Yes	Yes	Yes	Yes	Yes
Observations	294,656	294,656	99,747	93,969	100,940	10,125
Number of applications	58,948	58,948	19,957	18,799	20,192	2025
Mean, no connections	0.440	0.440	0.624	0.488	0.217	0.577
Connection effect, %	9.0	8.9	4.8	8.8	21.5	5.9

Notes: OLS estimates. Each observation represents evaluator j assessment of candidate i . The dependent variable is a dummy that takes value one if the evaluator votes in favor of the candidate. In columns 1-5, the vote is from the first evaluation round. In column 6, the vote is from the second round, and the sample is composed of individuals who withdrew application in the first round and reapplied again in the second round. Evaluations in the second round are available for 116 out of 184 fields, in which reports were published before May 2015.

In column 6, standard errors are clustered at the committee level.

*** denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table 7: The impact of connections on 2nd round outcomes

	1	2
Dependent variable:	Reapplies in the 2 nd round	Qualifies in the 2 nd round
Sample:	Withdrew in the 1 st round	Reapplied in the 2 nd round
Connection in committee	0.041*** (0.014)	0.094*** (0.025)
Observations	9,870	3,647
Adjusted R-squared	0.158	0.204
Mean, no connections	0.357	0.551
Connection effect, %	11.4	17.0

Notes: OLS estimates. All regressions include exam fixed effects and a set of dummy variables for the expected number of connections in committee. Individual controls include position, university, and all variables in the upper panel of Table 2.

Standard errors are clustered at the committee level. *** denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table 8: Identification based on observables

	1	2	3	4	5
Dependent variable:	Qualifies	Positive votes	Qualifies		
Sample:	All final candidates		Research productivity:		
			High	Medium	Low
Connection in committee	0.066*** (0.006)	0.319*** (0.028)	0.066*** (0.009)	0.062*** (0.008)	0.064*** (0.010)
Observations	59,150	59,150	20,028	18,855	20,267
Adjusted R-squared	0.422	0.451	0.380	0.373	0.381
Mean, no connections	0.399	2.084	0.586	0.446	0.186
Connection effect, %	16.6	15.3	11.2	13.9	34.1

Notes: OLS estimates. The sample is composed of all final applicants who received evaluations. All regressions include exam fixed effects, a set of dummy variables for the expected number of connections in committee, a set of dummies for position and university, and the set of individual controls listed in Table 2. Standard errors are clustered at the committee level. *** denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table 9: The effect of connections on two-period outcomes and promotion

	1	2	3	4
	All	Research productivity:		
		High	Medium	Low
A. Applies in the 1st or the 2nd round				
Connection in committee	-0.012*** (0.004)	-0.001 (0.005)	0.001 (0.006)	-0.036*** (0.009)
Observations	69,020	21,443	21,800	25,777
Mean, no connections	0.911	0.961	0.925	0.861
Connection effect, %	-1.3	-0.2	0.1	-4.2
B. Qualifies in the 1st or the 2nd round				
Connection in committee	0.062*** (0.006)	0.058*** (0.010)	0.066*** (0.009)	0.053*** (0.010)
Observations	68,453	21,272	21,651	25,530
Mean, no connections	0.372	0.568	0.423	0.178
Connection effect, %	16.6	10.3	15.7	30.0
C. Fails in the 1st or the 2nd round				
Connection in committee	-0.074*** (0.007)	-0.061*** (0.010)	-0.066*** (0.009)	-0.090*** (0.011)
Observations	68,453	21,272	21,651	25,530
Mean, no connections	0.539	0.394	0.504	0.683
Connection effect, %	-13.7	-15.4	-13.0	-13.1
D. Promoted by December 2015				
Connection in committee	0.013*** (0.004)	0.009 (0.010)	0.010 (0.007)	0.021*** (0.006)
Observations	69,020	21,443	21,800	25,777
Mean, no connections	0.121	0.140	0.092	0.038
Connection effect, %	10.4	6.5	10.9	55.9

Notes: The table reports results from instrumental variables estimations where the final composition of the committee has been instrumented using the outcome of the initial random draw.

All regressions include exam fixed effects, a set of dummy variables for the expected number of connections in committee, a set of dummies for position and university, and the set of individual controls listed in the upper panel of Table 2. Standard errors are clustered at the committee level. *** denotes significance at 1%, ** significance at 5% and * significance at 10%.