// NO.23-056 | 12/2023

DISCUSSION PAPER

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Representation Is Not Sufficient for Selecting Gender Diversity

Leibniz Association

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October 17, 2023

Abstract

One strategy for promoting female leaders in STEM professions is to appoint more women to the committees that select leaders. Unfortunately, evidence from other settings, such as committees for selecting judges or professors, suggests this approach does not work. We use a natural experiment to test the idea that organizational norms supporting gender diversity are necessary for representation on "selectorates" to promote gender diversity among STEM leaders. Our empirical setting is the Internet Engineering Task Force (IETF) – a standard-setting organization that develops key protocols for Internet hardware and software. We find that when more women are randomly selected for the committee that appoints IETF leaders, the committee appoints more female leaders, but only after a set of interventions meant to increase members' awareness of the benefits of gender diversity.

*We are grateful to Jari Arkko, Manuel Bagues, Francesca Barigozzi, Graziella Bertocchi, Leslie Daigle, Rosa Ferrer, Eliana La Ferrara, Allison Mankin, Kathleen Moriarty, Pia Pinger, Paola Sapienza, Maria Savona, Leigh Thompson, and Reinhilde Veugelers. We also thank seminar participants at American University, BU (Questrom School of Business), KU Leuven, LUISS, University of Portsmouth, and ZEW Mannheim for helpful comments and suggestions, and Laurenz De Rosa for excellent research assistance. Bernhard Ganglmair acknowledges financial support from the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through CRC TR 224 (Project B2). Baron: justus.baron@law.northwestern.edu; Ganglmair: b.ganglmair@gmail.com; Persico: n-persico@kellogg.northwestern.edu; Simcoe: tsimcoe@bu.edu; Tarantino: etarantino@luiss.it.

1 Introduction

Increasing the representation of women and minorities in "selectorates," i.e., among those who select an organization's leaders, is a key mechanism for promoting diversity. We show that representation in selectorates is not enough: organizational culture as regards diversity must change as well.

This paper is a case study of the determinants of female representation among the leaders of an important standard-setting organization. The Internet Engineering Task Force (IETF) develops interoperability standards for Internet hardware and software. Without these standards, the Internet would not work. Because the IETF's decisions have enormous technological and financial implications, many companies seek to place employees in leadership roles. Within this context, the underrepresentation of women in IETF leadership is highly societally relevant.

The top operational leaders in the IETF are appointed by a selection committee called NomCom. NomCom has ten members who are *randomly selected* each year from a pool of volunteers. We leverage this random variation to study whether female representation on NomCom causes the committee to appoint more women. The expectation (which is the basis for the random selection procedure) is that equitable representation within NomCom should ensure equitable representation among those appointed by NomCom to fill leadership positions.

We find that random increases in female representation in NomCom cause the committee to appoint more women, but only in recent years. During the first half of our study, from 2005 to 2011, more women in NomCom caused *fewer* women to be appointed. This counter-intuitive result echoes some of the most credible findings in the literature, which show that increased female representation in (academic and legal) selection committees does not cause these committees to appoint more women and sometimes leads to fewer female appointments. However, we go beyond the prior literature by showing that the sign of the causal relationship flips from negative to positive after some important organizational changes.

We consider several mechanisms that could explain why female representation on NomCom led to the selection of more female leaders only after 2011. First, we examine changes in the number of female IETF participants and their qualifications. Our findings are essentially unaffected when we control for the "pipeline" of well-qualified women. Next, we ask whether changes in the *formal* procedures that regulate the appointment process (before and after 2012) might account for the difference. The radical transparency of IETF's procedures,[1] and our interviews with IETF leaders facilitated our task, but we

[1]Similar to a regulatory agency, the IETF publicizes proposed procedural innovations through

found no evidence that our results were influenced by any procedural changes. In fact, the interviews suggested a third alternative: changes in IETF "culture" around 2012. By culture, we refer to *holistic, informal norms, both societal and organization-specific*, i.e., public speeches, codes of conduct, and other activities that are technically unconnected with the appointment process but whose effect is to change members' attitudes towards certain gender stereotypes. There is strong evidence that IETF culture changed around 2012 because of both active efforts from inside the organization and a broader societal shift in attitudes regarding gender diversity and inclusion in STEM professions. This cultural change, we argue, explains why the relationship between female representation within NomCom and the selection of female IETF leaders switches sign.

In sum, the statistical evidence in this paper establishes a clear regime change: before 2012, a random increase in female representation in NomCom *hurts* the chances of female appointments; after 2012, it helps them. This evidence indicates that representation is not enough to select gender diversity. Our analysis of the mechanisms suggests that, in our case study, whether or not representation helps diversity is not explained by the quality of the pipeline, or by the formal procedural rules connected with the appointment process. Instead, the effect of representation depends upon the presence of informal and holistic norms, both societal and organization-specific, some of which are shaped by organizational leadership.

2 Hypotheses and related literature

There is broad support for the idea that *representation* in a collective decision-making body helps protect a group's interests. Variation in the composition of the political franchise, for example, has been shown to impact a variety of policies (Berlinski and Coppenolle, 2014; Corvalan et al., 2020; Larcinese, forthcoming), with some papers focusing specifically on the gender composition of the franchise and showing that policies change in the expected directions (Aidt et al., 2006; Lott and Kenny, 1999; Miller, 2008). Similarly, variation in the representation of Blacks in criminal juries has been shown to influence jury verdicts in the expected direction (Anwar et al., 2012).

The benefits of representation are less straightforward when the decision-making body is an organizational committee whose members are bound by a *common set of professional norms* because these norms often play an important mediating role. We focus on the gender composition of *selectorates*, i.e., groups or committees that select other individuals for leadership positions. These include boards of directors, promotion committees, and

"Internet Drafts" which undergo a "public comment period," and then all accepted changes are enshrined into IETF's technical standards and organizational practices, or RFCs (from "Request for Comments").

selection panels (but not criminal juries).[2] Relative to other decision-making bodies, talent availability is of primary importance to selectorates.

Most academic studies lack access to random variation in the selectorate's gender composition, leading to well-known concerns about the impact of (possibly unobserved) confounds.[3] There are, however, a few studies that exploit random selection into a selectorate for causal inference: Bagues and Esteve-Volart (2010) in the context of Spanish judges and Bagues et al. (2017) in the context of university professors.[4] These authors find, counter-intuitively, that a random increase in the percentage of women on a selection committee does not increase (and, for Spanish judges, decreases) the likelihood that women are appointed. The decrease found by Bagues and Esteve-Volart (2010) is tentatively attributed to female evaluators' bias in favor of male candidates. A third causal study by De Paola and Scoppa (2015) finds the opposite result: more women in the selection committee cause more women to be appointed professors. We reconcile these divergent findings by proposing that organizational culture moderates the impact of representation. We leverage the random variation in the composition of the selectorate to show that a larger gender representation can have either a positive or a negative causal effect. Among the causal studies, a special feature of our work is its focus on STEM workers instead of academics or judges. This focus is important in light of broader societal concerns regarding women's representation in STEM fields.

From the prior literature, we draw three broad and mutually exclusive hypotheses:

H_0: Greater female representation in a selection committee leads to more women being selected. Hypothesis H_0 is the expected direction of the relationship. This is why selection committees are designed to be representative in their composition (which, incidentally, might be why the NomCom formation process is based so explicitly on random selection). Among the causal studies cited above, De Paola and Scoppa (2015) support this hypothesis. Related (but not focused on gender) studies support the idea that changing the characteristics of the "political selectorate" has an impact on who is selected;[5] and that a random increase in the fraction of Blacks empaneled in a jury decreases the likelihood that Black defendants are convicted (Anwar et al., 2012).

[2] Criminal juries do not engage in selecting one among many candidates, but rather on a single "candidate." As such, issues such as "talent availability" are not applicable.

[3] Bertrand et al. (2019), Delgado-Pina et al. (2020), Gould et al. (2018a,b), Kunze and Miller (2017), Maida and Weber (2022), or Matsa and Miller (2011).

[4] Similarly, Deschamps (forthcoming) finds that the imposition of a gender quota in academic hiring committees in France worsened both the probability of being hired and the ranks of women.

[5] Corvalan et al. (2020) show that eliminating suffrage restrictions in the U.S. sizably decreased the wealth of those elected.

H_1: Greater female representation in a selection committee leads to the same or fewer women being selected. Hypothesis H_1 is less intuitive, but it is the takeaway from the two largest and most credible studies in the existing literature.[6,7] Bagues and Esteve-Volart (2010), who find that *fewer* women are selected, speculate that this effect might either be due to a female "inferiority complex" in regards to men or a stronger "rally around the male flag" behavior on the men's part when more women are present in the committee. The authors, however, provide no direct evidence for these proposed mechanisms. An alternative "signaling" hypothesis has that women take the personally costly action of not promoting their peers to signal their commitment to other values, such as technical excellence in the case of the IETF.

H_2: The relationship between female representation in a selection committee and the gender of selected individuals is moderated by norms (both internal and external to the organization). Hypothesis H_2 holds that for representation to matter, informal norms must be supportive of diversity and inclusion. This theory reconciles the conflicting evidence from prior studies because it implies that diverse representation in a selectorate may or may not translate into diverse appointments.

3 IETF's formal institutions

IETF in general. The IETF is the main forum for Internet protocol development. It is responsible for setting internet standards, including well-known ones such as HTTP, POP3, and FTP. Put simply, the hardware that makes the Internet possible would not work if it deviated from IETF-defined protocols.[8]

The IETF is an open community, and anyone can participate. Participants are corporate employees, academics, engineers, and computer scientists. Participants offer input in the setting of standards. They do so by sharing technical information within a *working group* that, collectively, is responsible for creating a draft specification that may or may not evolve into a new standard. Working groups are organized by topic into broad technical *areas* (currently seven, including Routing, Transport, Security, etc.). For example, the HTTP working group (part of the "Applications and Real-Time" area) initially developed the "HTTP standard." Working Groups are chartered to write RFCs (for "Request for Comments", see footnote 1 above) that describe the IETF's technical

[6] These are Bagues and Esteve-Volart (2010) and Bagues et al. (2017). The latter is similar to De Paola and Scoppa (2015) in that both look at candidates for university posts, but Bagues et al. (2017) include 100 times the number of candidates in their sample.

[7] Among the non-causal papers, Berlinski and Coppenolle (2014) and Larcinese (forthcoming) find no "selectorate effect" in political representation.

[8] See Table A.1 for notable examples of technological standards developed by the IETF.

standards and organizational practices. Each working group must reach a consensus on the contents of an RFC before it is published.

Two powerful appointed positions: ADs and IAB members. Every area is headed up by an *area director* (AD). The AD is a technical expert with knowledge broad enough to oversee several working groups in her/his area. The AD is responsible for the productivity of these working groups (Huizer and Crocker, 1994, p. 17). When a working group produces a draft about which the AD is able to create sufficient "community consensus" (including from other ADs), the draft is elevated and tracked to become a standard. The AD can charter new working groups, nominate their chair, and disband old ones. ADs are appointed for two years. Not surprisingly, ADs are viewed as powerful:

> "[M]any people look at the ADs as somewhat godlike creatures."[9]

IAB members are also powerful. Compared to ADs they are less technical wizards and more "wise (wo)men." The IAB is composed of twelve members who serve for two years. Their mandate is as follows:

> "The IAB is responsible for keeping an eye on the 'big picture' of the Internet. [...] IAB members pay special attention to emerging activities in the IETF. When a new IETF Working Group is proposed, the IAB reviews its charter for architectural consistency and integrity."[10]

Neither ADs nor IAB members are remunerated by the IETF. They are appointed by a nominating committee (colloquially, *NomCom*). We refer to individuals in these two positions as "NomCom appointees."

The selection committee (NomCom). NomCom is composed of a (non-voting) chair and ten *members*. NomCom's task is to nominate the ADs and the IAB members "based on its understanding of the IETF community's consensus of the qualifications required to fill the open positions" (Galvin, 2004, p. 7). In practice, NomCom members collect proposals for nominations and feedback from the community and then interview the candidates for the open positions.

We use the term candidates instead of applicants to reflect the fact that the pool is not ex-ante defined in the same way as judges or professors in a public competition. The individuals under consideration for nomination as AD or IAB members by NomCom did

[9] Hoffman and Harris (2006, p. 9).
[10] Hoffman and Harris (2019, section 2.2.3).

not put themselves forward, nor is the list known to anyone (even within the IETF, outside of NomCom). NomCom creates its own list and quietly approaches the individuals in that list. Occasionally, NomCom receives suggestions on potential candidates from other IETF participants, but it is not compelled to accept those suggestions or include those names in the list of persons that will be approached. Thus, the candidates considered by NomCom do not even necessarily know they lost the position.

NomCom members vote to select the appointees using a voting mechanism that is proposed by the chair (see Galvin, 2004, p. 17).[11] The individuals nominated by NomCom must undergo a review process before being appointed, but the process is pro-forma, so henceforth, we will make no distinction between "nominees" and "appointees."[12] NomComs are formed in the second half of a given year t (formation year), and they make appointments in the following year $t+1$ (operation year).

NomCom *members* are simultaneously selected from a *volunteer* pool and serve for approximately one year. Anyone attending at least three of the five previous (tri-annual) IETF meetings can volunteer. In 2019, for example, there were 177 volunteers for ten NomCom positions. Similar to serving as an AD or IAB member, NomCom membership implies a significant time commitment. Volunteering for NomCom signals that individuals and their employers are willing to commit the necessary time.

In the past, companies have tried to stack NomCom with their own employees in order to influence the appointment process. To avoid that outcome, the IETF selects members at random from the volunteer pool.[13] For example, in 2019 the algorithm ranked volunteers using the outcomes of three public lotteries and a baseball game as "seeds," and the ten top-ranked volunteers (by the random-number generator) became NomCom members.[14] Although preserving an equitable gender composition of NomCom is not a stated goal of the selection process, random selection ensures that everyone in the volunteer pool has an equal chance of selection. We use this random variation in selecting NomCom members to estimate the causal impact of gender composition in the selectorate.

[11] To our knowledge, the voting mechanisms are not made public.

[12] Technically, NomCom only has the power to recommend, not to appoint. Once NomCom has recommended candidates for the open positions, the candidates are reviewed and confirmed by another body. In practice, however, confirmation is a mere formality.

[13] The algorithm is detailed in RFC 2777, which also provides the following rationale: "It is highly desirable that the random selection of the voting NomCom be done in an unimpeachable fashion so that no reasonable charges of bias or favoritism can be brought. This is as much for the protection of the selection administrator (currently, the appointed non-voting NomCom chair) from suspicion of bias as it is for the protection of the IETF." (Eastlake, 2004)

[14] The actual seeds used in 2019 were the numbers of the EuroMillions Lottery (July 5, 2019), statistics of the Orioles vs. Blue Jays baseball game (July 5, 2019), the numbers of the Ontario Lottery (July 6, 2019), and US Power Ball lottery (July 5, 2019). See https://datatracker.ietf.org/nomcom/ann/110997 (last accessed: February 4, 2021).

4 Societal and informal norms change around 2011–12

We now describe the events that led to a dramatic shift in organizational culture around 2011–12. To substantiate our claim, we conducted an investigation based on documents internal to the IETF, articles from the press concerning the diversity-related events at IETF, and interviews with significant figures within the organization. Specifically, the internal documents include the blog posts published on the IETF website on diversity and inclusion, the RFCs introducing organizational changes related to the same matters, and the emails sent to the IETF listserv during the period of interest. We cite these documents throughout this section. We then interviewed individuals who have taken official roles (as IETF chair, AD, or Working Group chair) and are recognized leaders on these issues within the IETF.[15]

At a societal level, the issue of gender diversity in STEM disciplines became of acute concern around 2011–12. To illustrate this shift, the top-left panel in Figure 1 uses data from Twitter, plotting the share of all STEM-related tweets that contain gender-oriented terms between 2009 and 2015.[16] After the high variability in the monthly observations between 2009 and 2010, during the calendar years 2011 and 2012, the slope of the curve tracing the share of gender-related tweets becomes upward-sloping. It reached its peak in 2015.

Concurrently, IETF's ecosystem was also changing, a sentiment expressed by Kathleen Moriarty, a former AD and an IETF leader in diversity issues:

> "Many companies were making an internal push for greater diversity, and that was imported to IETF via participants. Other standards consortia were experiencing similar issues."[17]

[15] We asked the same set of questions to the persons we interviewed, including the following: When did you see things changing? What happened during those years to bring the diversity issue to the forefront of IETF politics? What is that practically changed the atmosphere? Where can we find evidence supporting your impressions? How can it be detected? Do you expect that the appointment of a female Area Director can imply that more women are appointed as Working Group (WG) chairs within that area? Would you be willing to go on record and give us impressions we can cite in the paper?

[16] We downloaded all English-language tweets containing "#stem" (case insensitive) using the Twitter API (in early April 2023) for a total sample of 1,989,610 tweets sent between January 1, 2009 and December 31, 2015. We parse the texts for the following gender-related terms: "woman," "women," "girl," "female," "feminine," "femininity," and "gender." In the figure, we plot the monthly share of tweets that contain at least one of these gender-related terms.

[17] Kathleen Moriarty (former AD), personal communication (July 17, 2020). Similarly, Leslie Daigle (former IAB chair), personal communication (June 18, 2020): "Corporatization of IETF may have induced the push for diversity: managers care more about diversity, due to HR policies, than academics." (In this context, the term "corporatization" refers to changes in the organizations where IETF participants are employed, as opposed to changes in IETF itself.)

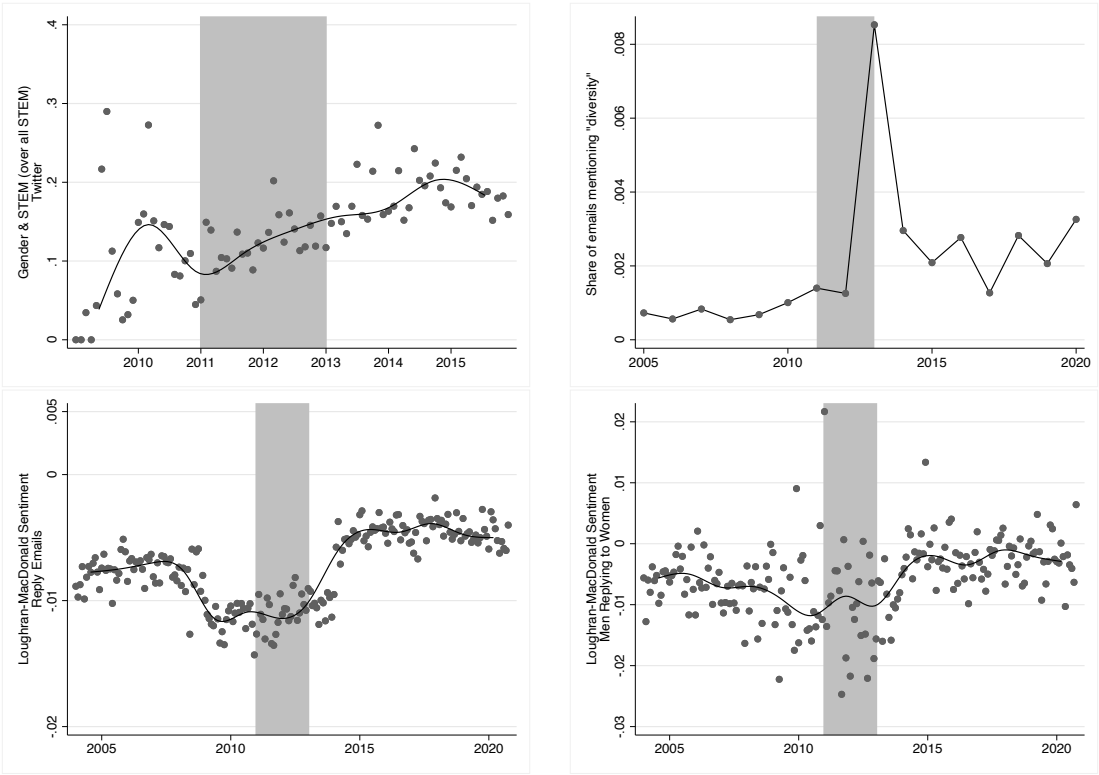

Figure 1: Societal norms (left panel) and informal norms (right panel) change in calendar year 2011–12. In the top-left panel, each point corresponds to the monthly share of STEM-related tweets that contain gender-oriented terms. The solid line is a non-linear interpolation of the monthly data. Source: Twitter. In the top-right panel, the vertical axis is the yearly share of individual emails posted on all IETF mailing lists that contain the term "diversity." In the bottom-left panel, we plot the sentiment of the reply emails posted on all IETF mailing lists. In the bottom-right panel, we plot the sentiment of the reply emails sent by men to women on all IETF mailing lists. In both bottom panels, we use the Loughran-McDonald (Loughran and McDonald, 2011, 2015) approach to measuring sentiment. See the main text for details. Each point corresponds to the monthly average sentiment of emails, and the solid line is a non-linear interpolation of the monthly data. In all the panels, the shaded area covers calendar years 2011–12.

Within IETF, meanwhile, things appeared to be at odds with evolving societal attitudes. The NomComs operating in 2009, 2010, and 2012 did not appoint a single woman. Some inflammatory events in 2011–12 are referred to only obliquely in internal IETF reports that describe a historical culture of "white, male technicians, demonstrating a distinctive and challenging group dynamic."[18] Finally, in the calendar year 2012, an IETF affinity group called "Systers" created an experiment of sorts: they quietly transmitted to the 2013 NomCom a slate of many qualified female candidates for appointment to ADs. NomCom appointed none of them.[19] These events generated a

[18] See RFC 7704 (Crocker and Clark, 2015) and https://www.ietf.org/blog/ietf-diversity-update (last accessed: February 4, 2021).

[19] Our data confirm that no female AD, and only one female IAB member unconnected with the Systers

perception that the random selection of NomCom members was not working as expected. Specifically, women were not being appointed at a rate commensurate with their presence in the eligible pool.

The earliest institutional response we could trace is from 2012 when a "Diversity Design Team" (DDT) was established.[20] In April 2013, the IETF chair wrote a blog post titled "Diversity" where he announced the creation of the DDT and foreshadowed a mentoring initiative (Arkko, 2013).[21] In the same month, a diversity mailing list was set up to create a forum for discussion. In 2013, the share of emails containing the word "diversity" shot up to an all-time high of 0.8% of all IETF emails (see the top-right panel in Figure 1). Based on this measure, discussion of diversity was already increasing by 2011, and after 2013 it stabilized around 0.2% of all IETF emails (more than twice the pre-2010 average).

The DDT reported out in an IETF plenary session in July 2013 and recommended, among other changes, that a code of conduct be adopted and that more diverse ADs and working group chairs be selected.[22] In November 2013, the ADs collectively posted a statement titled "IETF Anti-Harassment Policy."[23] In early 2014, two draft RFCs were posted: one proposing anti-harassment procedures,[24] the other discussing practical ways to boost diverse participation in IETF.[25] Finally, the 2014 NomCom chair adopted "equitable" as opposed to "rapid" shortlisting procedures and inclusive interviewing for her NomCom only.[26] The changes worked. By 2015, Moriarty was able to report:

> "In short, I think we've come a long way since 2012. We do have more work to do and still have some issues, but there is a very quick and open dialog that typically follows any occurrence of inappropriate conduct now."[27]

experiment, was appointed in 2013. The experiment was later spotlighted by the online publication Vice.com as "a pretty clear case of systemic bias" (Turk, 2015).

[20] Moriarty and Arkko (2015) write: "In 2012, when these behavior and diversity issues were glaringly apparent to the IETF, Jari Arkko worked with others to establish a 'Diversity Design Team'." Jari Arkko was an AD in 2012, and later became chair of IETF.

[21] Moriarty and Arkko (2015) report that the mentoring program was later established. The program sought to assist newcomers, who are more likely to be female than legacy members.

[22] The DDT's agenda is available at https://www.ietf.org/proceedings/87/slides/slides-87-iesg-opsplenary-8.pdf (last accessed: March 25, 2021).

[23] See https://www.ietf.org/about/groups/iesg/statements/anti-harassment-policy, posted on November 3, 2013 (last accessed: February 4, 2021).

[24] The first draft of RFC 7776 (Resnick and Farrel, 2016) was published in February 2014. The final version was published in March 2016.

[25] The first draft of RFC 7704 (Crocker and Clark, 2015) was published in March 2014. The final version was published in November 2015.

[26] Allison Mankin, personal communication (August 7, 2020). We do not include these changes in NomCom's nomination procedure as part of our proposed mechanism and, indeed, regard them as a potential confounder of the "cultural change" channel. Thus, although 2014 happens to be a "peak female" appointment year (see Figure 2), we conduct several tests to ensure that our main findings are not an artifact of that year's outcomes.

[27] Turk (2015).

There is evidence that interactions between male and female IETF participants improved around the time of these events. The bottom panels of Figure 1 show results from a sentiment analysis conducted on emails sent to all IETF mailing lists.[28] The bottom-left figure plots the average sentiment across all emails sent as a reply to an earlier message, and the bottom-right plots the average sentiment for all emails sent by men in response to messages sent by women. Both figures suggest an improvement in the sentiment after calendar years 2011–12 (corresponding to the shaded area). The pattern is less obvious in the bottom-right panel because the relatively small number of emails sent by female participants leads to greater variance. Nevertheless, a non-linear interpolation (solid line) looks similar to the more precisely estimated pattern based on the full sample of replies.

This section described the triggers, both societal and internal to IETF, that made gender diversity a hot topic within IETF, and how IETF responded. The story is that society changed, and the IETF found that its formal institutions of representation (NomCom) did not deliver the desired effect. Change was imperative. The change in IETF was promoted from the top and, critically for our interpretation, it was not a change to the formal mechanism and procedures of NomCom but, rather, a push to adopt more inclusive informal norms and attitudes. In the rest of the paper, we show that these changes successfully activated the formal institution of representation to work as intended.

5 Data description

For every calendar year between 2005 and 2020, we collected data including the name of each IETF meeting attendee, NomCom volunteer, NomCom member, and appointee (AD or IAB member).[29] Gender was not recorded and so had to be imputed. To minimize subjective judgment calls, we used a script called "*genderizeR*" that assigns a probability to each name.[30] This approach measures how others perceive appointees, which may differ from how they self-identify or their assigned sex at birth. The data

[28] The IETF mailing list archives are available at https://www.ietf.org/mail-archive/text/ (last accessed: October 2020). We conduct several pre-processing steps to extract the text of each email (e.g., dropping URLs, Internet draft names, and email addresses), and predict the sender's gender based on first name. For details on our approach, see Section 5. Our sample contains 670,680 emails for which we can identify the gender of the sender. For the sentiment analysis, we use the word lists of positive and negative words from Loughran and McDonald (2011, 2015), and calculate the difference of the number of positive and negative words in any given email divided by the total number of words in that email.

[29] The information was downloaded from IETF's website https://ietf.org. We drop the years 2003 and 2004 because information on volunteers is incomplete.

[30] The "genderizeR" script is described in Wais (2016). We corroborated the results using "he/she" statements and profile pictures on the bio pages of NomCom volunteers, NomCom members, and appointees.

contain 13 appointments per year, on average, and each NomCom has ten members, with the number of female members varying between zero and two.[31] We construct two samples for analysis. The first sample consists of all NomCom appointees ($N = 209$). The second sample contains one observation for each IETF participant-year ($N = 307{,}210$), where a participant is anyone who has attended an IETF meeting, authored a draft specification, or emailed an IETF listserv.

This paper asks whether female representation in NomCom causes more female appointees, and Figure 2 illustrates our main result. The left panel of Figure 2 shows that the share of female appointees declined prior to the shift in informal norms, reaching zero in 2009, 2010, and 2012 before increasing sharply thereafter. The right panel of Figure 2 shows the relationship between female NomCom representation and female appointment rates. Despite the relatively small variation in the share of women in NomCom during our sample period (ranging from 0 to 20%), we find a negative relationship between female NomCom members and female appointments before 2012 and a positive relationship afterward.

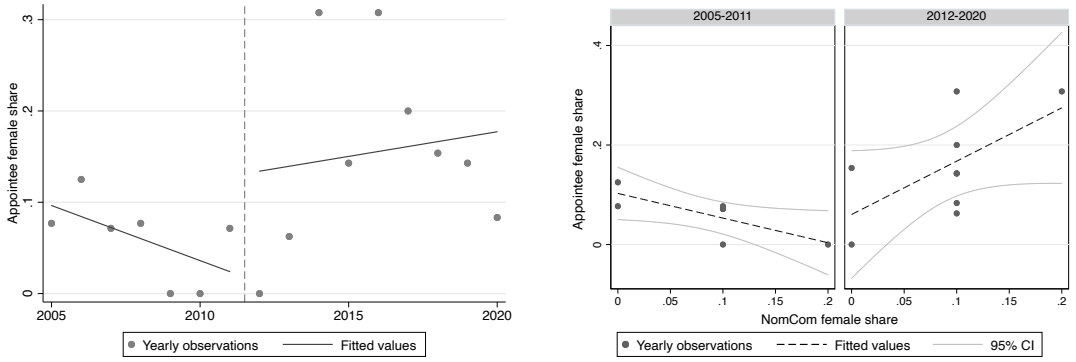

Figure 2: Before 2012, greater female representation in NomCom did not translate into more women appointed; after the 2012 norm shift, it did. In the left panel, the horizontal axis is NomCom year, which coincides with the calendar year in which a given NomCom makes appointments. The vertical axis is the share of women among all appointees in a given year. In the right panel, horizontal axes depict female representation in a NomCom. Vertical axes depict the share of appointments (by that NomCom) that are female. The straight lines are best linear fits. The slopes have opposite signs before and after the calendar year 2012, suggesting a different direction in the relationship before and after 2012.

The pattern in Figure 2 suggests that the impact of changing cultural norms on the gender of NomCom appointees was mediated by the composition of the committee, as opposed to having a direct effect. Although there are potentially multiple mechanisms explaining this, our reconstruction of the events within the IETF points to one of them: changing norms may not be sufficient to activate more equitable appointments by

[31] Summary statistics for NomCom members and volunteers are in Table A.2.

NomCom if information is lacking on the pool of suitable female candidates. In other words, in a setting with a scarcity of female participants (during the years we consider the share of female IETF participants was about nine percent), the presence of more women in the selectorate brings information about the set of potential female appointments. The results of the experiment conducted by the group of "Systers" in 2012 support this potential mechanism. After they transmitted to NomCom a slate of qualified female candidates for the open positions as ADs, NomCom appointed none in a year with only one woman on the committee.

Neither panel in Figure 2 adjusts for the number of women at risk of appointment, given that the list of individuals evaluated by NomCom is never made public. If each NomCom draws from a large pool of well-qualified male and female candidates, one might reasonably assume that no adjustment is necessary. On the other hand, we might want to control for the relative quality of male and female "appointables" given that female IETF participation has increased over time (albeit not very quickly).[32] The next section proposes a regression model to control for changes in the gender composition of the appointable pool and presents statistical evidence supporting the hypothesis that informal norms are required to activate the effects of representation.

6 Female representation in NomCom causes a decrease in female appointments before the 2012 norm shift and an increase thereafter

Our first set of regressions takes the AD/IAB member appointee as the unit of analysis. The outcome variable is an indicator variable that equals one if the appointee is coded as female and zero otherwise. The key explanatory variables are the share of female NomCom members and an indicator for years 2012 and later, where the latter serves as a proxy for the change in informal norms. Our model is specified as:

$$\begin{aligned} Female_{it} &= \alpha + Pre_t \cdot (\beta_{\text{pre}}\ NomComp_t + \gamma_{\text{pre}}\ X_t) + \\ &\quad Post_t \cdot (\beta_{\text{post}}\ NomComp_t + \gamma_{\text{post}}\ X_t) + Election\ \ Year + \epsilon_{it}, \end{aligned} \tag{1}$$

where $Female_{it}$ codes the gender of the person i appointed in year t; $NomComp_t$ is the share of women in the NomCom that operates in year t (which was formed at $t-1$); Pre_t and $Post_t$ are indicators for the period before and after the 2012 norm shift; X_t measures the share of females in the population at-risk of appointment; *Election Year* is the year

[32] See Appendix Table A.11, along with Figures A.1 and A.2, showing that female participation in IETF and the share of women in the pool of NomCom volunteers increased between 2005 and 2020.

of election of an appointee as AD or IAB member, which controls for a linear time-trend; and ϵ_{it} is an econometric error term. We set $Female_{it}$ equal to one whenever *genderizeR* returns a probability greater than 75% that person i's name is associated with a woman.[33]

Because the shortlists created by each NomCom are confidential, we cannot observe how many women are considered in each year. Instead, we set X_t equal to the share of females in the NomCom volunteer pool.[34] In addition to serving as a proxy for the pool of appointable women, this guarantees that $NomComp_t$ is uncorrelated with ϵ_{it}, because of the random selection process (i.e., each NomCom is formed by a random draw from a population with a fraction X_t of women).

We estimate Equation (1) by ordinary least squares regression and cluster standard errors at the year level because outcomes may not be independent within a NomCom year.[35] The coefficients of interest are the β's, which measure the relationship between female NomCom representation and the probability of female AD/IAB member appointees before and after the shift in informal norms. Estimates are reported in Table 1.

Model (1) fixes $\beta_{pre} = \beta_{post}$ and $\gamma_{pre} = \gamma_{post}$ in order to estimate a single NomCom representation effect for the entire study period. The point estimate for β is positive and implies that adding one female to NomCom (a 10 percent increase) is associated with a 3.4 percentage point increase in female appointments. However, the relationship is not statistically significant at conventional levels. This null result is summarized in the title of the paper: representation is not sufficient for selecting gender diversity. Model (2) estimates the pre- and post-period β's without any controls (making it directly comparable to the right panel of Figure 2). The results show that $\hat{\beta}_{\text{pre}} < 0 < \hat{\beta}_{\text{post}}$ with both inequalities statistically significant: the correlation between female NomCom representation and female appointments is negative before 2012, and positive after.

Model (3) adds the share of women in the volunteer pool as a control. Based on these estimates, the causal effect of adding a woman to NomCom *after* the shift in informal norms is a 13.3 percentage point increase in female AD/IAB member appointments, compared to a 5.4 percentage point decrease beforehand.[36] This is our

[33] The results are robust to varying this threshold. At the 75% cutoff, about 89% of NomCom volunteers and 92% of NomCom members could be assigned a gender. The rest are excluded from the sample. However, we report the results of regressions obtained using the raw probabilities from *genderizeR* to impute the sex of individuals (see Tables A.4 and A.8).

[34] We choose the year in which NomCom was formed, as opposed to the year in which it made appointments because most appointments are made early in the calendar year, before volunteers for the next NomCom are solicited.

[35] OLS estimates provide an easy-to-interpret summary of the conditional probabilities and are generally quite close to the average marginal effects from a logistic regression (see Tables A.5 and A.9). The results are robust to alternative specifications (i.e., logit) more commonly applied to binary outcomes.

[36] We obtain very similar estimates from models where we constrain $\beta_j = \gamma_j$ for $j \in \{pre, post\}$, which is equivalent to using the de-trended explanatory variable ΔFemale $\equiv$ NomCom Female Share $-$ Volunteer Female Share. See Appendix Table A.6.

Specification	OLS				
Unit of Analysis	NomCom Appointee				
Outcome Variable	1[Appointee is Female]				
	(1)	(2)	(3)	(4)	(5)
Pre × NomCom Female Share	0.34	-0.50	-0.54	-0.23	-0.70
	[0.42]	[0.19]**	[0.14]***	[0.14]	[0.27]**
Post × NomCom Female Share		1.08	1.33	0.98	1.16
		[0.40]**	[0.31]***	[0.37]**	[0.31]***
Pre × Volunteer Female Share	-0.23		1.44	0.63	1.87
	[1.06]		[0.43]***	[0.72]	[1.40]
Post × Volunteer Female Share			-3.17	-3.11	-2.12
			[1.03]***	[1.31]**	[1.24]
Post		-0.04	0.43	0.50	0.25
		[0.09]	[0.12]***	[0.12]***	[0.16]
Election Year	0.01	0.00	-0.01	-0.02	-0.00
	[0.00]**	[0.01]	[0.00]**	[0.01]***	[0.01]
N	209	209	209	209	209
R-squared	0.02	0.04	0.05	0.06	0.04

Table 1: Effect of NomCom gender composition on appointee gender is negative before the 2012 informal norm shift, positive thereafter. In all columns, $Female_{it}$ is 1 if probability that appointee i is female exceeds 75%, and $NomComp_t$ (resp., X_t) is the average of the "female dummies" among NomCom members (resp., volunteers). $Post_t = 1[Year \geq 2012]$ for models (1) to (3); $1[Year \geq 2013]$ for model (4); and $1[Year \geq 2011]$ for model (5). *Election Year* is the year of appointee election for AD or IAB member. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

preferred specification, and it provides strong evidence in support of H2. While the coefficients on the share of volunteers in model (3) are not statistically different from zero, the point estimate for γ_{post} is negative. Because the share of female volunteers declined after NomCom 2011 (see Figure A.1), this indicates that the number of female appointees grew even while the share of "female appointables" declined, providing additional support for our regime change assumption.

A challenge for our empirical analysis is that we have a small number of observations to identify the regime switch. The last two models in Table 1 explore robustness to that timing assumption. Model (4) re-defines the variables Pre_t and $Post_t$, so that 2013 – the NomCom of the Systers' experiment – is included in the pre-period. Although the basic pattern of results does not change, we no longer find a statistically significant negative impact of female NomCom representation in the pre-period. Model (5) includes 2011 in the post-period. For this early regime switch model, we find once again that $\hat{\beta}_{\text{pre}} < 0 < \hat{\beta}_{\text{post}}$ with both inequalities statistically significant.

Additional robustness checks are in the Appendix. In particular, Tables A.3 and A.7 show that the results are robust to excluding appointments of IAB members. This is

useful because, based on our conversations with IETF former ADs, IAB members are often treated by NomCom as a slate, as opposed to the ADs who are voted on position-by-position. This analysis gives us confidence that our results are not driven by the differences in the competencies required by each role.

7 Alternative mechanisms

Pipeline. One critique of the estimates in Table 1 is that X_t is a very coarse measure of the relative quality of female IETF participants. This might be a concern if the availability of qualified female candidates increased over time. To address this issue, we estimate a second set of models that include individual-level measures of IETF engagement and leadership. For this analysis, we turn to the larger sample of all IETF participant-years, where each individual enters the panel in the first year they are observed in any IETF dataset. Our model is specified as:

$$\begin{aligned} Appointed_{it} \;=\; & \alpha + Pre_t \cdot (\beta_{\text{pre}}\, NomComp_t \cdot Female_i + \gamma_{\text{pre}}\, Female_i) + \\ & Post_t \cdot (\beta_{\text{post}}\, NomComp_t \cdot Female_i + \gamma_{\text{post}}\, Female_i) + \\ & \theta\, Quality_{it} + \lambda_t + \epsilon_{it}, \end{aligned} \tag{2}$$

where the outcome $Appointed_{it}$ is an indicator equal to 100 if person i is appointed as AD or IAB member in year t and zero otherwise. The variables Pre_t, $Post_t$, and $NomComp_t$ are defined above, and $Female_i$ is an indicator equal to one if *genderizeR* assigns a 75% or greater probability that a name is female. The vector $Quality_{it}$ contains several measures of individual IETF engagement and leadership described below, and λ_t is a vector of calendar-year effects.

Equation (2) is a triple-differences specification where the main effects of $NomComp_t$, Pre_t, and $Post_t$, along with all of their two-way interactions, are absorbed by the calendar-year fixed effects. Once again, the coefficients of interest are β_{pre} and β_{post}, which measure the association between female NomCom representation and the probability that a woman is appointed to AD or IAB member before and after the shift in norms. Estimates are reported in Table 2.

Models (1) and (2) parallel the first two columns of Table 1. Without accounting for the regime change, we estimate a positive and statistically insignificant relationship between female representation and female appointments. After accounting for the norm shift, we obtain $\hat{\beta}_{\text{pre}} < 0 < \hat{\beta}_{\text{post}}$ with both inequalities statistically significant. Model (3) adds the stock of published RFCs, the number of emails sent to IETF listservs, and the

Specification	OLS					
Unit of Analysis	IETF Participant-Year					
Outcome Variable	1[Appointed to IESG or IAB] × 100					
	(1)	(2)	(3)	(4)	(5)	(6)
Pre × Female × NomCom Share	0.30	-0.29	-0.26	-0.22	-0.06	-0.23
	[0.30]	[0.14]**	[0.13]*	[0.11]*	[0.15]	[0.13]*
Post × Female × NomCom Share		0.71	0.71	0.72	0.57	0.70
		[0.26]**	[0.27]**	[0.21]***	[0.20]**	[0.22]***
Pre × Female	-0.01	-0.00	0.02	0.01	-0.02	0.00
	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Post × Female		-0.03	0.01	-0.02	-0.00	-0.02
		[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
ln(1+RFCs)			0.39	0.05	0.05	0.05
			[0.05]***	[0.04]	[0.04]	[0.04]
ln(1+Emails)			0.07	0.02	0.02	0.02
			[0.01]***	[0.01]**	[0.01]**	[0.01]*
ln(1+Meetings)			0.07	0.03	0.03	0.03
			[0.01]***	[0.01]***	[0.01]***	[0.01]***
Incumbent				0.58	0.58	0.58
				[0.08]***	[0.08]***	[0.08]***
WG Chair Experience Effects				✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
N	307,210	307,210	307,210	307,210	307,210	307,210
R-squared	0.00	0.00	0.01	0.04	0.04	0.04

Table 2: Effect of NomCom gender composition on appointments controlling for individual experience. In all columns $Female_i$ is 1 if probability that individual i is female exceeds 75%, and $NomComp_t$ is the average of the "female dummies" among NomCom members. $Post_t = 1[Year \geq 2012]$ for models (1) to (4); $1[Year \geq 2013]$ for model (5); and $1[Year \geq 2011]$ for model (6). Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

number of IETF meetings attended by individual i as controls.[37] Each of these proxies for individual IETF engagement is highly statistically significant, but collectively, they produce no measurable change in the parameters of interest. Model (4) adds the control variable $Incumbent_{it}$, which equals one if individual i served as an AD or IAB member in any year before t, along with a set of dummies indicating how many times individual i has previously served as a WG chair (top-coded at four). Adding these proxies for IETF leadership substantially increases the overall model R-squared, and produces large changes in the coefficient estimates for the other measures of individual IETF engagement. It does not, however, change the estimates of β_{pre} or β_{post}. This is what one would expect given the random selection of each year's NomCom.

The last two models in Table 2 assume alternative years for the regime switch.

[37] Because all of these variables are highly skewed, we take natural logs (after adding one) before including them as regressors.

Model (5) redefines Pre_t and $Post_t$ by assuming the shift in norms occurs one year later, retaining all of the individual controls, and finds estimates very similar to model (4) in Table 1. Finally, model (6) assumes that the norm shift happens in 2011 and finds that $\hat{\beta}_{\text{pre}} < 0 < \hat{\beta}_{\text{post}}$ with both inequalities statistically significant.

Overall, the regression analyses confirm the visual pattern in Figure 2 (right panel): a random increase in female representation in NomCom produces an increase in female appointees after, and only after, the change in IETF's informal norms.

Procedural changes. The IETF is characterized by radical transparency, and our investigation of NomCom's formal procedures revealed no major changes during the sample period, with the possible exception of 2014. During our interview with Allison Mankin, the chair of the 2014 NomCom, we were informed that she adopted gender-blind shortlisting for that year's appointees, as well as inclusive interviewing procedures. To address any concern that this outlier NomCom is driving the results, we re-estimate Equation (1) for a subsample that excludes the appointments made in 2014. Table 3 shows that our main results are unchanged.[38]

To be clear, we do not argue that the 2014 procedural changes did not matter. Figure 2 shows that 2014 is actually a "peak" female appointment year. Our point is that the 2014 NomCom, on its own, does not explain why the causal impact of female representation on gender diversity changed signs in 2012.

8 Discussion and conclusions

What prevents more women from being appointed to leadership roles in business organizations? One hypothesis is that women are under-represented within the formal groups, such as boards and promotion committees, that choose leaders. A second hypothesis is that the organizations as a whole might have failed to adopt norms and values that promote gender diversity. We study a particular selectorate – the IETF Nominating Committee – whose members are randomly chosen. This randomness produces a natural experiment in female representation. We find that greater female representation in the selectorate causes more females to be appointed, but only after a change in IETF's informal and holistic norms.

Although we do not measure "informal norms" directly, we show that societal interest in the gender composition of STEM fields increased around 2011–12 (as reflected in the analysis of Twitter data); that this shift coincided with a sharp spike in discussion of diversity on IETF email lists; and that it was reflected in the improvement

[38] Table A.10 reports the results obtained estimating Equation (2).

Specification	OLS				
Unit of Analysis	NomCom Appointee				
Outcome Variable	1[Appointee is Female]				
	(1)	(2)	(3)	(4)	(5)
Pre × NomCom Female Share	0.34	-0.56	-0.56	-0.23	-0.72
	[0.43]	[0.20]**	[0.15]***	[0.15]	[0.26]**
Post × NomCom Female Share		0.99	1.26	1.10	1.13
		[0.42]**	[0.32]***	[0.43]**	[0.36]***
Pre × Volunteer Female Share	-0.91		1.27	0.25	1.95
	[0.75]		[0.44]***	[0.69]	[1.38]
Post × Volunteer Female Share			-3.65	-3.67	-2.89
			[0.68]***	[0.79]***	[0.68]***
Post		-0.09	0.43	0.45	0.31
		[0.06]	[0.10]***	[0.12]***	[0.12]**
Election Year	0.01	0.00	-0.01	-0.01	0.00
	[0.00]***	[0.01]	[0.00]**	[0.00]***	[0.01]
N	196	196	196	196	196
R-squared	0.02	0.04	0.06	0.05	0.05

Table 3: Effect of NomCom gender composition on appointee gender – Excluding year 2014 appointees. In this table, we run our OLS specification on the sample of appointees excluding those from 2014. In all columns, $Female_{it}$ is one if the probability that appointee i is female exceeds 75%, and $NomComp_t$ (resp., X_t) is the average of the "female dummies" among NomCom members (resp., volunteers). $Post_t = 1[Year \geq 2012]$ for models (1) to (3); $1[Year \geq 2013]$ for model (4); and $1[Year \geq 2011]$ for model (5). *Election Year* is the year of appointee election as AD or IAB member. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

of the interaction between women and men in the organization. These broader shifts were reinforced by deliberate actions within the IETF (e.g., the creation of a Diversity Design Team, and the organic emergence of "codes of conduct"). Consistent with our interpretation, IETF's own diagnosis of the problem places a particular emphasis on culture:

> "NomCom is itself a potentially diverse group of IETF participants, chosen at random from a pool of recent meeting attendees who offer their services. Hence, its problematic choices – or rather, omissions – could be seen as reflecting IETF culture generally."[39]

Our analysis of the IETF NomCom contributes to a prior literature on representation and selection for gender diversity that has produced mixed results. Well-designed causal

[39] Crocker and Clark (2015, p. 3).

studies of selectorates report conflicting and counter-intuitive findings that suggest female representation both promotes and discourages the selection of women. For the first time, this paper documents a change in the sign of the relationship between representation and selection. This reversal does not reflect the availability of more female talent in the pipeline or changes to the formal selection procedures. Rather, it comes from a change in the informal and holistic norms and values that foster gender diversity, with support and encouragement from IETF leadership. These findings suggest that representation in the selectorate and "tone from the top" are *both* necessary to promote gender diversity in the selection of leaders.

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Appendix: Supplementary Tables and Figures – Not for Publication

	Description	Year
RTP	Real-time Transport Protocol	2003
SIP	Session Initiation Protocol	2002
HTTP	Hypertext Transfer Protocol	1999
IPV6	Internet Protocol, Version 6 (IPv6)	1998
DHCP	Dynamic Host Configuration Protocol	1997
POP3	Post Office Protocol – Version 3	1996
NAT	Network Address Translator	1994
FTP	File Transfer Protocol	1985
TCP	Transmission Control Protocol	1981
IP	Internet Protocol	1981

Table A.1: Examples of IETF Internet Standards.

Panel A										
	(1) NomCom Volunteers					(2) NomCom Members				
	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
1[Individual is Female]	0.098	0.297	0	1	1,860	0.094	0.293	0	1	149
Panel B										
	(1) All IETF Participants					(2) All Appointees				
	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
1[Individual is Female]	0.102	0.302	0	1	307,210	0.120	0.325	0	1	209
ln(1+RFCs)	0.165	0.494	0	5.352	340,658	2.256	1.006	0	4.234	214
ln(1+Emails)	0.705	1.424	0	9.330	340,658	5.867	1.569	0	8.556	214
ln(1+Meetings)	1.123	0.693	0	4.304	340,658	3.289	0.493	1.792	4.111	214

Table A.2: Summary statistics – NomCom Volunteers, NomCom Members, All IETF Participants and All Appointees. Panel A reports information on the share of female NomCom Volunteers (col. 1) and NomCom Members (col. 2). Panel B reports information on all the IETF participants (col. 1) and on the sample of All Appointees (col. 2). 1[Individual is Female] is 1 if the probability that the individual in each subsample is female exceeds 75%. Individuals whose gender could not be determined algorithmically are excluded from the sample. We also report information on the stock of published RFCs (ln(1+RFCs)), the number of emails sent to IETF listservs (ln(1+Emails)), and the number of IETF meetings attended by individual i (ln(1+Meetings)).

Specification	OLS				
Unit of Analysis	NomCom Appointee				
Outcome Variable	1[Appointee is Female]				
	(1)	(2)	(3)	(4)	(5)
Pre × NomCom Female Share	0.56	-0.80	-0.56	-0.51	-0.80
	[0.78]	[0.34]**	[0.35]	[0.24]**	[0.47]
Post × NomCom Female Share		2.16	2.52	2.64	2.22
		[0.74]**	[0.64]***	[0.90]**	[0.79]**
Pre × Volunteer Female Share	-0.81		-0.11	-0.43	-0.32
	[1.55]		[0.89]	[1.18]	[2.04]
Post × Volunteer Female Share			-4.85	-4.96	-2.98
			[2.82]	[2.86]	[2.94]
Post		-0.11	0.47	0.44	0.10
		[0.14]	[0.36]	[0.38]	[0.35]
Election Year	0.02	0.00	-0.01	-0.01	0.01
	[0.01]**	[0.02]	[0.01]	[0.01]	[0.02]
N	119	119	119	119	119
R-squared	0.06	0.14	0.17	0.17	0.14

Table A.3: Effect of NomCom gender composition on appointee gender – ADs only. In this table, we look at the effect of NomCom gender composition on appointee gender considering the sample of ADs only. In all columns, $Female_{it}$ is 1 if the probability that appointee i is female exceeds 75%, and $NomComp_t$ (resp., X_t) is the average of the "female dummies" among NomCom members (resp., volunteers). $Post_t = 1[Year \geq 2012]$ for models (1) to (3); $1[Year \geq 2013]$ for model (4); and $1[Year \geq 2011]$ for model (5). *Election Year* is the year of appointee election as AD or IAB member. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	OLS				
Unit of Analysis	NomCom Appointee				
Outcome Variable	1[Appointee is Female]				
	(1)	(2)	(3)	(4)	(5)
Pre × NomCom Female Share	0.32	-0.49	-0.56	-0.25	-0.91
	[0.41]	[0.19]**	[0.15]***	[0.13]*	[0.31]**
Post × NomCom Female Share		1.05	1.29	0.95	1.10
		[0.36]**	[0.29]***	[0.32]***	[0.27]***
Pre × Volunteer Female Share	-0.15		1.52	0.72	3.79
	[1.03]		[0.64]**	[0.72]	[1.57]**
Post × Volunteer Female Share			-3.05	-3.00	-1.79
			[0.91]***	[1.22]**	[1.07]
Post		-0.04	0.43	0.49	0.30
		[0.08]	[0.11]***	[0.13]***	[0.15]*
Election Year	0.01	-0.00	-0.01	-0.02	-0.00
	[0.00]*	[0.01]	[0.00]***	[0.01]***	[0.01]
N	214	214	214	214	214
R-squared	0.01	0.04	0.05	0.05	0.04

Table A.4: Effect of NomCom gender composition on appointee gender – Alternative gender imputation approach. In this table, we change the gender imputation approach from one based on a dummy that equals 1 if Pr[Appointee is Female] exceeds 75%, to one based on raw probabilities obtained using *genderizeR*. Specifically, in all columns, $Female_{it}$ is the probability that appointee i is female, and $NomComp_t$ (resp., X_t) is the average of the probabilities that NomCom members (resp., volunteers) are women. $Post_t = 1[Year \geq 2012]$ for models (1) to (3); $1[Year \geq 2013]$ for model (4); and $1[Year \geq 2011]$ for model (5). *Election Year* is the year of appointee election as AD or IAB member. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	Logistic (Average Marginal Effects)				
Unit of Analysis	NomCom Appointee				
Outcome Variable	1[Appointed is Female]				
	(1)	(2)	(3)	(4)	(5)
Pre × NomCom Female Share	0.35	-0.50	-0.89	-0.16	-1.87
	[0.39]	[0.28]*	[0.41]**	[0.14]	[1.37]
Post × NomCom Female Share		1.04	1.75	1.09	1.35
		[0.40]***	[0.46]***	[0.43]***	[0.45]***
Table 1 Controls	✓	✓	✓	✓	✓
N	209	209	209	209	209

Table A.5: Effect of NomCom gender composition on appointee gender – Logit specification. In all columns, $Female_{it}$ is 1 if probability that appointee i is female exceeds 75%, and $NomComp_t$ (resp., X_t) is the average of the "female dummies" among NomCom members (resp., volunteers). $Post_t = 1[Year \geq 2012]$ for models (1) to (3); $1[Year \geq 2013]$ for model (4); and $1[Year \geq 2011]$ for model (5). The table reports average marginal effects (multiplied by 100 for legibility) and standard errors computed using the delta method. Table 1 controls refer to all explanatory variables shown in the corresponding column of Table I. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	OLS			
Unit of Analysis	NomCom Appointee			
Outcome Variable	1[Appointee is Female]			
	(1)	(2)	(3)	(4)
Pre × ΔFemale	0.33	-0.56	-0.22	-0.62
	[0.42]	[0.18]***	[0.18]	[0.22]**
Post × ΔFemale		1.30	1.00	1.17
		[0.35]***	[0.47]*	[0.33]***
Post		0.14	0.21	0.07
		[0.07]*	[0.08]**	[0.08]
Election Year	0.01	-0.00	-0.01	0.00
	[0.00]**	[0.01]	[0.01]	[0.01]
N	209	209	209	209
R-squared	0.02	0.05	0.05	0.04

Table A.6: Effect of NomCom gender composition on appointee gender – De-trended explanatory variable. In this table, we constrain $\beta_j = \gamma_j$ for $j = \{pre, post\}$. In all columns, $Female_{it}$ is 1 if the probability that appointee i is female exceeds 75%, and ΔFemale ≡ NomCom Female Share − Volunteer Female Share. $Post_t = 1[Year \geq 2012]$ for models (1) to (3); $1[Year \geq 2013]$ for model (4); and $1[Year \geq 2011]$ for model (5). *Election Year* is the year of appointee election as AD or IAB member. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	OLS					
Unit of Analysis	IETF Participant-Year					
Outcome Variable	1[Appointed to IESG or IAB] × 100					
	(1)	(2)	(3)	(4)	(5)	(6)
Pre × Female × NomCom Share	0.30	-0.37	-0.36	-0.33	-0.25	-0.33
	[0.34]	[0.15]**	[0.15]**	[0.15]**	[0.14]*	[0.15]**
Post × Female × NomCom Share		0.78	0.77	0.78	0.78	0.75
		[0.26]***	[0.26]***	[0.24]***	[0.31]**	[0.27]**
Pre × Female	-0.02	-0.00	0.01	0.00	-0.01	0.00
	[0.02]	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]
Post × Female		-0.03	-0.01	-0.03	-0.03	-0.04
		[0.03]	[0.03]	[0.02]	[0.03]	[0.03]
ln(1+RFCs)			0.23	0.03	0.03	0.03
			[0.03]***	[0.02]	[0.02]	[0.02]
ln(1+Emails)			0.04	0.01	0.01	0.01
			[0.01]***	[0.01]	[0.01]	[0.01]
ln(1+Meetings)			0.04	0.02	0.02	0.02
			[0.01]***	[0.01]***	[0.01]***	[0.01]***
Incumbent				0.34	0.34	0.34
				[0.06]***	[0.06]***	[0.06]***
WG Chair Experience Effects				✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
N	307,210	307,210	307,210	307,210	307,210	307,210
R-squared	0.00	0.00	0.01	0.03	0.03	0.03

Table A.7: Effect of NomCom gender composition on appointments controlling for individual experience – ADs only. In this table, we look at the effect of NomCom gender composition on appointee gender considering the sample of ADs only. In all columns $Female_i$ is 1 if the probability that individual i is female exceeds 75%, and $NomComp_t$ is the average of the "female dummies" among NomCom members. $Post_t = 1[Year \geq 2012]$ for models (1) to (4); $1[Year \geq 2013]$ for model (5); and $1[Year \geq 2011]$ for model (6). Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	OLS					
Unit of Analysis	IETF Participant-Year					
Outcome Variable	Pr[Appointed to IESG or IAB] × 100					
	(1)	(2)	(3)	(4)	(5)	(6)
Pre × Female × NomCom Share	0.28	-0.33	-0.29	-0.24	-0.05	-0.24
	[0.29]	[0.13]**	[0.12]**	[0.09]**	[0.18]	[0.09]**
Post × Female × NomCom Share		0.71	0.71	0.76	0.58	0.74
		[0.23]***	[0.24]***	[0.22]***	[0.17]***	[0.23]***
Pre × Female	-0.02	-0.00	0.03	0.01	-0.02	0.01
	[0.02]	[0.02]	[0.02]*	[0.02]	[0.03]	[0.02]
Post × Female		-0.04	0.01	-0.02	-0.00	-0.03
		[0.03]	[0.03]	[0.03]	[0.02]	[0.03]
ln(1+RFCs)			0.38	0.05	0.05	0.05
			[0.05]***	[0.04]	[0.04]	[0.04]
ln(1+Emails)			0.07	0.02	0.02	0.02
			[0.01]***	[0.01]**	[0.01]**	[0.01]**
ln(1+Meetings)			0.06	0.03	0.03	0.03
			[0.01]***	[0.01]***	[0.01]***	[0.01]***
Incumbent				0.54	0.54	0.54
				[0.08]***	[0.08]***	[0.08]***
WG Chair Experience Effects				✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
N	328,602	328,602	328,602	328,602	328,602	328,602
R-squared	0.00	0.00	0.01	0.04	0.04	0.04

Table A.8: Effect of NomCom gender composition on appointments controlling for individual experience – Alternative gender imputation approach. In this table, we change the gender imputation approach from one based on a dummy that equals 1 if Pr[Appointee is Female] exceeds 75%, to one based on raw probabilities obtained using *genderizeR*. Specifically, in all columns $Female_i$ is the probability that individual i is female, and $NomComp_t$ is the average of the probabilities that NomCom members are women. $Post_t = 1[Year \geq 2012]$ for models (1) to (4); $1[Year \geq 2013]$ for model (5); and $1[Year \geq 2011]$ for model (6). Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	Logistic (Average Marginal Effects)					
Unit of Analysis	IETF Participant-Year					
Outcome Variable	1[Appointed to IESG or IAB]					
	(1)	(2)	(3)	(4)	(5)	(6)
Pre × Female × NomCom Share	0.25	-0.63	-0.89	-0.76	-0.38	-0.92
	[0.16]	[0.33]*	[0.47]*	[0.41]*	[0.43]	[0.48]*
Post × Female × NomCom Share		0.42	0.69	0.58	0.54	0.56
		[0.07]***	[0.11]***	[0.11]***	[0.10]***	[0.10]***
Table 2 Controls	✓	✓	✓	✓	✓	✓
WG Chair Experience Effects				✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
N	307,210	307,210	307,210	307,210	307,210	

Table A.9: Effect of NomCom gender composition on appointments controlling for individual experience – Logit specification. In all columns $Female_i$ is the probability that individual i is female, and $NomComp_t$ is the average of the probabilities that NomCom members are women. $Post_t = 1[Year \geq 2012]$ for models (1) to (4); $1[Year \geq 2013]$ for model (5); and $1[Year \geq 2011]$ for model (6). The table reports average marginal effects (multiplied by 100 for legibility) and standard errors computed using the delta method. Table 2 controls refer to all explanatory variables shown in the corresponding column of Table II. Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

Specification	OLS					
Unit of Analysis	IETF Participant-Year					
Outcome Variable	1[Appointed to IESG or IAB] × 100					
	(1)	(2)	(3)	(4)	(5)	(6)
Pre × Female × NomCom Share	0.27	-0.29	-0.26	-0.22	-0.06	-0.23
	[0.32]	[0.14]*	[0.13]*	[0.11]*	[0.15]	[0.13]*
Post × Female × NomCom Share		0.67	0.67	0.67	0.56	0.66
		[0.30]**	[0.31]**	[0.25]**	[0.29]*	[0.27]**
Pre × Female	-0.02	-0.00	0.02	0.01	-0.02	0.00
	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Post × Female		-0.04	0.00	-0.03	-0.01	-0.03
		[0.03]	[0.04]	[0.03]	[0.03]	[0.03]
ln(1+RFCs)			0.40	0.06	0.06	0.06
			[0.05]***	[0.04]	[0.04]	[0.04]
ln(1+Emails)			0.07	0.02	0.02	0.02
			[0.01]***	[0.01]**	[0.01]**	[0.01]**
ln(1+Meetings)			0.06	0.03	0.03	0.03
			[0.01]***	[0.01]***	[0.01]***	[0.01]***
Incumbent				0.58	0.58	0.58
				[0.09]***	[0.09]***	[0.09]***
WG Chair Experience Effects				✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
N	287,348	287,348	287,348	287,348	287,348	287,348
R-squared	0.00	0.00	0.01	0.04	0.04	0.04

Table A.10: Effect of NomCom gender composition on appointments controlling for individual experience – Excluding the year 2014 appointees. In this table, we run our OLS specification on the sample of IETF participants excluding those from 2014. In all columns $Female_i$ is 1 if the probability that individual i is female exceeds 75%, and $NomComp_t$ is the average of the "female dummies" among NomCom members. $Post_t = 1[Year \geq 2012]$ for models (1) to (4); $1[Year \geq 2013]$ for model (5); and $1[Year \geq 2011]$ for model (6). Stars indicate significance at *10%, **5% and ***1% level. Standard errors clustered by year.

	(1) Share Female NomCom Members	(2) Share Female NomCom Volunteers	(2) Share Female IETF Participant
NomCom Year	-0.00	0.00	0.00
	[0.00]	[0.00]	[0.00]***
N	16	16	16
R-squared	0.03	0.30	0.81

Table A.11: No time trend in the percentage of women in the samples of NomCom Members (col. 1), NomCom Volunteers (col. 2), and IETF Participants (col. 3).

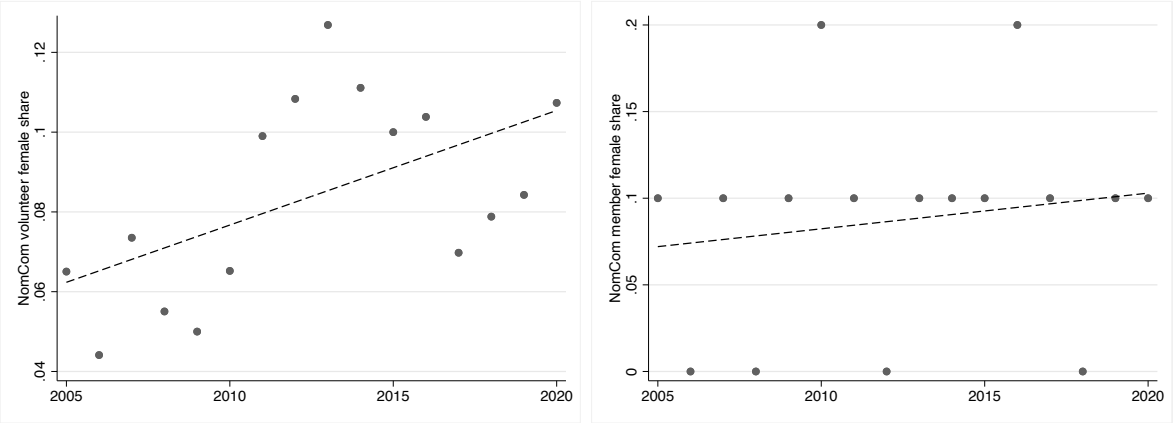

Figure A.1: NomCom female volunteers and members. The horizontal axis in every graph is NomCom year, which coincides with the calendar year in which a given NomCom makes appointments. The left panel is the share of women among all NomCom volunteers (volunteers must be NomCom-eligible). The right panel is the share of women among all NomCom members. Individuals whose gender could not be determined algorithmically are excluded from the sample. Comparing the left panel with Figure 2 indicates a pattern of non-decreasing female presence in the pool of "appointables" during the years 2005–2011(as proxied by NomCom volunteering), but a decreasing appointment rate.

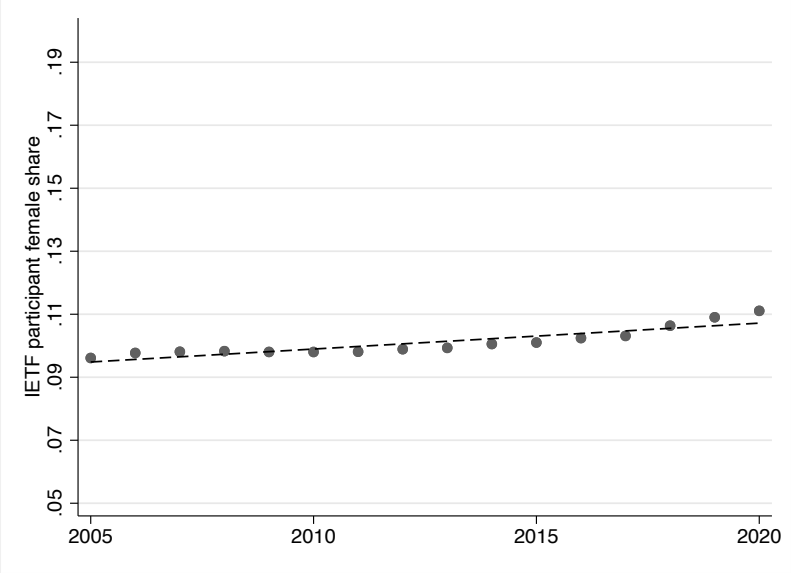

Figure A.2: Share of female IETF participants. The vertical axes represent the fraction of women among IETF participants, based on the coding of gender described in the text. On the horizontal axis is the calendar year. Individuals whose gender could not be determined algorithmically are excluded from the sample.

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