Networks and Power: The Effects of Random Selection Into an Administrative Elite

A. Allocca, B. Ganglmair, N. Persico, T. Simcoe, E. Tarantino

LMU and CESifo, Mannheim and ZEW, Northwestern and NBER, Boston and NBER, LUISS and CEPR

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Network and Power Spillovers

When someone in a professional network achieves a position of power, that person gains:

- Knowledge, connections, and informal credits in favor exchanges that can be used to increase the entire network's professional success (spillovers).

Example: a co-author who is past editor of a prestigious academic journal might improve one's acceptance rate.

Challenge:

Hard to estimate the pure effect of power as it typically correlates with the characteristics of the individuals holding it.

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Random Power Allocation

Unique setting within the IETF: random selection of members into powerful position, the Nominating Committee (NomCom)
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Look at whether randomly assigning power to individual X has favorable effects on X’s network, compared with the networks of similar individuals not selected
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Production of Internet standards and patents by a group of IETF contributors
This Talk

Data from IETF and Nominating Committee
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Construction of patents/inventors dataset and networks
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Empirical strategy
The Institution: IETF
Nominating Committee: NomCom

NomCom members have the **power** to appoint those that supervise IETF’s standardization process, the Area Directors
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Leverage the **random** selection into NomCom: random number generator algorithm draws members from volunteers’ pool
Idea of Empirical Strategy

Compare the productivity of co-authors of volunteers randomly selected into NomCom (treated)
Idea of Empirical Strategy

Compare the productivity of co-authors of volunteers randomly selected into NomCom (treated) with the productivity of co-authors of volunteers not selected into NomCom (control)
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Compare the productivity of co-authors of volunteers randomly selected into NomCom (treated) with the productivity of co-authors of volunteers not selected into NomCom (control)

This way, the only variation comes from the random selection and not from characteristics of individuals with power
Idea of Empirical Strategy
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Data
Data Sources

Sample period: 2005-2019

IETF “grassroot” participation: panel of 28,000 contributors
- E-mail listservs and tri-annual meetings
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IETF contributors named as inventors on U.S. utility patents
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Networks of NomCom volunteers and selected members
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Patents

Universe of patents from the United States Patent and Trademark Office (USPTO) from 1976 to 2023
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Challenge: need to match patents to IETF contributors
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- In USPTO data, inventor name and ID; in the IETF data, only name
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- In case of popular names, risk of wrongly assigning people to IETF
Patents: Filters

Filters:
- At least one patent in physics, electricity or new tech developments, or
- At least one patent including terms related to IETF and Internet

Any other idea is welcome!
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- 10 patents
- 20 patents

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10 patents → 15 patents
20 patents → 15 patents
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\[
\begin{align*}
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\end{align*}
\]

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In the network of NomCom volunteers: IETF contributors who wrote at least one draft with a volunteer prior to his/her first volunteering year.
Co-authorship Network

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There can be multiple volunteers (and NomCom members) associated with a contributor: he/she is in the network when the first co-author volunteers (treated when the first volunteer gets selected)
Co-authorship Network

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Unbalanced panel of ca. 25,000 co-author*year* observations
Contributors in the sample

- Individuals: 2,349
- Connected to 1.9 volunteers on average (st. dev. 1.9)
- Min 1 volunteer, max 24 volunteers
Facts About the Authorship Network

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Volunteers

- Volunteers with drafts: 491
- Connected to 14 co-authors on average (st. dev. 15)
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Volunteers

- Volunteers with drafts: 491
- Connected to 14 co-authors on average (st. dev. 15)
- Min 1 co-author, max 121 co-authors

NomCom members

- NomCom members with drafts: 115
- Connected to 14.9 co-authors on average (st. dev. 17)
- Min 1 co-author, max 100 co-authors
Definition of Network: Open Questions

Is the definition of network robust?
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- If someone co-authors with a volunteer only on one version of the draft, can he/she be considered part of the network?
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- Could use a measure of the intensity of coauthorship (number of drafts written together)
- Could be based on RFCs’ coauthorships
Estimation Approach
An IETF contributor in the network is “treated” the moment one of their co-authors gets randomly selected into NomCom.
Treatment

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We are interested in the effect of the treatment coefficient to measure whether randomly assigning power to a volunteer has favorable effects on the volunteer’s network, compared with the networks of volunteers not selected.
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The effect is unclear ex-ante
Empirical Specification


\[ Y_{jt} = \exp \left[ \gamma_0 + \gamma_1 \text{Treated}_{it} + \gamma_2 \text{Treated}_{it} \times \text{Female}_i + f(\text{age}_{jt}) + \text{FE}_j + \text{FE}_t \right] \]

- \( Y_{jt} \): yearly number of RFCs and patents produced by \( j \)
- \( \text{Treated}_{it} \): turns one on the year co-author \( i \) is selected into NomCom (absorbing state)
- \( \text{Female}_i \): indicator for female \( i \) selected into NomCom
- \( f(\text{age}_{jt}) \): age categories, proxy for \( j \)'s experience
- \( \text{FE}_j \) and \( \text{FE}_t \): individual \( j \) and year fixed effects
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Impact on Network of Co-authors: Results

<table>
<thead>
<tr>
<th></th>
<th>RFCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated</td>
<td>0.371***</td>
</tr>
<tr>
<td></td>
<td>(0.137)</td>
</tr>
<tr>
<td>Treated × Fem</td>
<td>0.433**</td>
</tr>
<tr>
<td></td>
<td>(0.208)</td>
</tr>
</tbody>
</table>

- Co-authors of volunteers randomly selected into NomCom are more productive
- Elasticity of $\sim 0.45$
- Stronger effect if female is selected

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age categories</td>
<td>Yes</td>
</tr>
<tr>
<td>Year and Individual FE</td>
<td>Yes</td>
</tr>
<tr>
<td>Mean Dep. Variable</td>
<td>0.425</td>
</tr>
<tr>
<td>No. of observations</td>
<td>11,321</td>
</tr>
<tr>
<td>Treated Units</td>
<td>6,386</td>
</tr>
<tr>
<td>Untreated Units</td>
<td>4,935</td>
</tr>
</tbody>
</table>
Conclusions and Agenda

We exploit a unique case in STEM profession in which allocation to powerful positions is random
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Agenda: work on the empirical analysis, other outcomes to analyze
Appendix
Network effects and scientific productivity:
Azoulay et al (2010); Waldinger (2012); Borjas, Doran (2012); Colussi (2018); Brogaard et al. (2018); Ma et al (2020); Zacchia (2020)

How random selection into leadership role (for short time) affects productivity of co-authors
Network effects and scientific productivity:
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How random selection into leadership role (for short time) affects productivity of co-authors

The origins of innovation:
Hoisl et al. (2022); Aghion et al (2017); Bell et al (2019)

Random power as innovation-fostering channel
To determine participants’ affiliation, we use data on email addresses in IETF listservs:

- 61% from corporate organizations (e.g., Cisco, Microsoft, Huawei, Google, Nokia)
- 6% from non-for-profit organizations (including government, academic, international organizations, and think-thanks)
Area Directors (AD)

- NomCom members nominate **area directors (AD)**
- Technical experts with knowledge broad enough to oversee several working groups
- Responsible for the productivity of these working groups
- Appointed for two years, they check whether there is sufficient “community consensus” before a proposal is published as standard
I will be contacting the selected volunteers to ensure they remain willing and available to serve.

Random selection data used:

**EuroMillions Lottery Results**
https://www.euro-millions.com/results
Friday, July 5, 2019
Results: https://www.euro-millions.com/results/05-07-2019
Results: 2 9 28 34 42 6 9

**MLB Major League Baseball** (“Score, Hits and Errors”), Result of the Orioles vs. Blue Jays game scheduled for Friday, July 5, 2019 at 7:07 PM
https://www.mlb.com/gameday/orioles-vs-blue-jays/2019/07/05/566909@gameday_results?state=final
Results: 4 6 0 1 4 1

**Ontario Lottery and Gaming Corporation Lotto 6/49**
Saturday, July 6, 2019 Results:
(7 Numbers including the bonus ball: 6 numbers between 1 and 49 and one bonus ball between 1 and 49)
Results: 10 28 38 39 40 43 45

**Powerball Lottery Results**
http://www.powerball.com/games/powerball
Saturday, July 6, 2019
Results: 04 08 23 46 65 01

Victor Kiamesha
victor at jvnet dot com
nomcom-chair-2019 at ietf dot org
### Top 5 Affiliations

<table>
<thead>
<tr>
<th>Affiliation</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Systems</td>
<td>13.11</td>
</tr>
<tr>
<td>Huawei Technologies</td>
<td>12.68</td>
</tr>
<tr>
<td>Ericsson Inc.</td>
<td>9.58</td>
</tr>
<tr>
<td>Nokia</td>
<td>5.34</td>
</tr>
<tr>
<td>Juniper Networks</td>
<td>4.96</td>
</tr>
</tbody>
</table>

- Similar percentages over time
- Preserves the composition of the IETF population