Gender inequalities in academia: trends, reasons and mechanisms

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Selected papers:


The three questions

Why so few?
Alice Rossi, 1965

Why so low?
Inspired by:
Rossella Palomba, 2013

Why so slow?
Virginia Valian, 1999
Why so few: female rates across scientific field - Italy

Source: MIUR data on the Italian academic population, Gaiaschi and Musumeci 2021
Why so low: the scissor diagram

Gaiaschi, Musumeci, 2021 – Gaiaschi 2022

<table>
<thead>
<tr>
<th>02 - Physical Sciences</th>
<th>% F AR</th>
<th>% F RTDA</th>
<th>% F RTDB</th>
<th>% F RU</th>
<th>% F PA</th>
<th>% F PO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31,2</td>
<td>43,7</td>
<td>18,8</td>
<td>29,1</td>
<td>21,9</td>
<td>14,6</td>
</tr>
</tbody>
</table>
Why so slow: recruitments vs employed

Recruitments (R) against stock (S) – female % among associate (PA) and full (PO) professors

Source: MUR data - Gaiaschi and Musumeci, 2020, 2021
Watch out: how to measure inequalities?

• Descriptive statistics can only provide us with unadjusted gender inequality gaps (in the career progression).

• Inequality does not mean discrimination!

• In order to see if discrimination is occurring it is essential to measure the adjusted gender gap through, for example, experimental methods or multivariate analysis on observational analysis!
The adjusted gaps in academia

- The international literature shows that women have a smaller – adjusted – probability of becoming full professor (i.e. Perna et al. 2005; Durodoye et al. 2020; IT: Marini e Meschitti 2018), associate professor (i.e. Wolfinger et al. 2008; Box Steffenmeiser et al. 2015; Weisshaar 2017; Filandri e Pasqua 2019) and assistant professor (Groenwald et al. 2012; Wolfinger et al. 2008; Ginther e Kahn 2009).
- They are more likely to drop-out before obtaining tenure: Durodoye et al. 2020; Dubois-Shaik and Fusulier 2015, Huang et al. 2020.
- To date, studies that have measured the "adjusted" probability of career transition in Italy have focused on full (Marini and Meschitti, 2018; Filandri and Pasqua, 2019) or associate (Filandri and Pasqua) professors.
- The disadvantage that women experience in the transition from postdoc to assistant professor has been documented only at a descriptive level (Picardi, 2019; Gaiaschi and Musumeci, 2020, 2012, Gaiaschi 2022).
- To date, an "adjusted" measure of the likelihood of becoming an RTD is lacking, even in light of the contractual changes this position has gone through over time (L. 240/2010).
- The WIRED project is filling this gap!
The WIRED project
MSCA IF 2021-2023

Women In Research and higher EDucation - Marie Skłodowska-Curie project

Measuring gender inequalities in recruitment and promotion in European Universities by focusing on two case-studies conducted in Italy and Switzerland.
Il progetto WIRED (2021-2023)

• Aim: to analyze the gender gap in academia in IT and CH with a focus on early career stages.

• Partnerships: MUR; UST; UNIL; UNIGE.

• TEAM: Camilla Gaiaschi (PI), Stephanie Steinmetz (UNIL), Giulia Valsecchi (UNIGE), Katy Morris (UNIL).

• Italian dataset: administrative data on the academic population + ASN data (provided by MUR) + 3 web sources on organizational performance: data on departments of excellence (MUR) 2017, Anvur data 2011-2014 and 2015-2019.

• Range: 2005-2020

• Information on: gender, year of birth, nationality, position, area (14 items), SSD (361 items), ASN standardized productivity scores, year of application and attainment, area, university, department, 2017 score in the « departments of excellence ranking » (department), 2011-2014 and 2015-2019 scores in ANVUR ranking (universityXarea and SSD).
Research questions

• WHAT – Do women have a smaller probability to become assistant professor?
• WHY – If it’s so: what are the reasons for this disadvantage?
• WHEN 1 - Do women take longer to become RTD (with Katy Morris)?
• WHEN 2 – Has the gender gap changed over time?
**Methods and models**

**WHAT: are postdoc women less likely to become RTDs?**
- Linear probability model (LPM) with random effects on 2010-2020 data
  \[ Y_{it} = \beta_0 + \beta_{1gender} + \beta_pX_p + \alpha_i + \epsilon_{it} \]

**WHY: what are the determinants of the gap?**
- "Nested" models and models with interactions (between gender and: productivity, science area, and % ordinary)

**WHEN 1 - do women take longer to get an RTD?**
- Survival analysis – «accelerated failure time» (AFT) su dati 2010-2020

**WHEN 2 - Has the gap changed since the reform?**
- Linear regression discontinuity model with RE on 2005-2020 data.
  \[ Y_{it} = \beta_0 + \beta_{3time} + \beta_{1gender} + \beta_{2treat} + \beta_{4treat*gender} + \beta_{5time*gender} + \beta_pX_p + \alpha_i + \epsilon_{it} \]
Some preliminary results
What: the gender gap in recruitment

<table>
<thead>
<tr>
<th>Model</th>
<th>Comparison</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>AR &gt; RTDa</td>
<td>b: -0.040***</td>
<td>b: -0.042***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE: 0.0017516</td>
<td>SE: 0.0016882</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N obs.: 254,299</td>
<td>N obs.: 254,299</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N ind.: 84,657</td>
<td>N ind.: 84,657</td>
</tr>
<tr>
<td>M2</td>
<td>AR &gt; RTDb</td>
<td>b: -0.024***</td>
<td>b: -0.031***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE: 0.0015251</td>
<td>SE: 0.0015264</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N obs.: 236,460</td>
<td>N obs.: 236,460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N ind.: 83,505</td>
<td>N ind.: 83,505</td>
</tr>
<tr>
<td>M3</td>
<td>AR &gt; RTDb</td>
<td>b: -0.027***</td>
<td>b: -0.029***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE: 0.0015264</td>
<td>SE: 0.0012388</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N obs.: 226,19</td>
<td>N obs.: 226,19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N ind.: 82,537</td>
<td>N ind.: 82,537</td>
</tr>
<tr>
<td>M4</td>
<td>RTDa &gt; RTDb</td>
<td>b: -0.032**</td>
<td>b: -0.052***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE: 0.0071166</td>
<td>SE: 0.0073427</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N obs.: 45,946</td>
<td>N obs.: 45,946</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N ind.: 14,041</td>
<td>N ind.: 14,041</td>
</tr>
</tbody>
</table>

* p<0.05, ** p<0.01, *** p<0.001
Why: gender and self-promotion

<table>
<thead>
<tr>
<th>having succeeded in the PA habilitation</th>
<th>gender_real</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>Tried and failed</td>
<td>4,079</td>
<td>4,291</td>
<td>8,370</td>
</tr>
<tr>
<td></td>
<td>5.28</td>
<td>5.93</td>
<td>5.59</td>
</tr>
<tr>
<td>Tried and succeeded</td>
<td>29,812</td>
<td>22,218</td>
<td>52,030</td>
</tr>
<tr>
<td></td>
<td>38.58</td>
<td>30.69</td>
<td>34.76</td>
</tr>
<tr>
<td>.</td>
<td>43,390</td>
<td>45,875</td>
<td>89,265</td>
</tr>
<tr>
<td></td>
<td>56.15</td>
<td>63.38</td>
<td>59.64</td>
</tr>
<tr>
<td>Total</td>
<td>77,281</td>
<td>72,384</td>
<td>149,665</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Why: gender and scientific area

Post > RTDab - average marginal effects of gender

01-Mathematics and informatics
02-Physical sciences
03-Chemical sciences
04-Earth sciences
05-Biological sciences
06-Medical sciences
07-Agriculture and veterinary
08-Architecture and construction
09-Engineering trades and manufacturing
10-Archeology, languages and arts
11-History, phylosophy, psychology, education
12-Law
13-Business, administratition and statistics
14-Political and social sciences

Effects on linear prediction

Watch out: nella transizione ad rtdA anche le aree 02-04 non riportano uno svantaggio femminile significativo!
Why: gender and scientific productivity

post> RTDab - predictive margins of gender

Linear prediction vs PA_ASN_mean for M and W.
When: the effects of the reform

<table>
<thead>
<tr>
<th>Average marginal effects of postreform*gender</th>
<th>Men</th>
<th>Women</th>
<th>W-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Udjusted model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the reform</td>
<td>0</td>
<td>0</td>
<td>-.023*** (.0027)</td>
</tr>
<tr>
<td>After the reform</td>
<td>-.850*** (0.0021)</td>
<td>.0871*** (0.0021)</td>
<td>-.043*** (.0040)</td>
</tr>
</tbody>
</table>

N. obs: 529,275; N. ind: 123,354 - SE in parenthesis
* p < 0.05, ** p < 0.01, *** p < 0.001

- Random-effects Regression Discontinuity model:
  \[ Y_{it} = \beta_0 + \beta_{time} + \beta_{gender} + \beta_{treat} + \beta_{treat*gender} + \beta_{time*gender} + \beta_{treat*time} + \beta pXp + \alpha_i + \epsilon_{it} \]

- DEP VAR: Y=RU (if year < 2012) + RTDa+RTDb
- TREATMENT (var « postreform »): post-reform=1 if year>2011; post-reform=0 if year<2012
Preliminary conclusions

• Women are around -4% / -5% less likely to become researchers controlling for differences in: age, nationality, university, department, scientific field, individual and organizational productivity, etc.

• Women are less likely to apply for the ASN and this partly explains the gap!

• Scientific productivity does not " pay " equally for men and women in terms of chances for promotion.

• Scientific fields play a crucial role in explaining the gap: medicine is the most penalizing area for women, preceded by political and social sciences! Many STEM areas, on the other hand, are not more unequal than the SSH, particularly mathematics (where there is no gap!).

• The Gelmini reform seems to have widened the gender gap.
Explaining the gender promotion gap
Explaining the gender gap in promotion

**MICRO**

- **Supply**
  - Choices, preferences, attitudes. Ex: work hours & productivity (human capital)
- **Demand**
  - (Direct) discrimination in recruitment, promotion, etc. due to gender biases in evaluations

**MESO**

- The culture and the structure of organizations:
  - Institutional sexism
  - Exclusionary practices, re-segregation and subordinated integration, differences in resources, old boy networks

**MACRO**

- The labour market and its structure
- Policies: educational; welfare; equal opportunities, university policies
- Values and norms
The reasons:

• Supply-side, *micro*:
  1. Differences in scientific and mathematical abilities and attitudes
  2. Differences in family responsibilities (*babies*)
  3. Differences in scientific productivity
  4. Differences in self-promotion

• Demand-side, *micro*: *biases* in evaluation processes

• Demand-side, *meso*: resources, networks, segregation, work-place climate.

• Demand-side, *macro*: university reforms and transformations
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• Demand-side, **meso**: resources, networks, segregation, work-place climate.

• Demand-side, **macro**: university reforms and transformations
The reasons:

• Supply-side, **micro**:
  1. Differences in scientific and mathematical abilities and attitudes
  2. Differences in family responsibilities \((\textit{babies})\)
  3. Differences in scientific productivity
  4. Differences in self-promotion

• Demand-side, **micro**: \(\textit{biases}\) in evaluation processes

• Demand-side, **meso**: resources, networks, segregation, work-place climate.

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- Demand-side, **meso**: resources, networks, segregation, work-place climate.

- Demand-side, **macro**: university reforms and transformations
Thank you!
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More on the book:
https://www.carocci.it/prodotto/doppio-standard

More on my current project:
https://wp.unil.ch/wired/

More on me:
www.camillagaiaschi.com