Effects of gender on publication practices in STEM

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Webinar on the ISC Gender Gap in Science Project

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Digital Future

Goals

- explore effects of gender on publication practices
  - in different academic fields in STEM
  - across world countries and regions
- thus identify common and discipline-specific issues that might require interventions in view of the measured gender gaps
- provide access to aggregated data and interactive visualizations for the scientific community → democratization of data & explorations

Why study publications?

- scientific publications are major outlet for scholarly communication
- proxy for a researcher’s scientific reputation
- play a key role in achieving and maintaining a successful career in academia
- decisions on tenure and other academic promotions are mostly based on evaluations of the candidate’s research portfolio

Thus, the understanding of publication practices is of great interest to **academic institutions**, **science policy makers**, and **researchers** alike

Relation to state of research

- large body of research from scientometric community

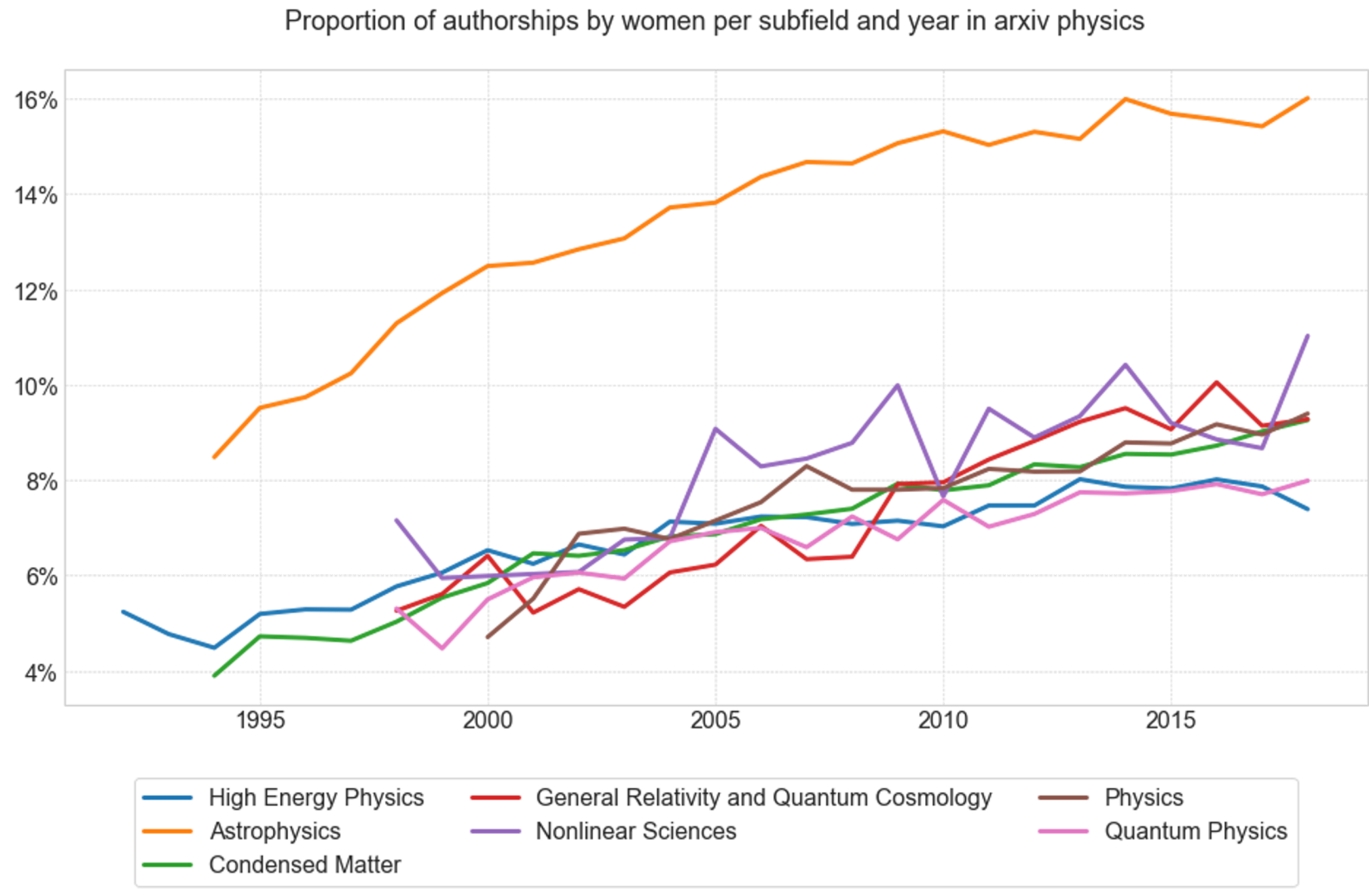
  + few individual works by researchers from the respective STEM disciplines
- we worked closely with researchers from the disciplines
- we used non-commercial data sources, possibly open access
- we studied
  - longitudinal development of individuals (requires assignment of papers to persons)
  - representation of women in selected (prestigious) journals
  - proportion of women across different countries
  - distribution across subfields
- Results descriptive / exploratory

Data sources

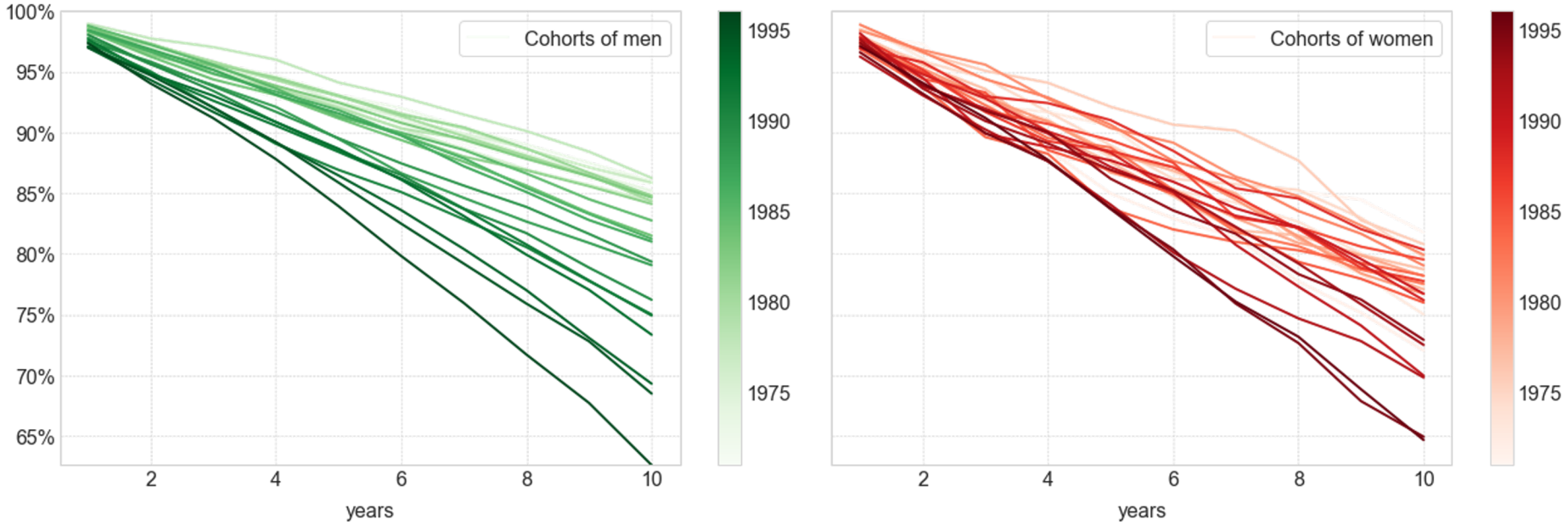
- Astronomy and Astrophysics: **ADS** (SAO/NASA Astrophysics Data System)
- Mathematics: **zbMATH** (Zentralblatt MATH)
- (Theoretical) Physics (and more?): **arXiv** + CrossRef
- six selected journals in Chemistry using CrossRef (tried CAS)

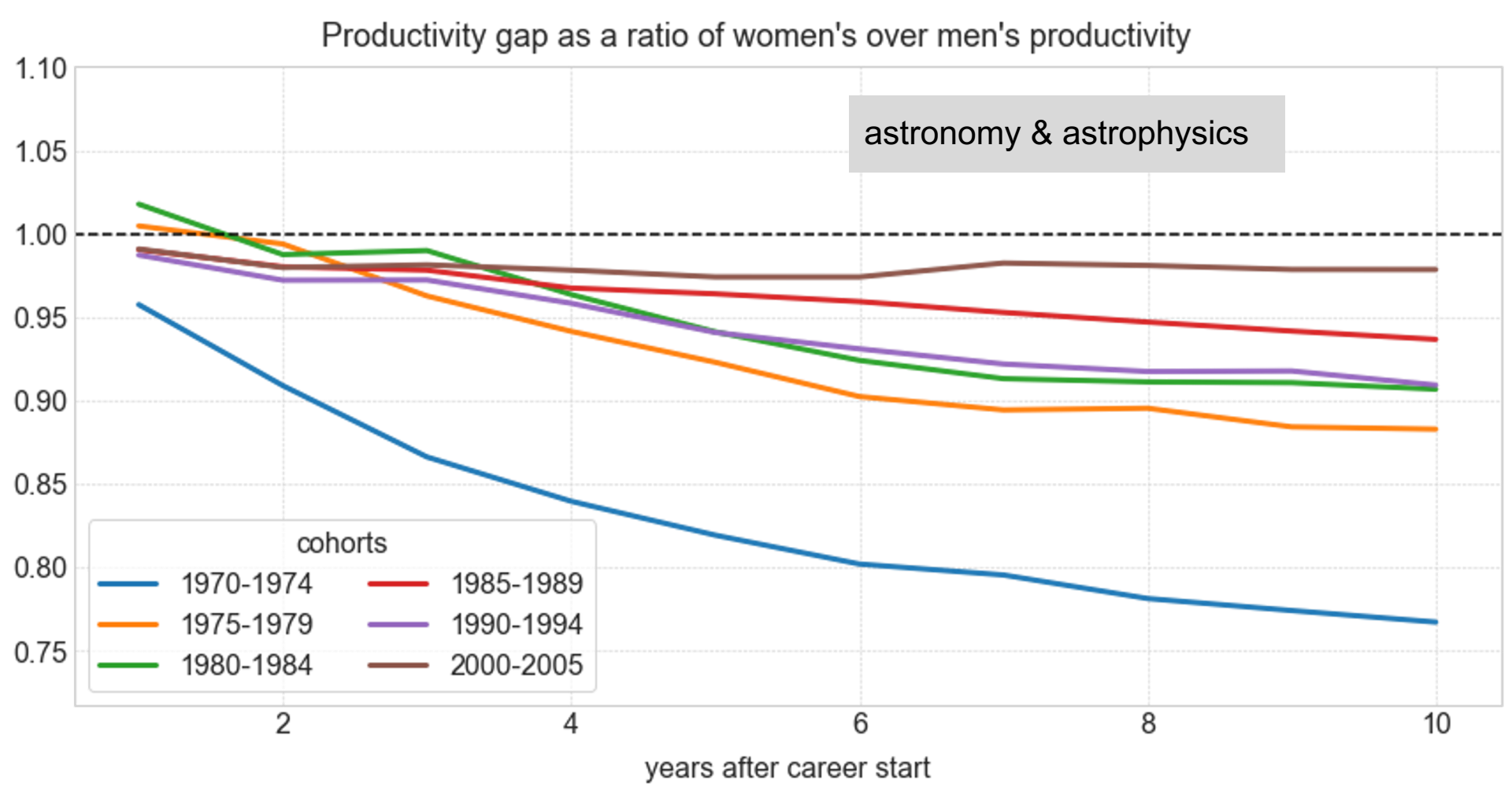
http://gender-publication-gap.f4.htw-berlin.de/

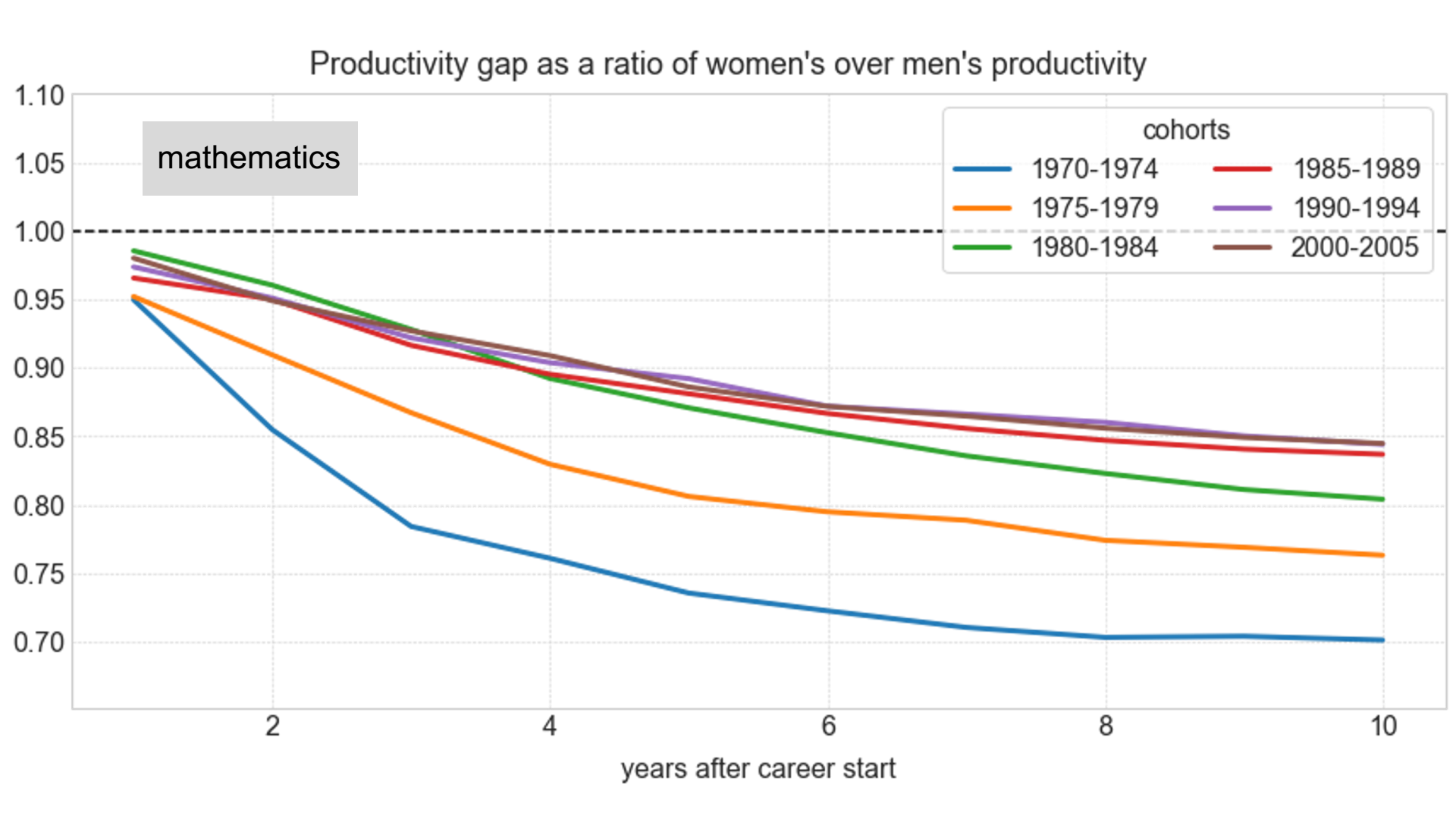
Longitudinal development:
proportions,
career lengths,
number of publications


Proportion of authorships by women per subfield and year in arxiv physics
16%
14%
12%
10%
8%
6%
4%
1995
2000
2005
2010
2015
High Energy Physics
Astrophysics
Condensed Matter
General Relativity and Quantum Cosmology
Nonlinear Sciences
Physics
Quantum Physics

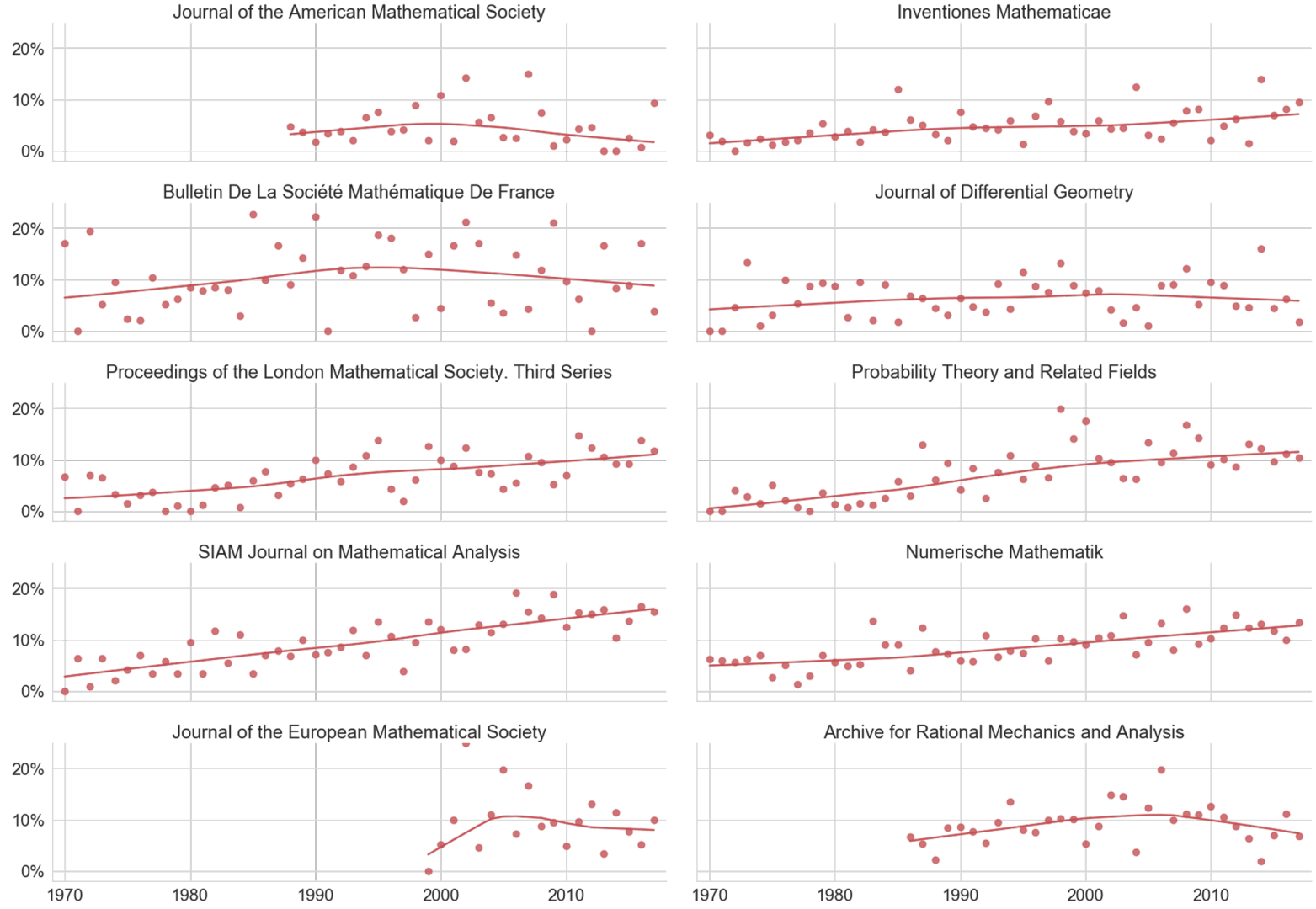
Publishing career lengths in mathematics



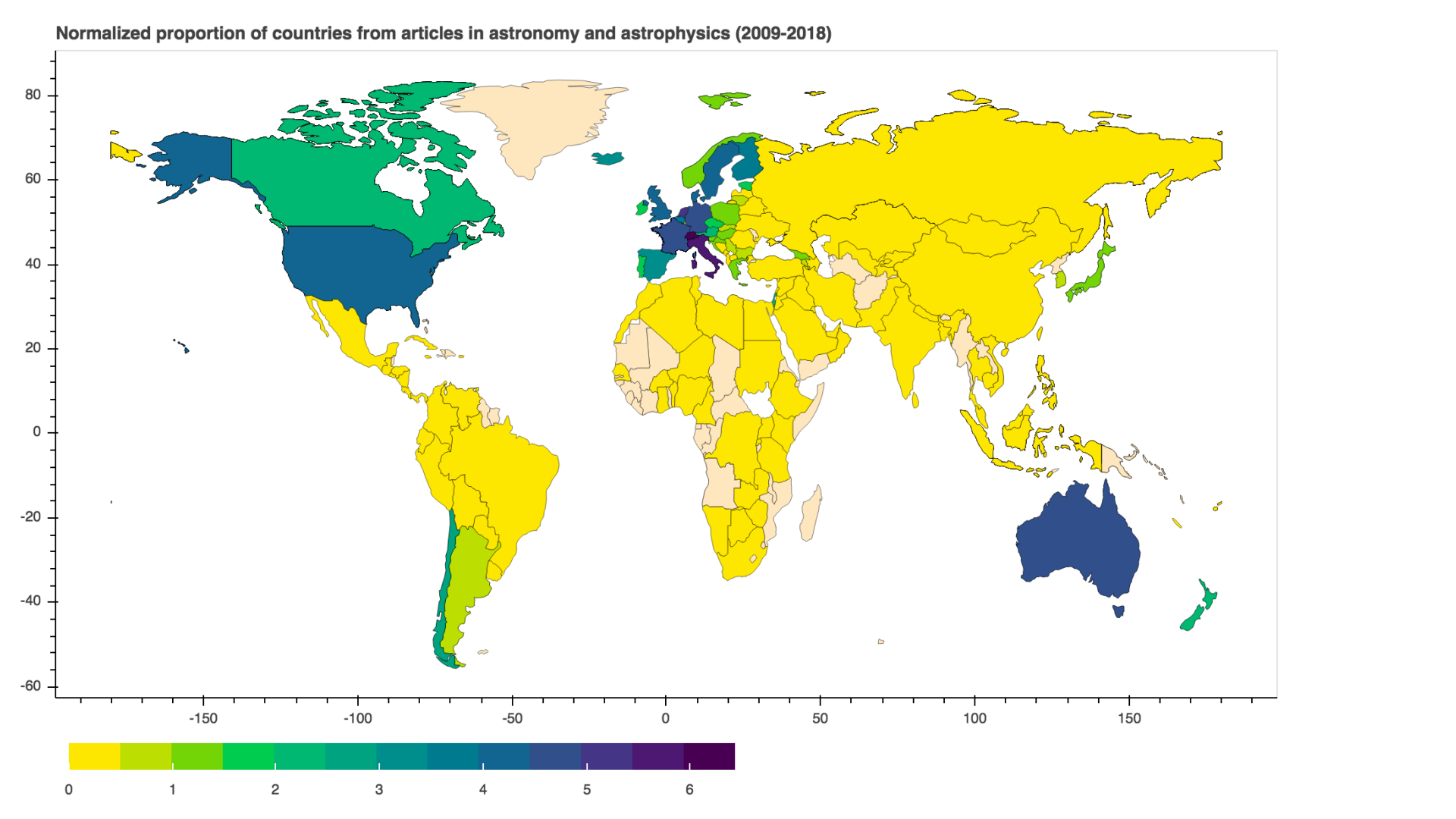

Productivity gap as a ratio of women's over men's productivity
astronomy & astrophysics
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
cohorts
1970-1974
1975-1979
1980-1984
1985-1989
1990-1994
2000-2005
2
4
6
8
10
years after career start

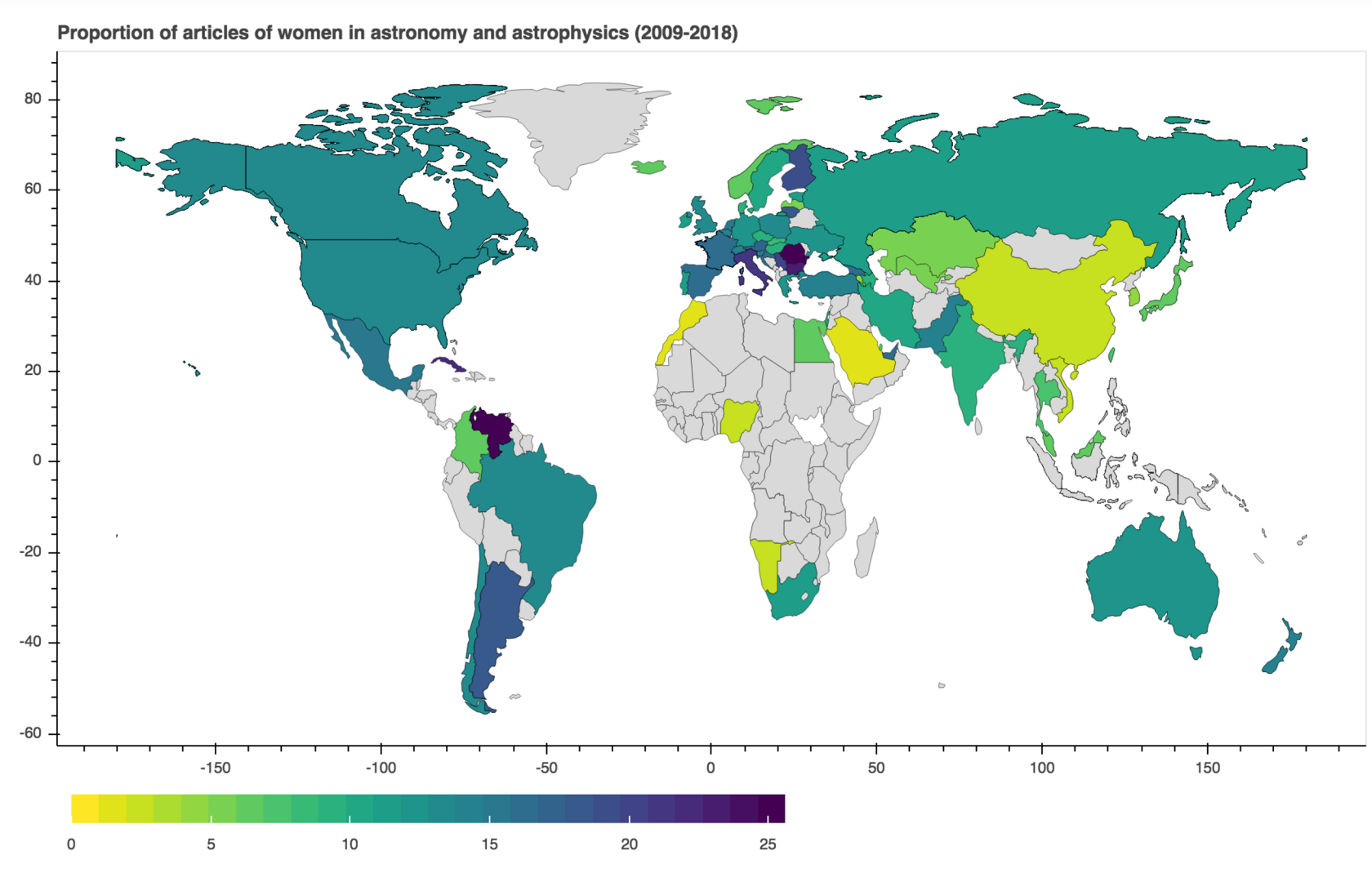

Productivity gap as a ratio of women's over men's productivity
mathematics
cohorts
1970-1974
1975-1979
1980-1984
1985-1989
1990-1994
2000-2005
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
0.70
2
4
6
8
10
years after career start

(Fractional) authorships in renowned journals


Journal of the American Mathematical Society
Inventiones Mathematicae
Bulletin De La Société Mathématique De France
Journal of Differential Geometry
Proceedings of the London Mathematical Society. Third Series
Probability Theory and Related Fields
SIAM Journal on Mathematical Analysis
Numerische Mathematik
Journal of the European Mathematical Society
Archive for Rational Mechanics and Analysis
20%
10%
0%
1970
1980
1990
2000
2010

Regional distributions


Normalized proportion of countries from articles in astronomy and astrophysics (2009-2018)
80
60
40
20
0
-20
-40
-60
-150
-100
-50
0
50
100
150
0
1
2
3
4
5
6


Proportion of articles of women in astronomy and astrophysics (2009-2018)
80
60
40
20
0
-20
-40
-60
-150
-100
-50
0
50
100
150
0
5
10
15
20
25

Reflections on methodology

- gender inference
- algorithmic data processing (geographic information, author profiles, …)
- selection bias
- interaction with the field(s) & recognition of regional differences
- data incompleteness (e.g. author-level affiliations for maths)

Summary

- increasing proportions of women entering science with each passing year
- “stop-publishing” rates, which used to be higher for women, are converging on similar values for both genders
- “productivity gap” getting narrower, although recent cohorts show signs of stagnation. Numbers partially skewed due to the fact that those who publish extremely many papers are typically men
- in various renowned journals women are under-represented; survey answers do not hint at submissions as primary reason → begs for more transparency of the submission / reviewing process
- in Astronomy and Mathematics, highest relative proportions of women are in Europe, especially east and south-east; in almost all African and many Asian countries, women in Astronomy and Mathematics almost not represented

Outlook

- add / improve visualizations in the website
- collaboration practices in terms of gender and region
- access to renowned journals by country (and gender)
- migration analysis