A Balanced Portfolio?

The relationship between gender and funding for U.S. Academic Professors

Dakota Murray, Vincent Larivière, Cassidy R. Sugimoto
dakmurra@iu.edu; vinvent.lariviere@umontreal.ca; sugimoto@indiana.edu

Presented by: Dakota Murray
Universalism

“The acceptance or rejection of claims entering the lists of science is not to depend on the personal or social attributes of their protagonist; his race, nationality, religion, class, and personal qualities are as such irrelevant.”

Research Question

What is the relationship between gender and funding among U.S. professors?
“…in all, among grant applicants men have statistically significant greater odds of receiving grants than women by about 7%.”

- Bornmann & Daniel (2007). *Gender differences in grant peer review: A meta-analysis*
Fair Grant Review?

“...the weight of evidence overwhelmingly points to a gender-fair grant review process...”

Conflicted Literature

The grant review process is fair (probably)
Conflicted Literature

The grant review process is fair
(probably)

But women still hold less funding
“...on average, women at universities in Québec receive less funding for research than men...”

- Larivière et al. (2011). Sex differences in research funding, productivity and impact: an analysis of Québec university professors
Studies often limited
Limited in Scale

Size and Geography

Discipline or Source
Limited to Peer Review
Our Three Goals
Goal #1

Examine a broad population of professors in the United States
Goal #2

Examine a broad population of professors in the United States

Uncover the relationships between gender and funding
Goal #3

Examine a broad population of professors in the United States

Uncover the relationships between gender and funding

Introduce a new dataset
Academic Analytics
Academic Analytics

Collected Manually or with institutional co-operation

Tenure/TT faculty expected to produce research of of AA release

2014 Release
An Administrator’s View

Names are not actual, for representation only
Benchmarking

Department Radar – All Variables

Books: 2005-2014

Awards: No limit

Grants: 2010-2014

Articles: 2011-2014

Citations: 2010-2014
397 Institutions Represented

Institution Name

- University of Michigan
- Pennsylvania State University
- Ohio State University, The
- University of Minnesota, T.
- University of Wisconsin - ...
- University of Washington
- Texas A&M University
- Purdue University
- Michigan State University
- University of Illinois at Ur...
- University of California, L...
- University of Southern Cal...
- University of North Caroli...
- University of Florida
- Johns Hopkins University
- New York University
- University of Pennsylvania
- University of Georgia
- Arizona State University
- University of Pittsburgh
- University of California, B...
- Harvard University
- Cornell University
- University of Arizona, The

Count of Individuals
Faculty Resistance

“...taken on their own terms, the measures of books, articles, awards, grants, and citations within the Academic Analytics database frequently undercount, overcount, or otherwise misrepresent the achievements of individual scholars”

- Graduate Faculty Resolution from Rutgers University
Validation Study

Comparable coverage to other sources

Useful for most disciplines

Conference proceedings unreliable
What does this data look like?
Example: Cassidy Sugimoto

<table>
<thead>
<tr>
<th>Name</th>
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<th>Gender</th>
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- Each affiliation they hold
- Departments classified as belonging to multiple disciplines
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- Small sample Confirmed by visual inspection
- Or inferred by genderize.io using first name
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- Year that the researcher obtained their PhD
- “Scientific Age”
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- Articles published in last 4 years
- #Citations accumulated over last 5 years
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- Grants where they appear as PI over last 5 years
- Annualized USD amount of grant
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- Nobel prizes to individual society awards
- Somewhat vaguely defined/collected
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- Books/Book Chapters Published over last 10 years
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New Classification Scheme

AA’s Detailed Classification
- Accounting
- Linguistics
- Molecular Pharmacology
- Plant Sciences
- Computer Engineering
New Classification Scheme

AA’s Detailed Classification
- Accounting
- Linguistics
- Molecular Pharmacology
- Plant Sciences
- Computer Engineering

Our High-Level Classification
- Social Sciences
- Humanities
- Medical Sciences
- Natural Sciences
- Engineering
What can this data show?
143,001 With Gender

- M: 68.89%
- F: 31.11%
Disciplinary Overview

- Social Sciences: 25.35%
- Natural Sciences: 24.41%
- Medical sciences: 24.09%
- Humanities: 13.58%
- Engineering: 12.57%
Understudied Disciplines

- Social Sciences: 25.35%
- Engineering: 12.57%
- Humanities: 13.58%
- Natural Sciences: 24.41%
- Medical sciences: 24.09%
Research Funding
Proportion of population holding at least one grant
Proportion of population holding at least one grant

- Relatively equal in the humanities, natural, and social sciences
Proportion of population holding at least one grant

- Relatively equal in the humanities, natural, and social sciences

- Women in the medical sciences are less likely to hold a grant
Proportion of population holding at least one grant

- Relatively equal in the humanities, natural, and social sciences
- Women in the medical sciences are less likely to hold a grant
- Women in engineering more likely to hold a grant
Funding (USD) of those holding a grant
Funding (USD) of those holding a grant

- Women engineers get less average funding
Funding (USD) of those holding a grant

- Women engineers get less average funding
- The pattern is repeated for medical and natural sciences
Funding (USD) of those holding a grant

- Women engineers get less average funding
- The pattern is repeated for medical and natural sciences
- Women receive slightly more funding in social sciences and humanities
Effects of Age
Scientific Age of Individuals

Bar chart showing the percentage of individuals by scientific age and gender for various time periods:
- <= 1975: [Data]
- 1975-1985: [Data]
- 1985-1995: [Data]
- 1995-2005: [Data]
- 2005-2014: [Data]
Scientific Age of Individuals
Proportion holding grant by (Scientific) Age
Proportion holding grant by (Scientific) Age

Younger women at a disadvantage
Proportion holding grant by (Scientific) Age

Younger women at a disadvantage

Selection Bias
Potential Selection Bias
Avg. Grant dollars (USD) for those holding at least 1 grant

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Avg. Grant dollars (USD) for those holding at least 1 grant

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Avg. Grant dollars

- 0K
- 500K

0K

500K

Avg. Grantdollars

Avg. Grantdollars

Avg. Grantdollars

Avg. Grantdollars

Avg. Grantdollars

Avg. Grantdollars
Avg. Grant dollars (USD) for those holding at least 1 grant

<table>
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<th>YearBins</th>
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<th>Humanities</th>
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Summary of Findings
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Women are underrepresented in most disciplines
Summary of Findings

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Strong disciplinary differences in the distribution of funding
Summary of Findings

Women are underrepresented in most disciplines

Strong disciplinary differences in the distribution of funding

Prominent disparity in funding for scientifically young women

Medical sciences
Engineering
Interpretations
“Despite this overwhelming counterevidence, numerous organizations continue to suggest grant review is discriminatory (47), thus diverting attention from legitimate factors limiting women's participation in math-based careers.”

- Ceci & Williams (2011). *Understanding current causes of women’s underrepresentation in science.*
Women less “Successful”

“Our findings suggest that after the birth a child, productivity growth declines, but more so for women. Thus, children account for part of the gender gap in rates of productivity over time.”

Implicit Bias

“...the majority of these studies reveal a consistent and continuing range of biases at each stage of the hiring, tenuring, and promotion process as well as in peer review and teaching evaluation.”

Danica Savonick & Cathy N. Davidson, *Gender Bias in Academe: An Annotated Bibliography of Important Recent Studies.*

http://tiny.cc/academicgenderbias
Gendered Division of Scientific Labor

“Women were significantly more likely to be associated with performing experiments, and men were more likely to be associated with all other authorship roles. This holds true controlling for academic age...”

Feedback Loop

Win a Grant

Conduct Research

Buy Equipment

Hire Students

Less Teaching

Write papers

Win a Grant

Conduct Research

Buy Equipment

Hire Students

Less Teaching
Feedback Loop

- Less Teaching
- Buy Equipment
- Hire Students
- Conduct Research
- Win a Grant
- Write papers
Conclusion

• Introduced a new dataset
Conclusion

- Introduced a new dataset
- Relationships between gender and funding
Conclusion

- Introduced a new dataset
- Relationships between gender and funding
- Identified areas of disparity
Introduction of a new dataset
Relationships between gender and funding
Identified areas of disparity
Potential interpretations
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Questions, comments, or suggestions?

Dakota Murray, Vincent Larivièreme, Cassidy R. Sugimoto
dakmurra@iu.edu; vinvent.lariviere@umontreal.ca;
sugimoto@indiana.edu
References


