Gender and retention patterns among U.S. faculty

Katie Spoon, Nick LaBerge, K. Hunter Wapman, Sam Zhang, Allie Morgan, Mirta Galesic, Lauren Rivera, Joanna Mendy, Maria Martinez, Bailey K. Fosdick, Dan Larremore, Aaron Clauset

University of Colorado Boulder
Women are still underrepresented in academia.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Gender Parity</th>
<th>Women (%)</th>
<th>Men (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant professors</td>
<td>50% 50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Associate professors</td>
<td>45% 55%</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>Full professors</td>
<td>32.5% 67.5%</td>
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</tbody>
</table>
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Importance:
- Better science & different science (Page, 2008; Kozlowski, 2022)
- Scientific talent is not gendered

Assistant professors
- 50%
- Gender parity

Associate professors
- 45%
- 55%

Full professors
- 32.5%
- 67.5%


Women are still underrepresented in academia.

**Importance:**
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Gender parity in hiring will not lead to gender parity in representation if women disproportionately leave the system (the “leaky pipeline”) (Pell, 1996).

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Lots of interest, but this is really hard to study!
Literature is deep

Google Scholar

retention of women in academia

Articles

About 163,000 results (0.09 sec)
Literature is deep, but narrow

Focused mostly on:

- Assistant profs
- STEM
- High-prestige schools
Literature is deep, but narrow and contradictory
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No gendered differences

CULTURE, CLIMATE, AND CONTRIBUTION: Career Satisfaction Among Female Faculty
Louise August* ** and Jean Waltman*


Women in Academic Science: A Changing Landscape
Stephanie J Cios *, Dionna K Griffee *, Shannon Kato *, Wendy M Williams *

Psych. Science in the Public Interest (2014)
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Yes gendered differences

Trends in the Representation of Women Among US Geoscience Faculty From 1999 to 2020: The Long Road Toward Gender Parity
Meghana Ramachandran, Jin Lin, Lynne M. Fresse, Mary A. Frohlich, Julia M. Wilcox, Margaret L. Duffy
American Geophysical Union (2021)

Competing Risks Analysis of Promotion and Attrition in Academic Medicine: A National Study of U.S. Medical School Graduates
Demet B. Jaffe 1, Yan-Xin, Dorothy A. Andrade
Academic Medicine (2019)

Gender Differences in Academic Medicine: Retention, Rank, and Leadership Comparisons From the National Faculty Survey
Phyllis L. Carr 1, Anita Baj, Samantha E. Kaplan, Norma Terrin, Janice Breeze, Karen McInerny
Academic Medicine (2018)
Literature is deep, but narrow and contradictory

No gendered differences

- CULTURE, CLIMATE, AND CONTRIBUTION: Career Satisfaction Among Female Faculty
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  Psych. Science in the Public Interest (2014)

It’s complicated…

- Survival Analysis of Faculty Retention in Science and Engineering by Gender
  Science (2012)

- Retention and promotion of women and underrepresented minority faculty in science and engineering at four large land grant institutions
  PLOS One (2012)

Yes gendered differences

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- CULTURE, CLIMATE, AND CONTRIBUTION: Career Satisfaction Among Female Faculty
  *Louise August** and Jean Waltman*
  *Research in Higher Education (2004)*

- Women in Academic Science: A Changing Landscape
  *Stephen J Coz*, *Dorina K Goldfarb*, *Bridgette Kates*, *Wendy M Williams***
  *Psych. Science in the Public Interest (2014)*

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  *Women in Academic Economics: Have We Made Progress?* (2012)

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Limitations:

- Most studies are done at a **single institution or small group of institutions**
- Most studies are done at a **single point in time**
- Most studies are done on a **specific academic field or small group of fields**
Literature is deep, but narrow and contradictory

Similarly, the reasons women professors leave their jobs are also mixed.

Professional
  • Obtaining funding
  • Admin. support

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- Caring responsibilities
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![Professional](handset)
- Obtaining funding
- Admin. support

![Work-life balance](heart)
- Caring responsibilities
- Long hours

![Workplace climate](building)
- Competition
- Not belonging

Most common
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We need a system-level, comprehensive view of academic retention to resolve the conflicting evidence.
Part 1: Administrative analysis
Do women and men leave at different rates?

Part 2: Survey analysis
Do women and men leave for different reasons?
Part 1: Administrative analysis
Do women and men leave at different rates?

Part 2: Survey analysis
Do women and men leave for different reasons?
Longitudinal Data

- 245,270 U.S. tenure-track & tenured faculty
- 391 U.S. PhD-granting institutions
- 111 academic fields, grouped into 9 high-level domains
- 10 years, 2011-2020

From Academic Analytics Research Center (AARC)

What is an academic’s risk of leaving across their career?

![Graph showing annual attrition risk over career age]

- Women's risk is higher
- Men's risk is higher
- Equal risk

N = 245,270

Average attrition risk
What is an academic’s risk of leaving across their career?

![Graph showing the risk of leaving across academic career stages]

- **Women's risk is higher**
- **Men's risk is higher**
- **Equal risk**

- **Assistant (pre-tenure)**
- **Associate (post-tenure)**
- **Full retirement**

- **N = 245,270**

The graph illustrates the annual attrition risk, $r$, over career age, $t$, (years since PhD). The risk peaks during post-tenure and full retirement stages.
What is an academic’s risk of leaving across their career?

Women are more likely to leave their jobs than men at every career age.
What is an academic’s risk of leaving across their career?

Annual attrition risk, $r$

Career age, $t$ (years since PhD)

N = 245,270

Women

Men

Hired at parity

50% 50% 40% 60%

An additional loss of 1 in every 5 women over a career
What is an academic’s risk of leaving across their career?

We are averaging across people with different training & environments – are any of these factors influencing the gendered pattern we see?
Gendered odds

Adjusting for career age, employer prestige, and PhD training…
Adjusting for career age, employer prestige, and PhD training…

women are still more likely to leave their jobs and less likely to be promoted, than men, at every career stage.
Gendered odds vary across career stage

Gender gaps increase with rank, largest for tenured faculty (esp. Full)

Adjusting for career age, employer prestige, and PhD training…
women are still more likely to leave their jobs and less likely to be promoted, than men, at every career stage.
Gendered odds vary across career stage, domain

When we split by domain there’s even more variation!
Gendered odds vary across career stage, domain

The gendered retention gaps are larger in non-STEM domains than in STEM domains
Gendered odds vary across career stage, domain

There are no STEM domains where women assistant profs are more likely to leave than men.
Gendered odds vary across career stage, **domain**

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<tr>
<td><strong>Academia</strong></td>
<td>239,949</td>
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<tr>
<td>Medicine</td>
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<td>Social Sciences</td>
<td>34,244</td>
</tr>
<tr>
<td>Health</td>
<td>26,393</td>
</tr>
<tr>
<td>Business</td>
<td>16,788</td>
</tr>
<tr>
<td>Education</td>
<td>13,165</td>
</tr>
</tbody>
</table>

In contrast, women full profs in **every** non-STEM domain are more likely to leave than men.
Gendered odds vary across career stage, domain and prestige

Women more likely
Not significant ($\alpha = 0.05$)
Men more likely

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Women, full profs, in non-STEM, at low-prestige are at highest risk

Predicted probability of leaving, $\rho$

Avg prob

Highest →

Odds$_w$/Odds$_m$
Gendered odds vary across career stage, domain and prestige

All of this variability helps explain the “contradictory” results in the literature! **Most studies are consistent, given their samples.**
Gendered odds vary across career stage, domain and prestige.

These rates tell an important part of the story, but not the whole story. Example: early-career STEM faculty!
Part 1: Administrative analysis
Do women and men leave at different rates?

Part 2: Survey analysis
Do women and men leave for different reasons?
Survey Data

- 10,050 responses from current + former U.S. faculty, sampled from Part 1 dataset
- 325 U.S. institutions
- 25 academic fields
- Fall 2021

Which forces (push or pull) and what reasons, led or would lead faculty to leave their jobs?
1. Women and men leave in response to different forces

Both STEM & non-STEM women were more likely to feel pushed & less likely to feel pulled, than men, at every career age.
1. Women and men leave in response to different forces

Gender was the **strongest predictor** of feeling pushed/pulled, out of gender, STEM & prestige, controlling for career age.

Very few differences across domains.
1. Women and men leave in response to different forces

What types of pushes?

Gender was the strongest predictor of feeling pushed/pulled, out of gender, STEM & prestige, controlling for career age.

Very few differences across domains.
2. Women and men leave for different reasons

- **Professional**
  - Funding, admin. support, etc.

- **Work-life balance**
  - Kids, hours, etc.

- **Workplace climate**
  - Competition, not belonging, etc.
2. Women and men leave for different reasons

**Professional**
Funding, admin. support, etc.

**Work-life balance**
Kids, hours, etc.

**Workplace climate**
Competition, not belonging, etc.

![Bar chart showing reasons for leaving. The chart compares professional, work-life balance, and workplace climate, with a focus on women and men who left.](chart.png)
2. Women and men leave for different reasons

**Professional**
Funding, admin. support, etc.

**Work-life balance**
Kids, hours, etc.

**Workplace climate**
Competition, not belonging, etc.
2. Women and men leave for different reasons

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Workplace climate
Competition, not belonging, etc.
3. Women and men consider leaving for different reasons

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3. Women and men consider leaving for different reasons

Professional
Funding, admin. support, etc.

Work-life balance
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Workplace climate
Competition, not belonging, etc.

Professional: higher for late-career STEM faculty, especially women in STEM
3. Women and men consider leaving for different reasons

**Professional**
Funding, admin. support, etc.

**Work-life balance**
Kids, hours, etc.

**Workplace climate**
Competition, not belonging, etc.

*Work-life balance*: higher for all early-career faculty (especially women), falls sharply over time
3. Women and men consider leaving for different reasons

**Professional**
Funding, admin. support, etc.

**Work-life balance**
Kids, hours, etc.

**Workplace climate**
Competition, not belonging, etc.

**Climate**: consistently higher for women across an academic career
Implications

Part 1: Administrative analysis
Do women and men leave at different rates?

Part 2: Survey analysis
Do women and men leave for different reasons?
Implications

Part 1: Administrative analysis
Do women and men leave at different rates?
• **Women are more likely to leave & less likely to be promoted than men**
• **BUT women who are tenured, in non-STEM fields, or at lower-prestige institutions are at highest risk**

Part 2: Survey analysis
Do women and men leave for different reasons?
Implications

Part 1: Administrative analysis
Do women and men leave at different rates?

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• **BUT women who are tenured, in non-STEM fields, or at lower-prestige institutions are at highest risk**

Part 2: Survey analysis
Do women and men leave for different reasons?

• **Women are more likely to feel pushed & less likely to feel pulled**
• **Women are more likely to leave & consider leaving due to workplace climate**
• **BUT this doesn’t mean we should ignore work-life balance**
Implications

Part 1: Administrative analysis
Do women and men leave at different rates?
• Women are more likely to leave & less likely to be promoted than men
• BUT women who are tenured, in non-STEM fields, or at lower-prestige institutions are at highest risk

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Do women and men leave for different reasons?
• Women are more likely to feel pushed & less likely to feel pulled
• Women are more likely to leave & consider leaving due to workplace climate
• BUT this doesn’t mean we should ignore work-life balance

Takeaway: Even for subpopulations with no visible gender gap in retention, women still leave for different reasons than men, so we should focus on reasons, not just rates, to improve gender equity

→ let’s ask & listen to historically excluded academics, and address the specific reasons they bring up
A final note on the value of people’s stories

• **Ongoing qualitative follow-up study:** 7000 free-text responses about policy recommendations that would have improved their retention.

• Very preliminary, but overwhelmingly, women & gender-diverse faculty feel systemically devalued in academia → It’s about climate.

• These stories are not “just anecdotes”.

Preprint coming soon!
Thanks!

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Nick LaBerge  Hunter Wapman  Sam Zhang  Allie Morgan  Joanna Mendy  Maria Martinez

Mirta Galesic  Bailey Fosdick  Lauren Rivera  Dan Larremore  Aaron Clauset

& all of our survey respondents for their valuable time

University of Colorado Boulder