

Women in STEM: A Look at Participation & Recognition

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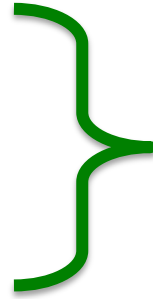
UC San Diego



Women in STEM: Outline

- **Participation:**

- Time
- Different countries
- Socioeconomic levels

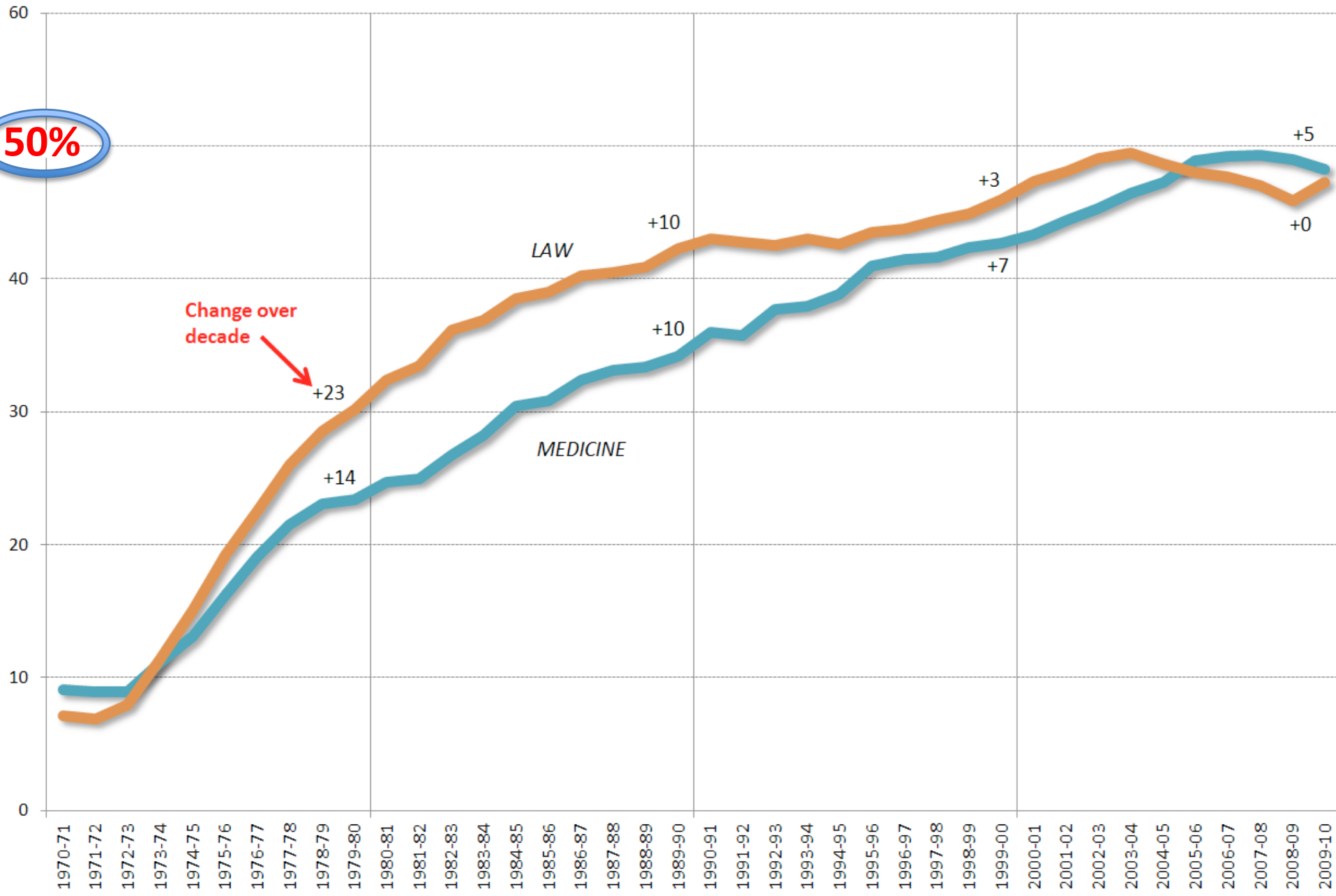


**Three
counter-intuitive
patterns**

- **Recognition:**

- Awards, keynote talks & session chairs
- My research: speaker introductions & more
- Wikipedia

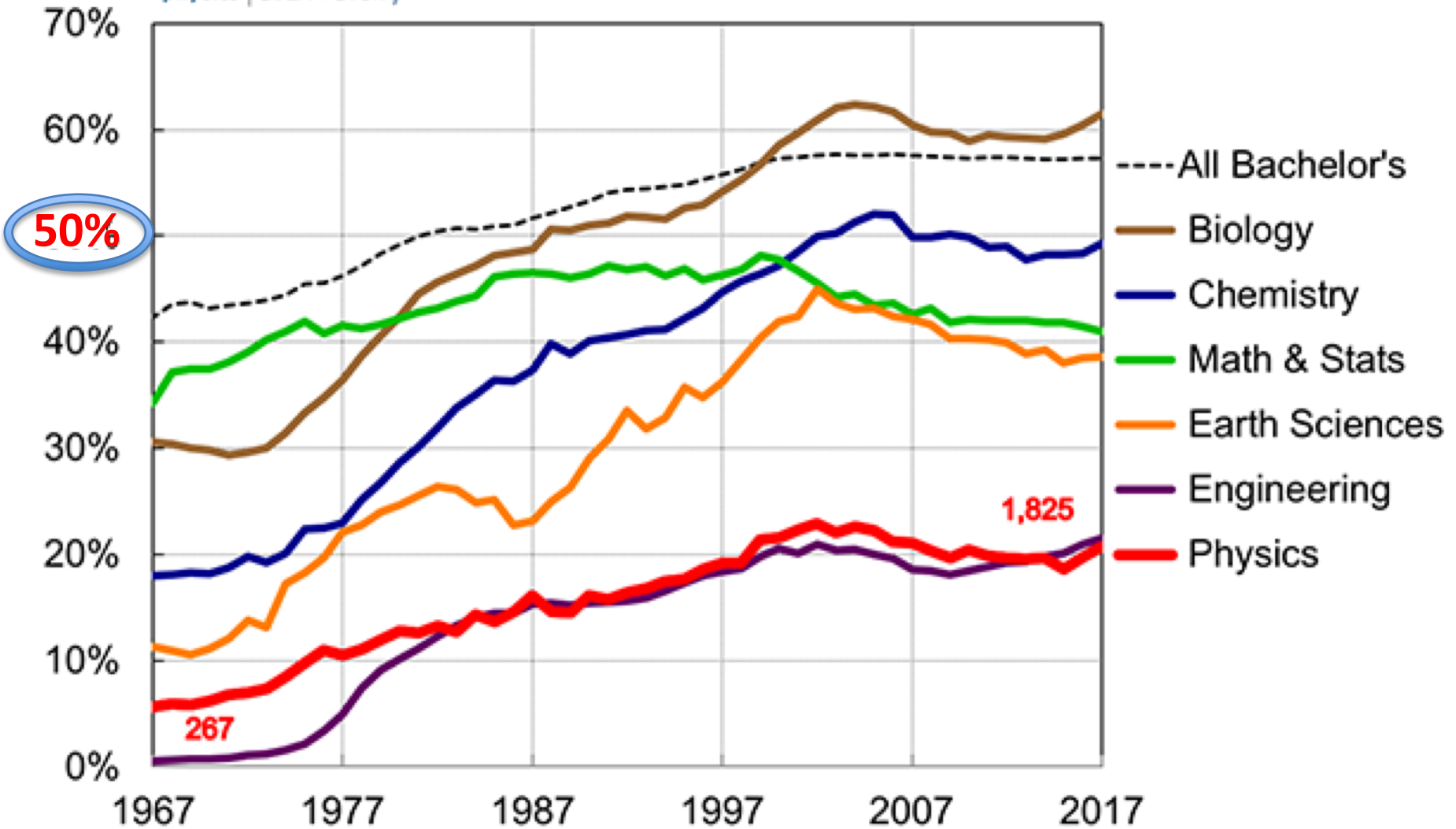
Law & Medical degrees: % women, 1971-2010



STEM B.S. degrees: % women, 1967-2017

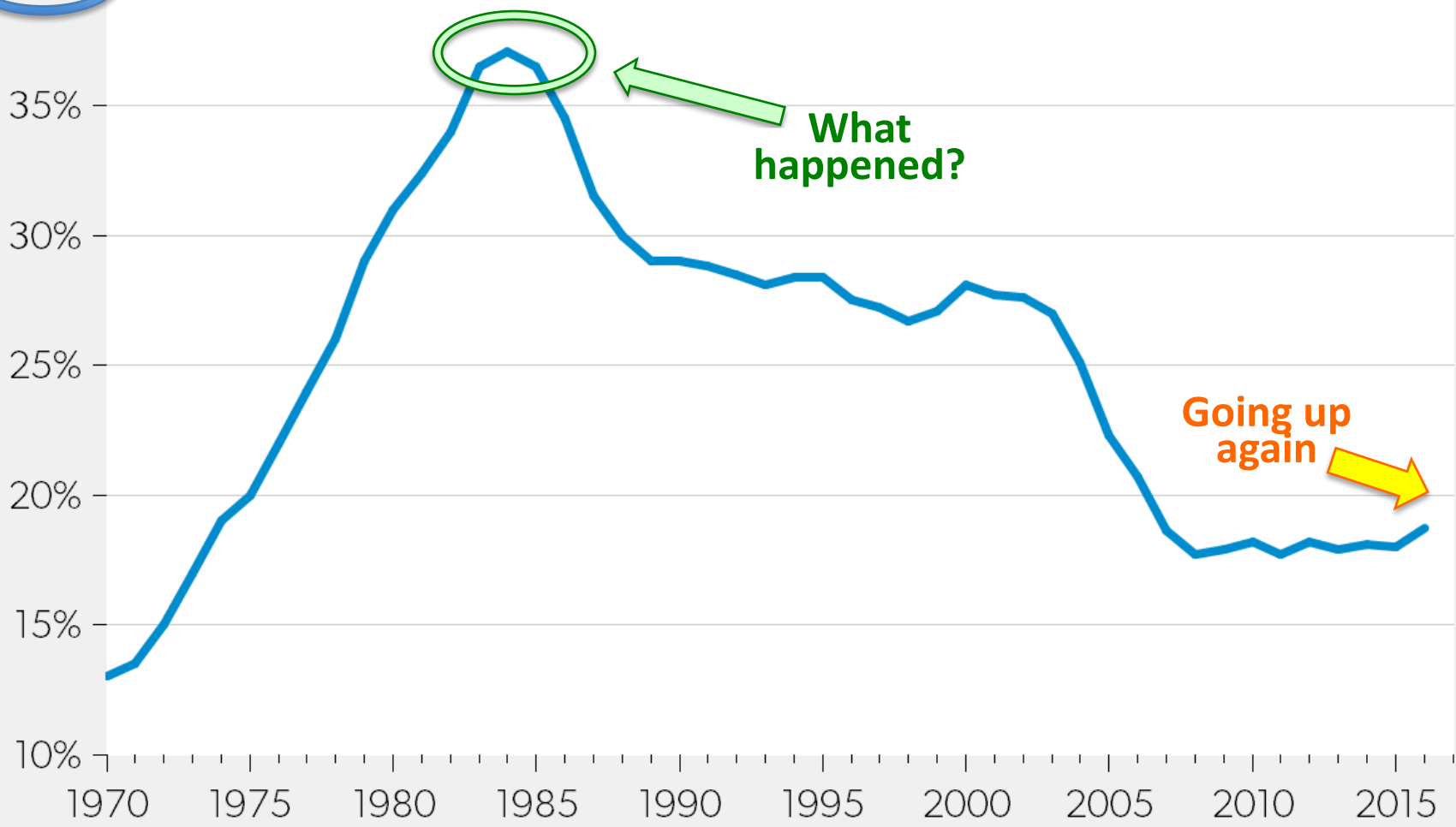


Bachelor's Degrees Earned by Women



Female Share of Bachelor's Degrees in Computer Science, 1970-2016

40%



Source: US Department of Education

What Caused the Drop? Some theories...

1. Personal computers arrived in the home, went to sons not daughters

Boy is better prepared for intro CS course, course moves at faster pace? ... Girl leaves CS

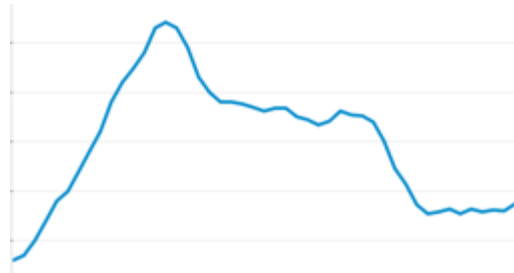
*Clive Thompson, "The Secret History of Women in Coding,"
New York Times Magazine, February 2019*

2. Women react more strongly to economic downturns
Recession in 1982, unemployment = 10.8%

3. Hollywood

Tron	1982
WarGames	1983
Revenge of the Nerds	1984
Weird Science	1985
Back to the Future	1985

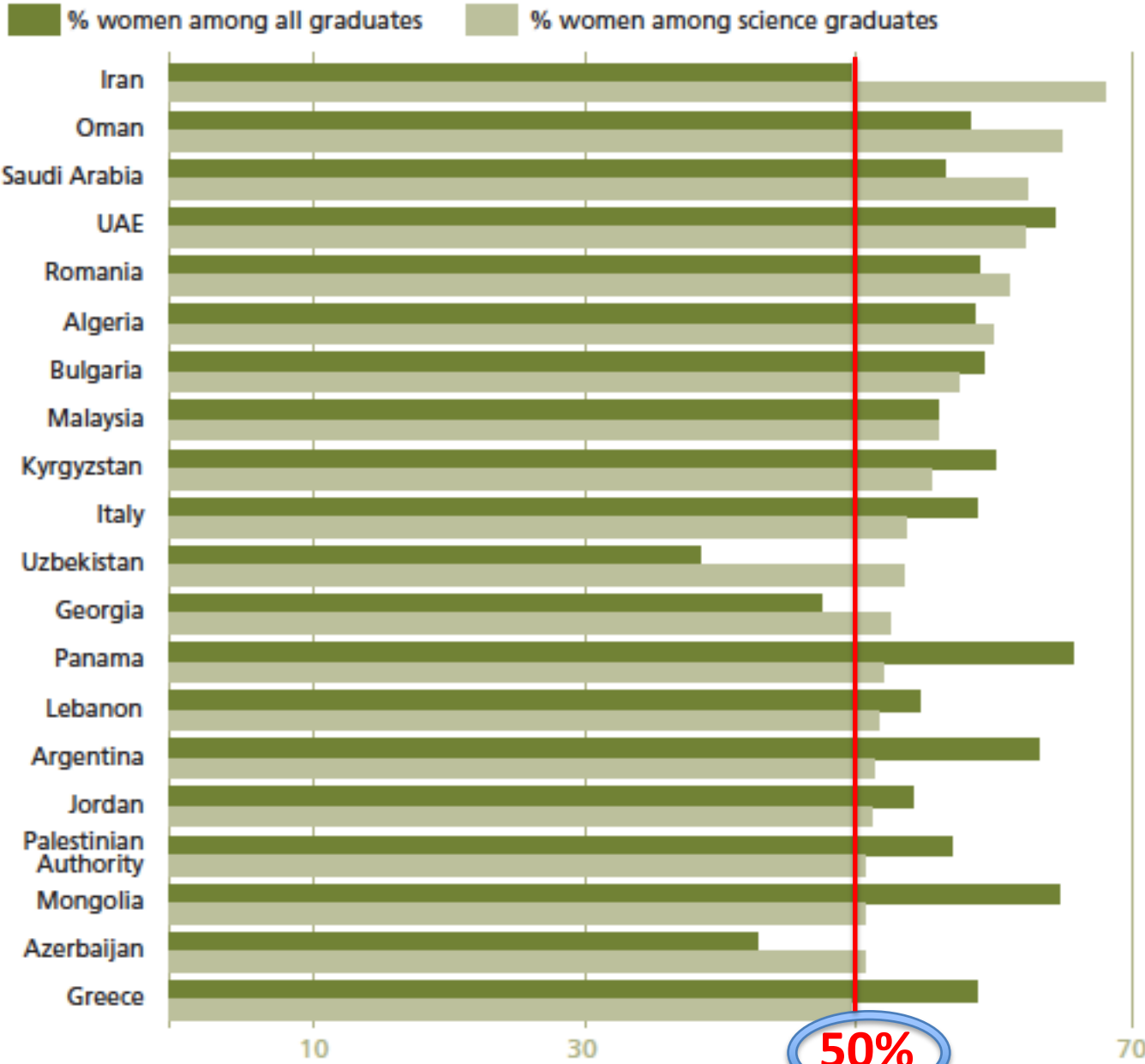
1. CS has a different trend from math, engineering fields, everything else...



Science Education in Other Countries

In more than 20 countries, women earn the majority of STEM bachelor's degrees

Where women earn the majority of science degrees



- Iran
- Oman
- Saudi Arabia
- UAE
- Romania
- Algeria
- Bulgaria
- Malaysia
- Kyrgyzstan
- Italy
- Uzbekistan
- Georgia
- Panama
- Lebanon
- Argentina...

Maria Charles, "What Gender is Science?" Contexts, Vol 10, May 2011

50%

Why do *wealthy* countries have *fewer* women in STEM?

Maria Charles, "What Gender is Science? Contexts, Vol 10, May 2011

1. **Personal economic security & national development more central concerns in developing societies**

- Affluent people can study subjects that don't lead to secure or high-paying jobs.

2. **College viewed as identity construction and self-realization:**

- Expressing your essential male/female selves, rather than career preparation, economic betterment

3. **More high school choices:**

- Art, drama, languages... Girls can opt out of STEM

4. **More college choices created for girls:**

- Home economics, early childhood education, gender studies

5. Consumerism:

- Sell more toys if boys/girls play with different stuff



Why do *wealthy* countries have *fewer* women in STEM?

Maria Charles, "What Gender is Science? Contexts, Vol 10, May 2011

6. "Follow your passion"

- Many 18-year-olds don't have a passion
- *What does society expect me to be passionate about?*
- Becomes a stereotypical gendered choice

7. Self-reinforcing:

- Fewer opportunities to socialize with other girls in STEM clubs

Why do many *conservative* Muslim countries have *more* women in STEM?

1. Single-sex education:

- More girls enjoy STEM when no pressure to appear feminine
- No need to “dumb down”

2. Military, religious, political jobs:

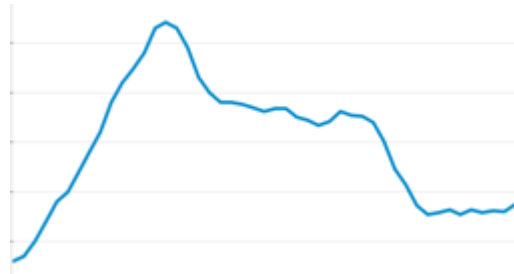
- Only for men in some countries, leaving more STEM jobs for women

3. Appropriate environments for women:

- Courtroom vs. chemistry lab

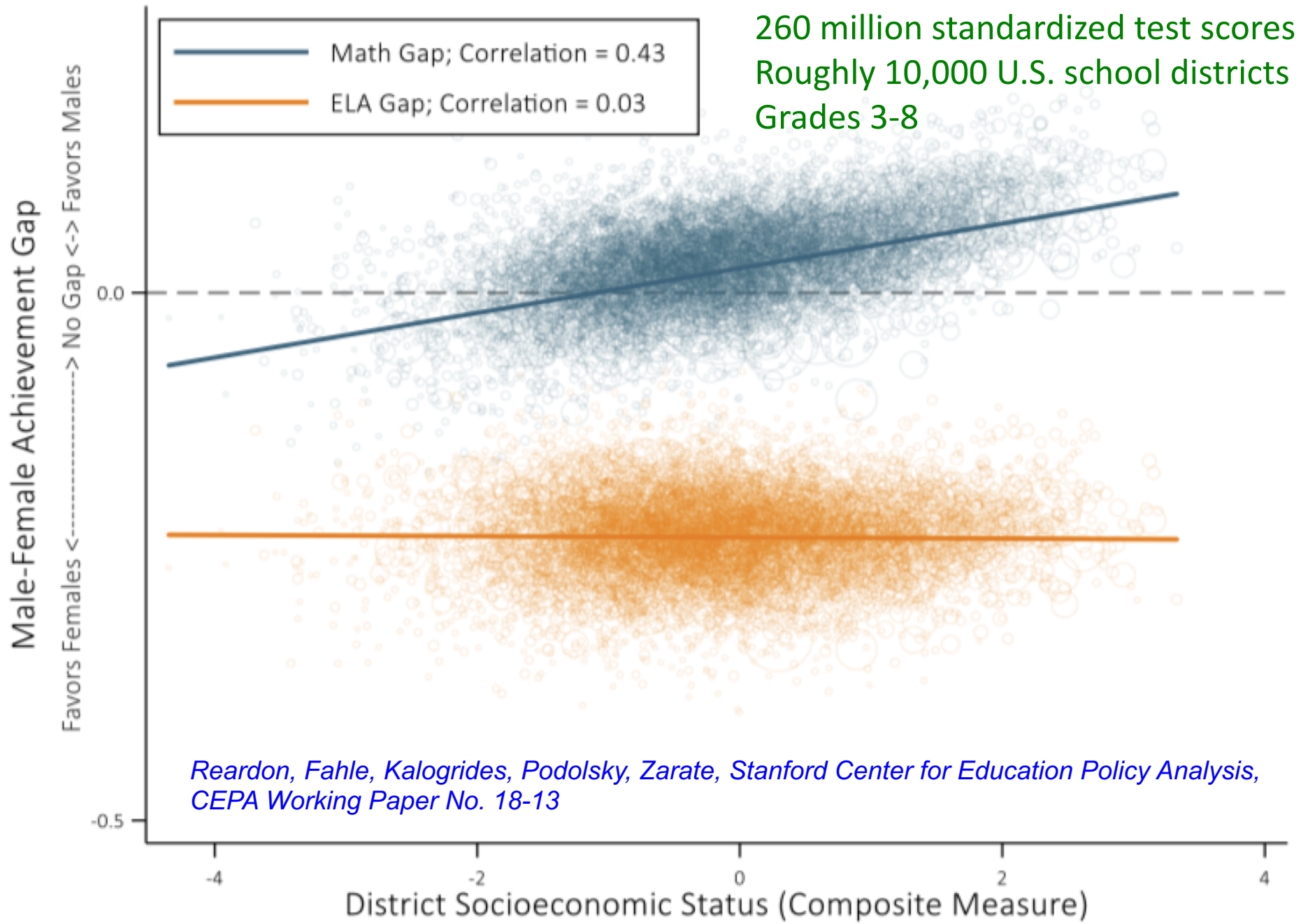
Two counter-intuitive patterns so far...

1. CS has a different trend from math, engineering fields, everything else...



2. Developing countries and, in particular, conservative Muslim countries, have more women in STEM

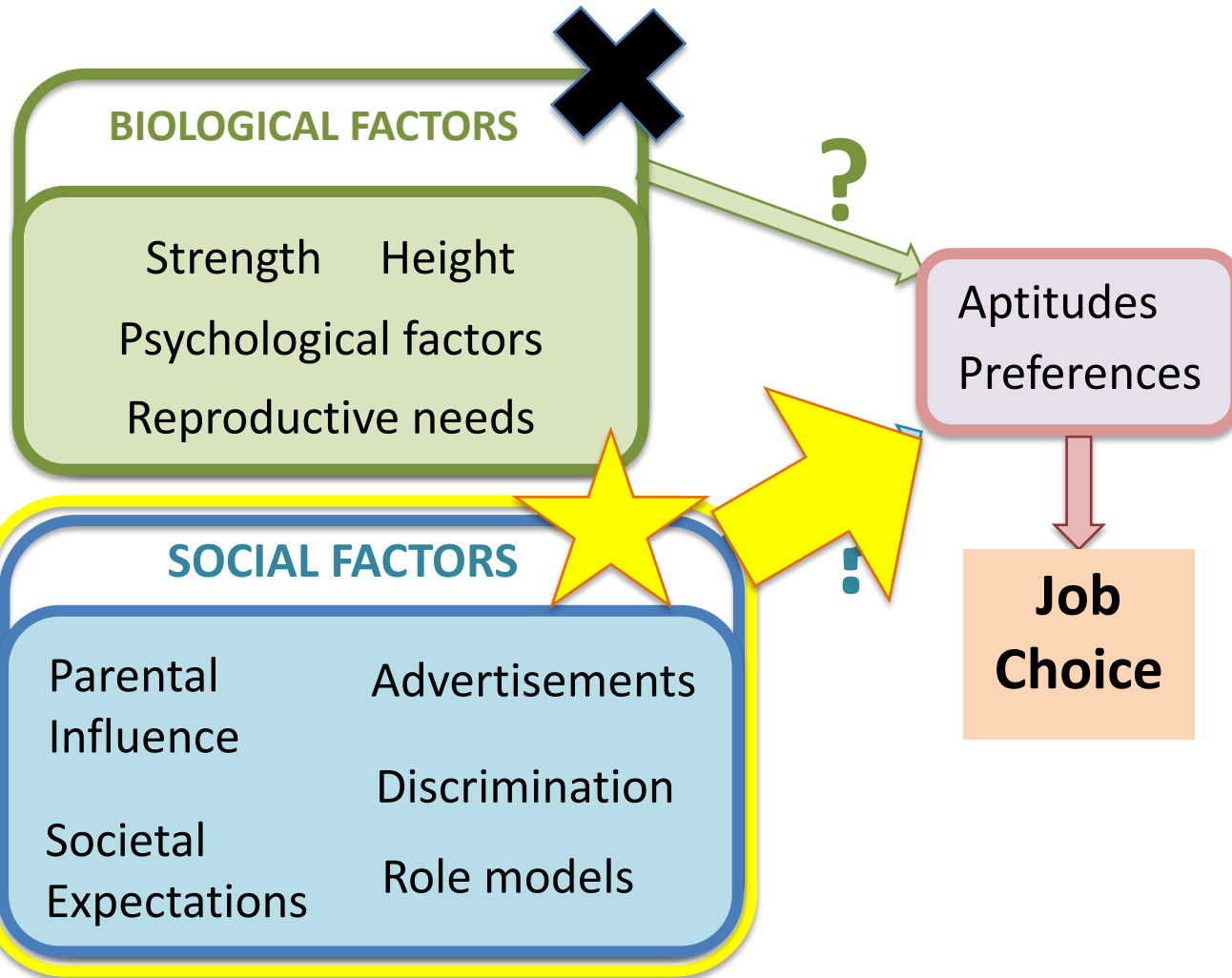
U.S. Math/ELA patterns by socioeconomic level



Why do girls outperform boys for low SES?

1. Parents invest time/money resources in their children in gendered ways
2. Different returns on educational investments
 - *In wealthy families, higher expected return on education for boys*
 - *In lower SES conditions, higher expected return on education for girls*

Why Learn about Causes of Under-representation?



Extraordinarily complex set of causes:

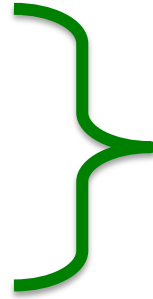
- Social
- Cultural
- Economic
- Religious...

1. Humility
2. No biological defeatism
3. We can do something!

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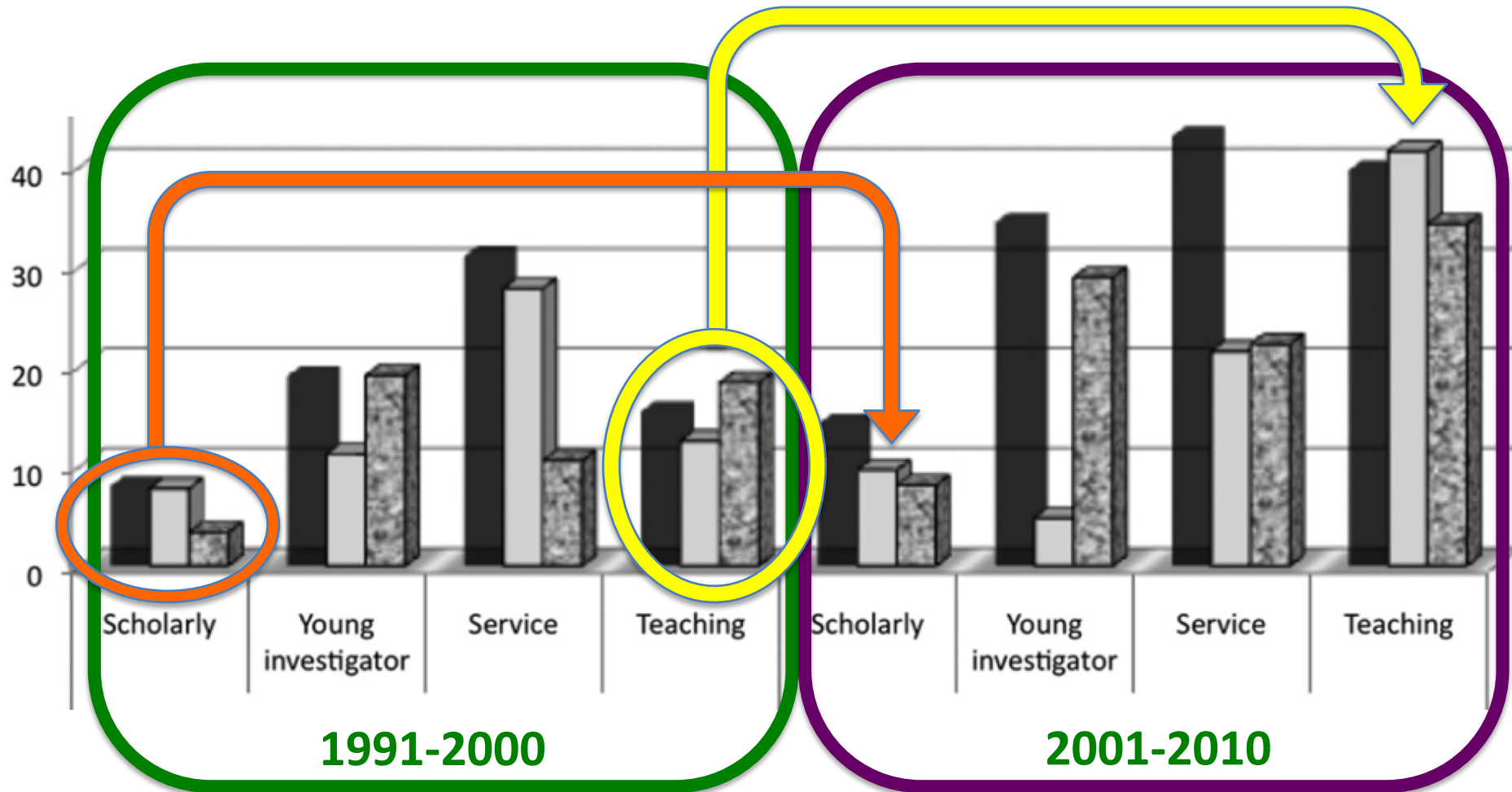


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% female winners by award type & field, 1991-2010 (13 disciplinary societies, Biology/Math/Physics)



AE Lincoln, S Pincus, JB Koster, PS Leboy, "The Matilda Effect in Science: Awards and Prizes in the US, 1990s and 2000s, Social Studies of Science, 2012

Awards 1991-2010 in Physics/Math/Biology

- **Pipeline effect? More awards over time?**
 - Awards to women jumped by 78% from first decade to second
 - Big gains in service and teaching awards
 - Almost no gains in scholarly awards
 - *Ghettoization of awards*

AE Lincoln, S Pincus, JB Koster, PS Leboy, "The Matilda Effect in Science: Awards and Prizes in the US, 1990s and 2000s, Social Studies of Science, 2012

Why so few awards? What to do?

Committee Composition:

- Each woman on awards committee doubles chances of woman winning
- Committees chaired by women 3 times more likely to name a woman as a winner

*AE Lincoln, S Pincus, V Schick,
“Evaluating science or evaluating gender?”
American Physical Society News, 2009*

Passive/active nomination

- Women less likely to self-promote

Amplification of previous biases:

- Being in Natl Academy of Sciences gives an edge for award

*EL Cadwalader & AC Bryant-Friedrich,
“Improving Transparency and Equity in Scholarly
Recognition by Scientific Societies” 2014*