Faculty hiring, social class, and epistemic inequality

Allison Morgan
Work w/ Dimitrios Economou, Nick LaBerge, Samuel Way, Daniel Larremore, Mirta Galesic, Aaron Clauset

EDI Spotlight Series @ University of Aberdeen, May 26th

Academic workforce

https://en.wikipedia.org/wiki/Solvay_Conference

Undergraduate Women in Science and Engineering: Effects of Faculty, Fields, and Institutions Over Time*

Gerhard Sonnert, *Harvard University*
Mary Frank Fox, *Georgia Institute of Technology*
Kristen Adkins, *The University of Texas at Austin*

ETHNIC DIVERSITY AND CREATIVITY IN SMALL GROUPS

POPPY LAURETTA McLEOD
University of Iowa
SHARON ALISA LOBEL
Seattle University
TAYLOR H. COX, JR.
University of Michigan

The Educational Benefits of Diversity: Evidence from Multiple Sectors

by Jeffrey F. Milem
University of Maryland

The Difference

HOW THE POWER OF DIVERSITY CREATES BETTER GROUPS, FIRMS, SCHOOLS, AND SOCIETIES

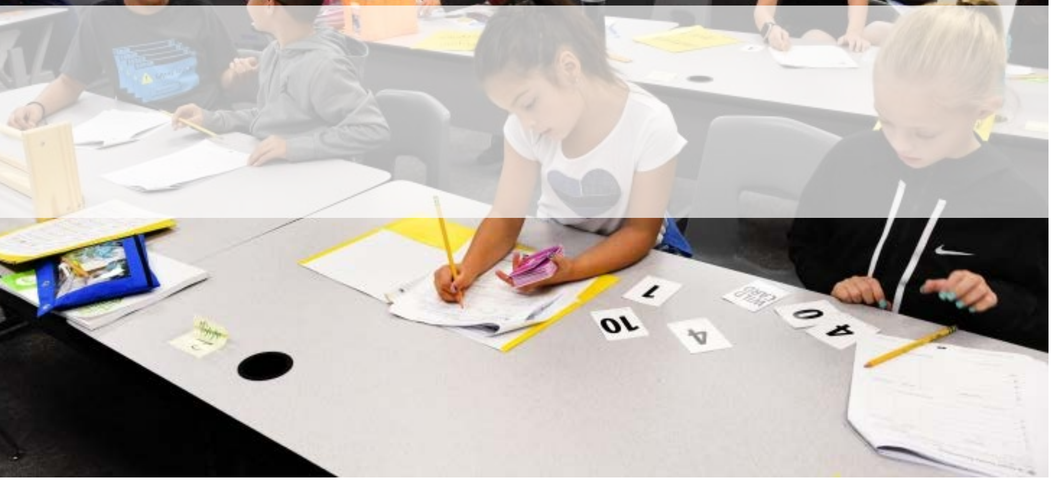
With a new preface by the author

Scott E. Page

https://en.wikipedia.org/wiki/Solvay_Conference

What makes some research more visible?

https://pxhere.com/en/photo/950021

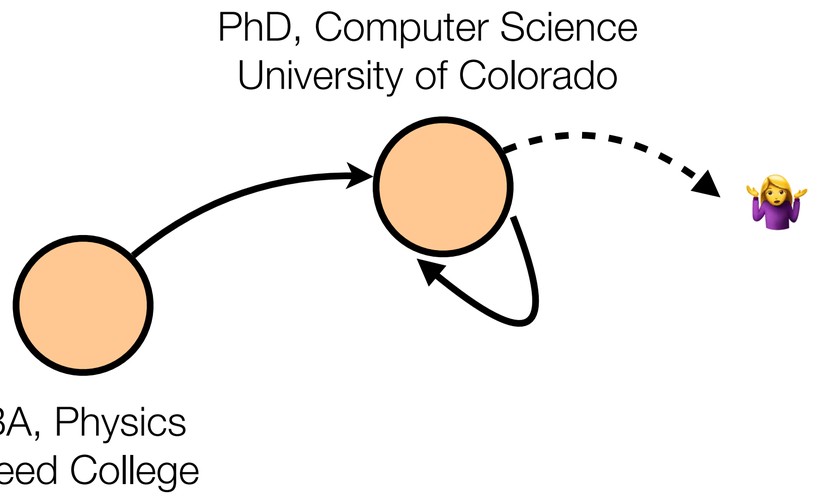


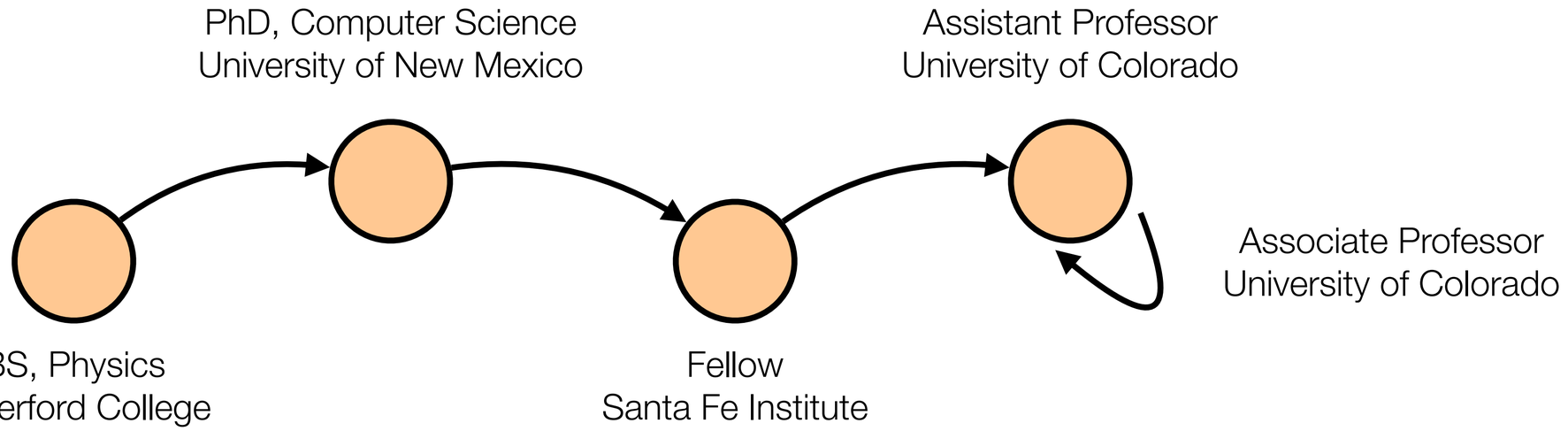
Who becomes tenure-track faculty?

Outline:

1. Career trajectories and university prestige
2. Institutional prestige shapes scholarship
3. Socioeconomic status shapes academic careers
4. Discuss implications

Career trajectories form networks





Career trajectories form networks

BA, Physics
Reed College

PhD, Computer Science
University of Colorado

🤷‍♀️

BS, Physics
Haverford College

PhD, Computer Science
University of New Mexico

Fellow
Santa Fe Institute

Assistant Professor
University of Colorado

Associate Professor
University of Colorado

Faculty hiring networks

Each directed edge $u \rightarrow v$
PhD from $u \rightarrow$ faculty at v

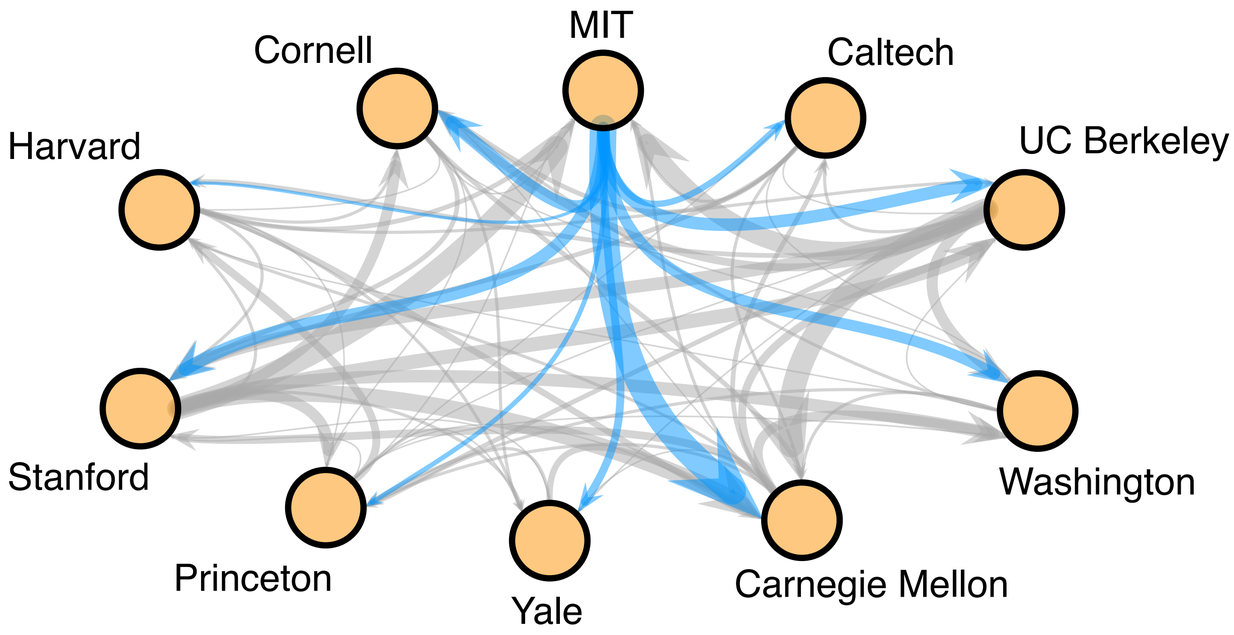
[US academia: big, mobile, self-contained, competitive]

Dramatic inequality in PhD production
[80/20 rule holds]

Common large-scale structure: influential, well-connected core

Small percentage of edges are self-loops
[8% in CS]

Assumption: reveals collective preferences.
Hiring committees want to hire the best candidates



Computer science faculty hiring network;
http://tuvalu.santafe.edu/~aaronc/facultyhiring/

Features of hierarchy

systematic

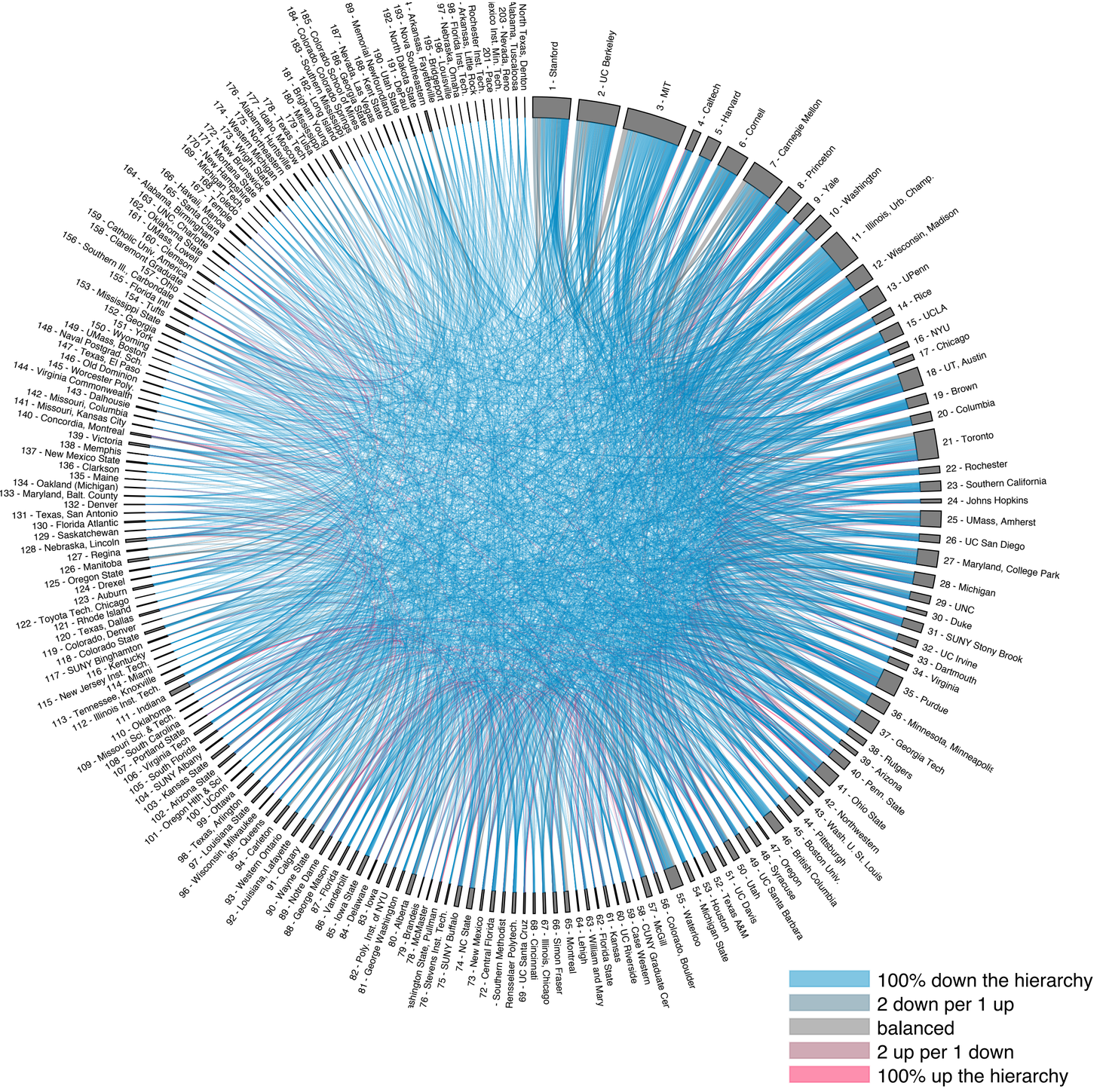
90% of hiring movement
is “down” the hierarchy

steep

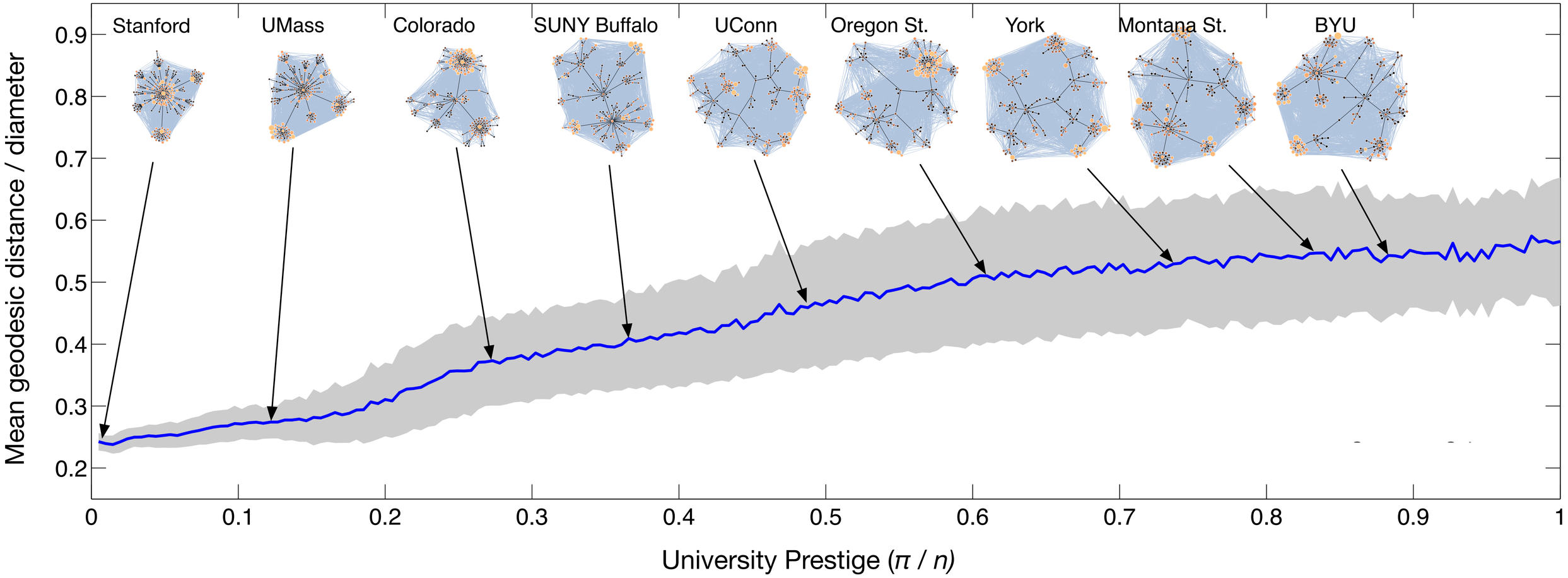
< 7% of faculty have PhD
from lower 75% of universities

biased

median change for women
~3 ranks worse than men



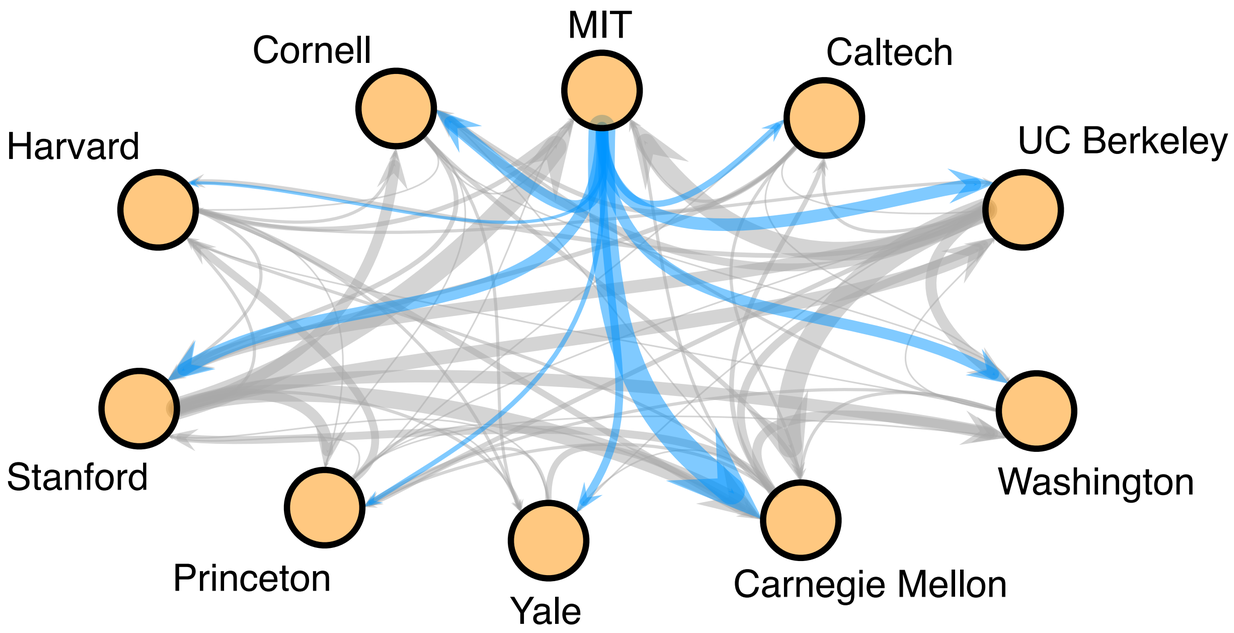
Core-periphery position changes with rank



What are the implications?

Shape of the faculty hiring network

- Large inequalities in placement power
- Faculty flow out of core, into periphery
- Modest fraction stays inside core
- Small fraction flows “upstream”
- Prestige describes influence via individuals placement
- **Next:** How does prestige affect science as a system? How does SES shape researcher prestige?



Outline:

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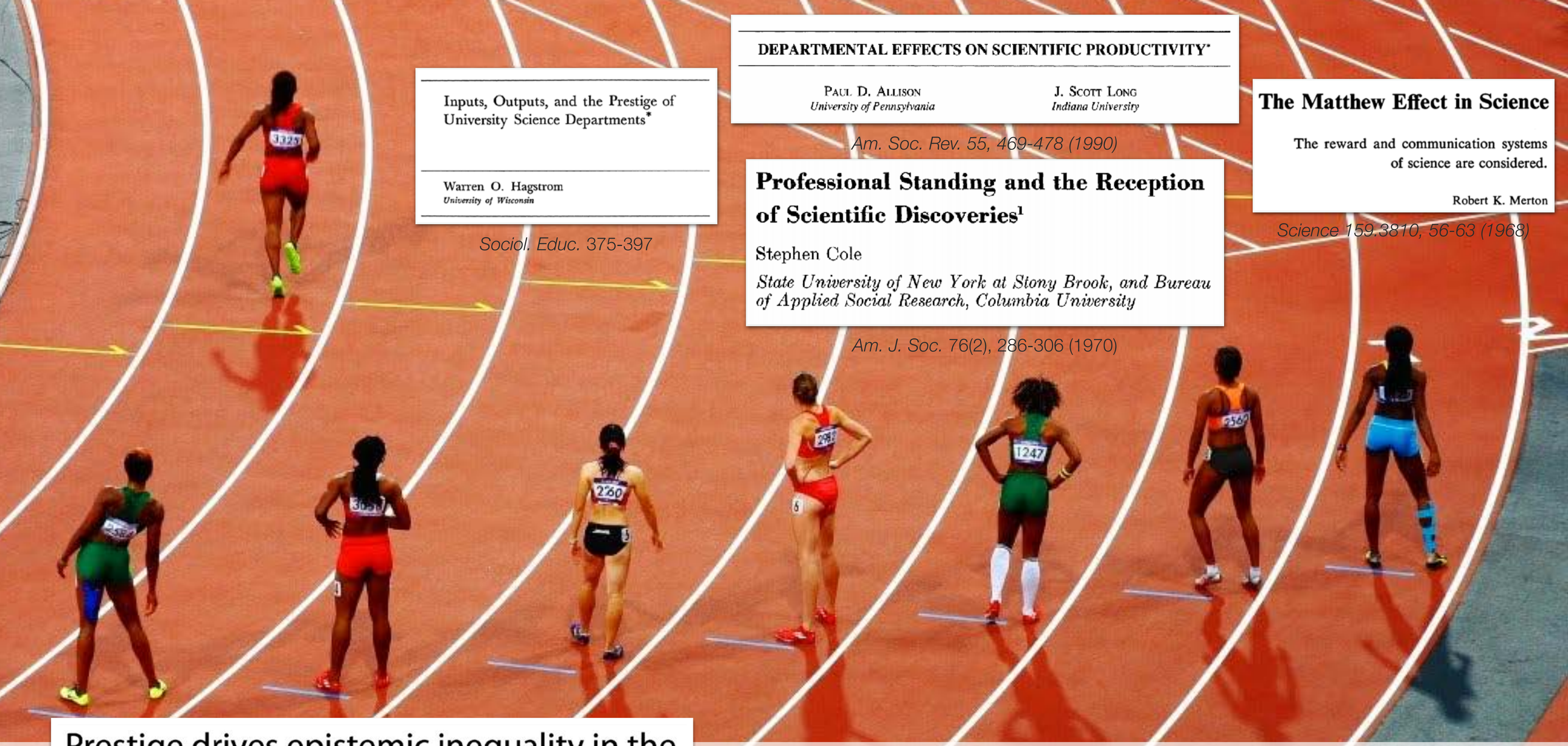
Prestige drives epistemic inequality in the diffusion of scientific ideas

Allison C. Morgan[1*], Dimitrios J. Economou[1], Samuel F. Way[1] and Aaron Clauset[1,2,3]

Visibility of research

https://pxhere.com/en/photo/950021 *(CC 2.0)*



Inputs, Outputs, and the Prestige of University Science Departments*

Warren O. Hagstrom
University of Wisconsin

Sociol. Educ. 375-397

DEPARTMENTAL EFFECTS ON SCIENTIFIC PRODUCTIVITY*

PAUL D. ALLISON
University of Pennsylvania

J. SCOTT LONG
Indiana University

Am. Soc. Rev. 55, 469-478 (1990)

Professional Standing and the Reception of Scientific Discoveries[1]

Stephen Cole

State University of New York at Stony Brook, and Bureau of Applied Social Research, Columbia University

Am. J. Soc. 76(2), 286-306 (1970)

The Matthew Effect in Science

The reward and communication systems of science are considered.

Robert K. Merton

Science 159.3810, 56-63 (1968)

Prestige drives epistemic inequality in the diffusion of scientific ideas

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Visibility of research

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Three explanations

(1) genuine differences in merit

(2) non-meritocratic social processes

(3) non-meritocratic structural factors

https://www.olympic.org/news/1932-the-podium-makes-its-olympic-debut

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Faculty hiring as a mechanism

R1: Are research ideas carried by faculty hiring?

Faculty hiring as a mechanism

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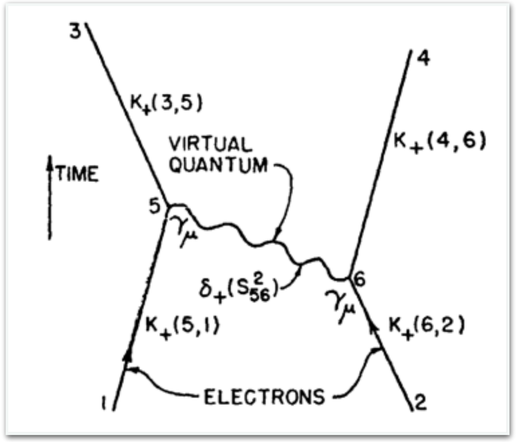
W. Lamb, J. Wheeler, A. Pais, R. Feynman, H. Feshbach, J. Schwinger

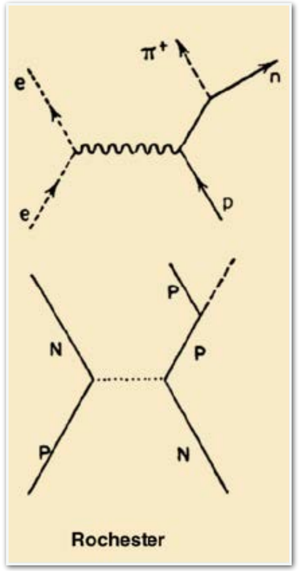
Earliest published Feynman Diagram

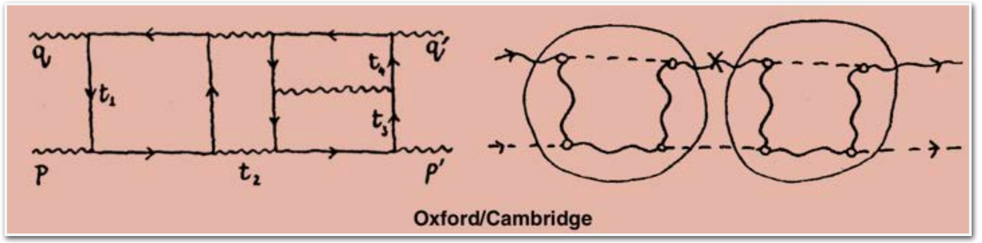


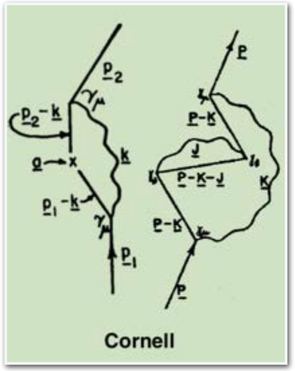
Faculty hiring as a mechanism

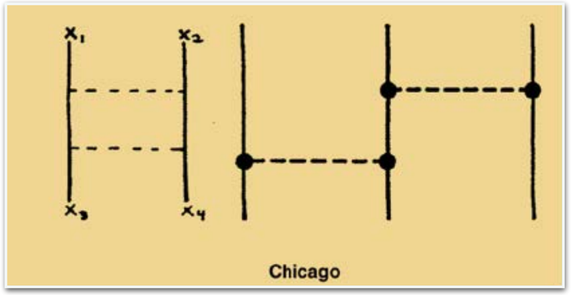
R1: Are research ideas carried by faculty hiring? (Yes.)

W. Lamb, J. Wheeler, A. Pais, R. Feynman, H. Feshbach, J. Schwinger





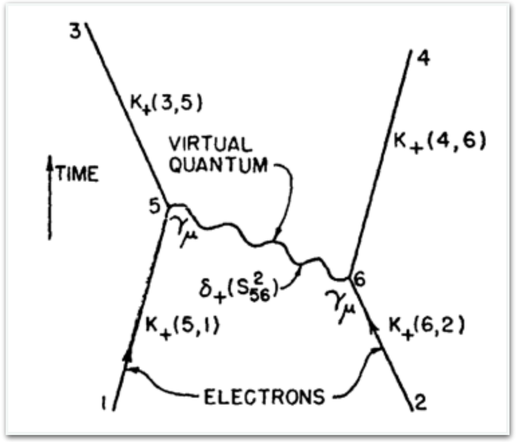




American Scientist 55, 156-165 (2005)

Proc. 11th Conf. on Web and Social Media (2017)

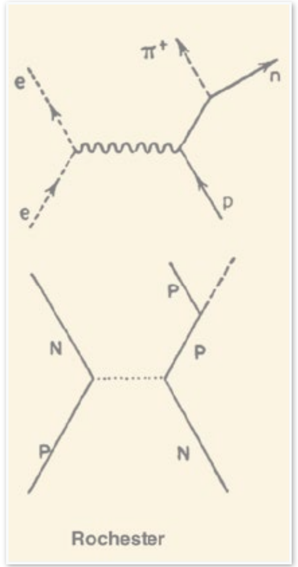
Earliest published Feynman Diagram

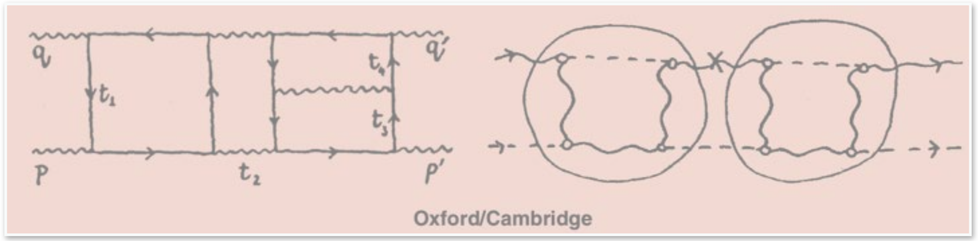


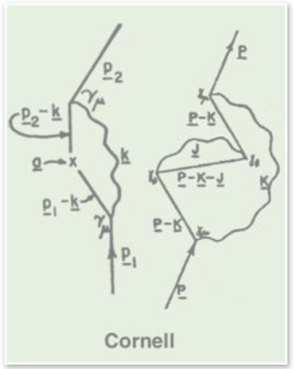
Faculty hiring as a mechanism

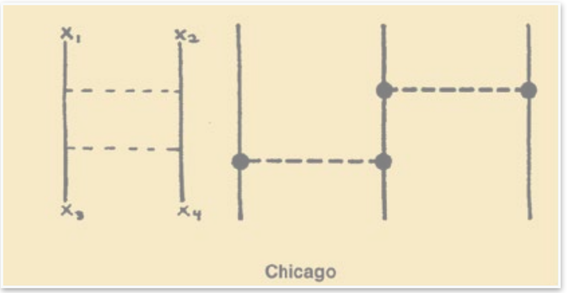
R1: Are research ideas carried by faculty hiring?

R2: Does the structure of the faculty hiring network affect the spread of ideas?









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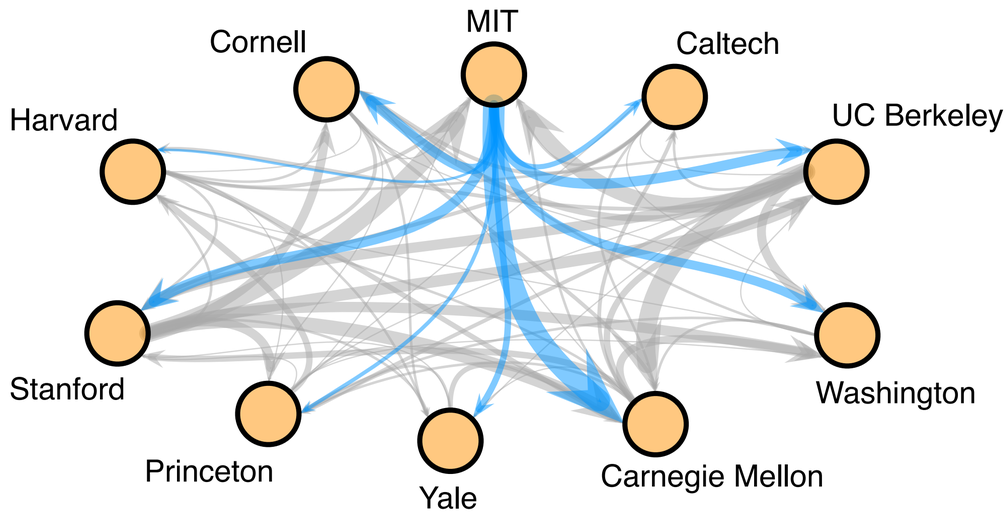
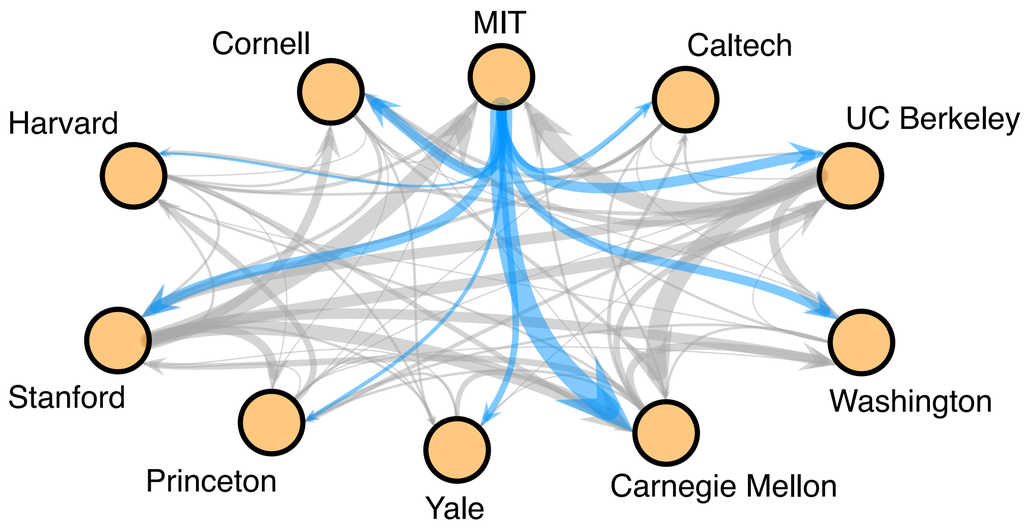


Sci. Adv. 1(1), e1400005, 2015.

Does the structure of the faculty hiring network affect the spread of ideas?

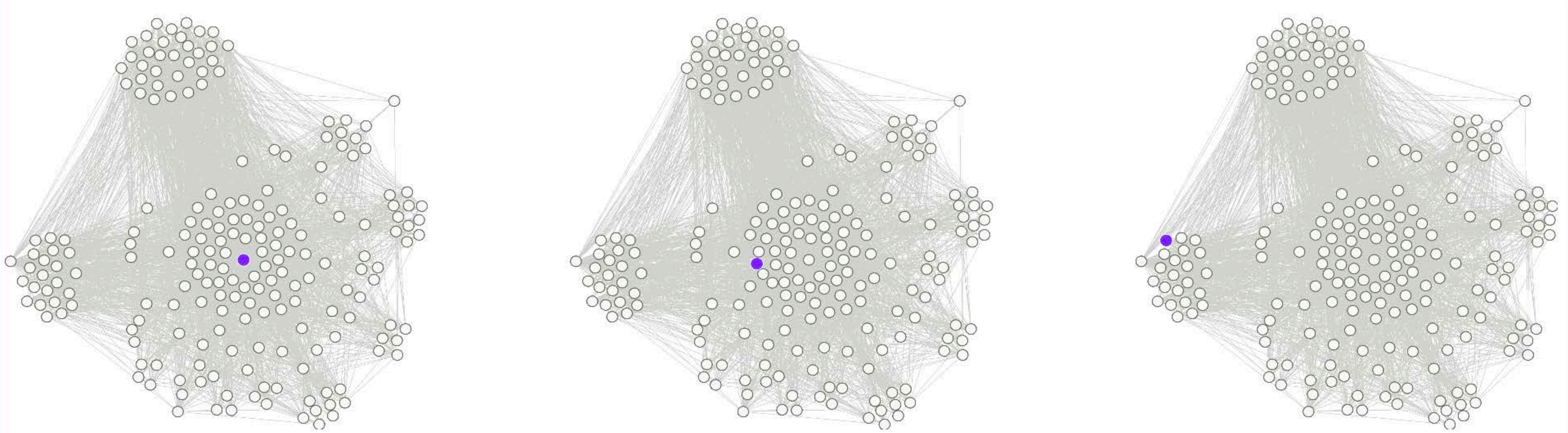


Seed an epidemic at a university with unique prestige π, varying the transmissibility p (quality of an idea)

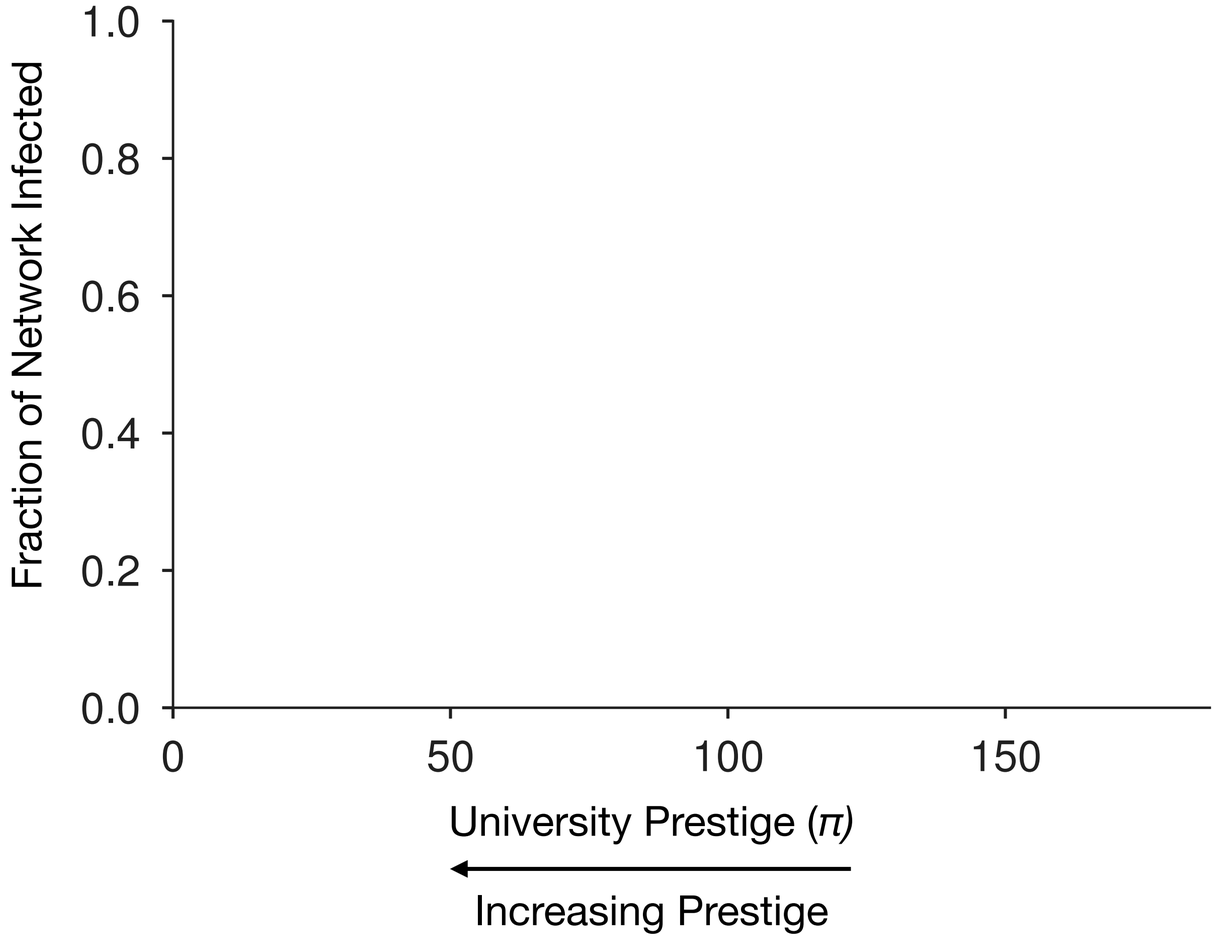
Quality of idea relates to how many nodes will adopt an idea (on average)

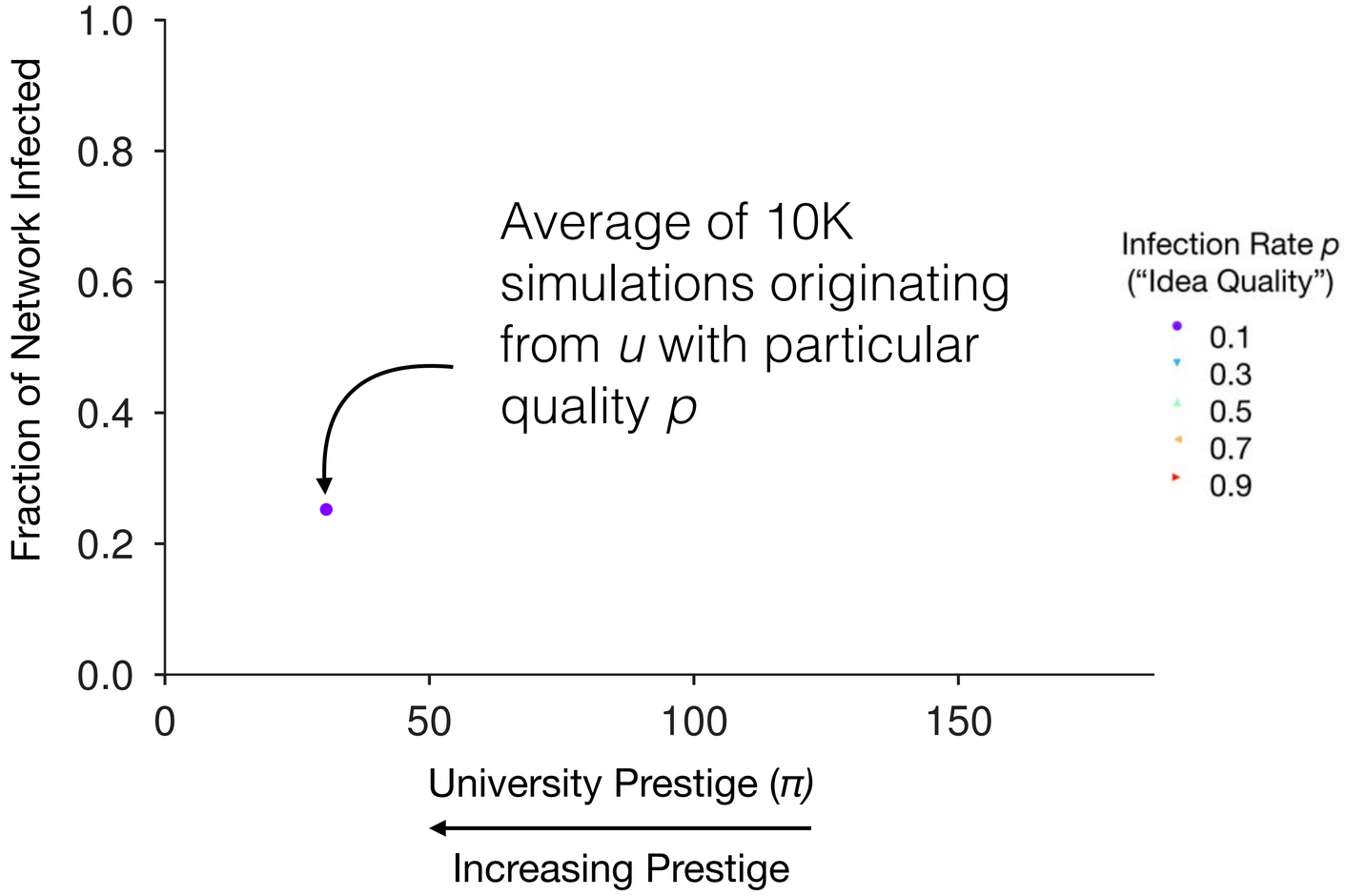
Measure the fraction of universities which adopted the idea

Does the structure of the faculty hiring network affect the spread of ideas?



Core-periphery position changes with prestige


1.0
0.8
0.6
0.4
0.2
0.0
Fraction of Network Infected
0
50
100
150
University Prestige (π)
Increasing Prestige


1.0
0.8
0.6
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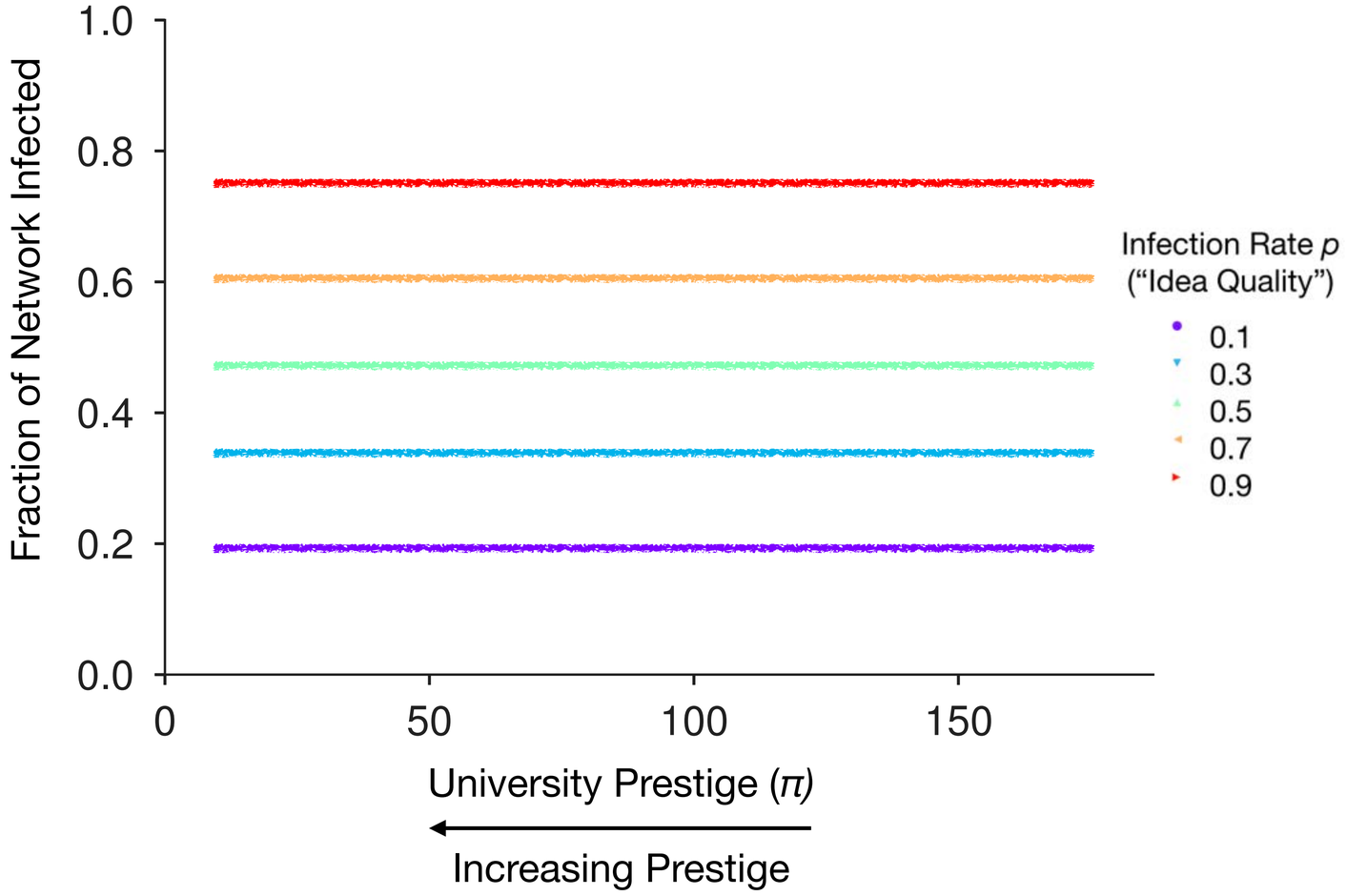
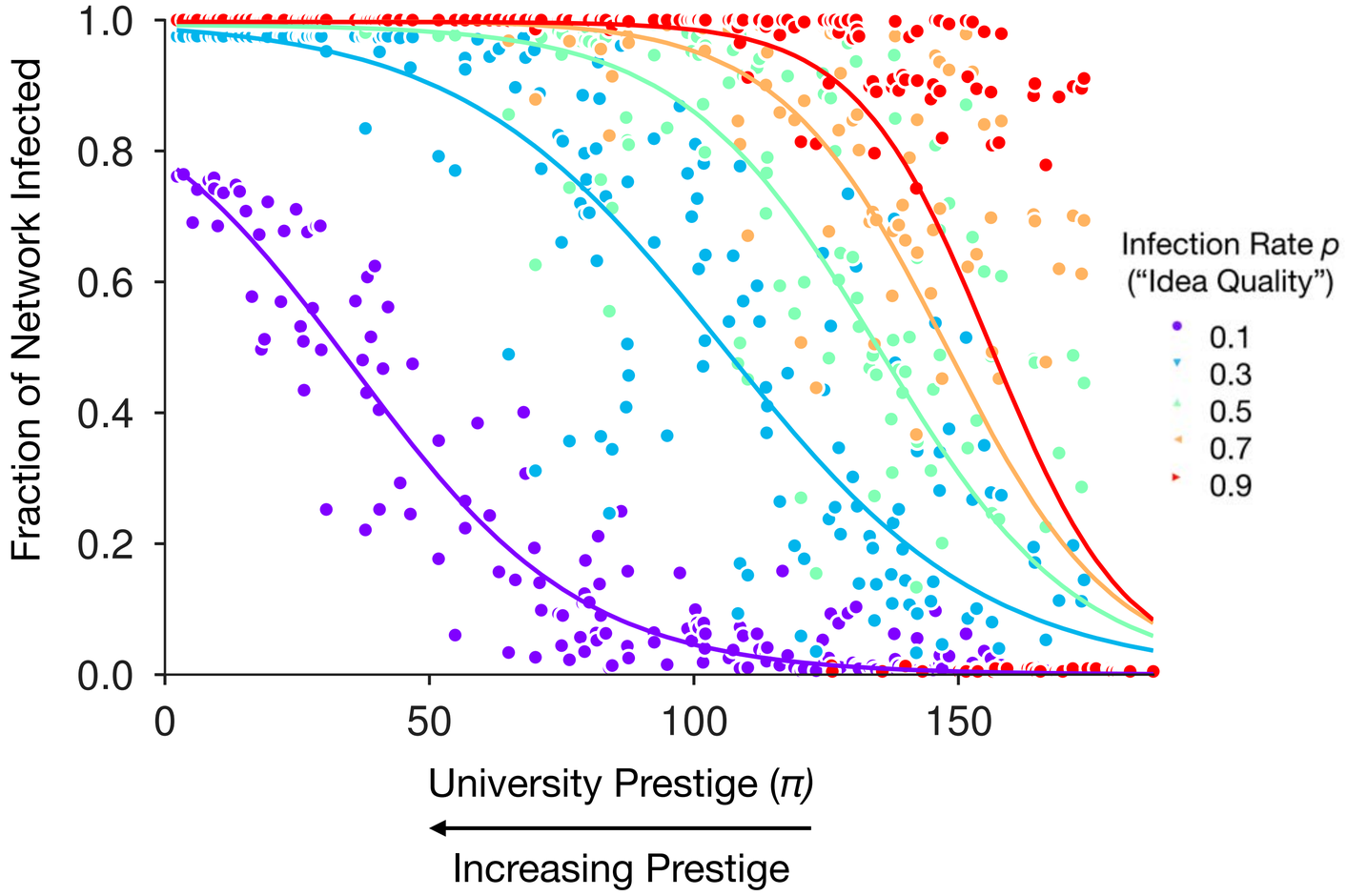
0.2
0.0
Fraction of Network Infected
0
50
100
150
University Prestige (π)
Increasing Prestige
Average of 10K simulations originating from u with particular quality p
Infection Rate p ("Idea Quality")
0.1
0.3
0.5
0.7
0.9



Assuming quality of ideas and their origins are independent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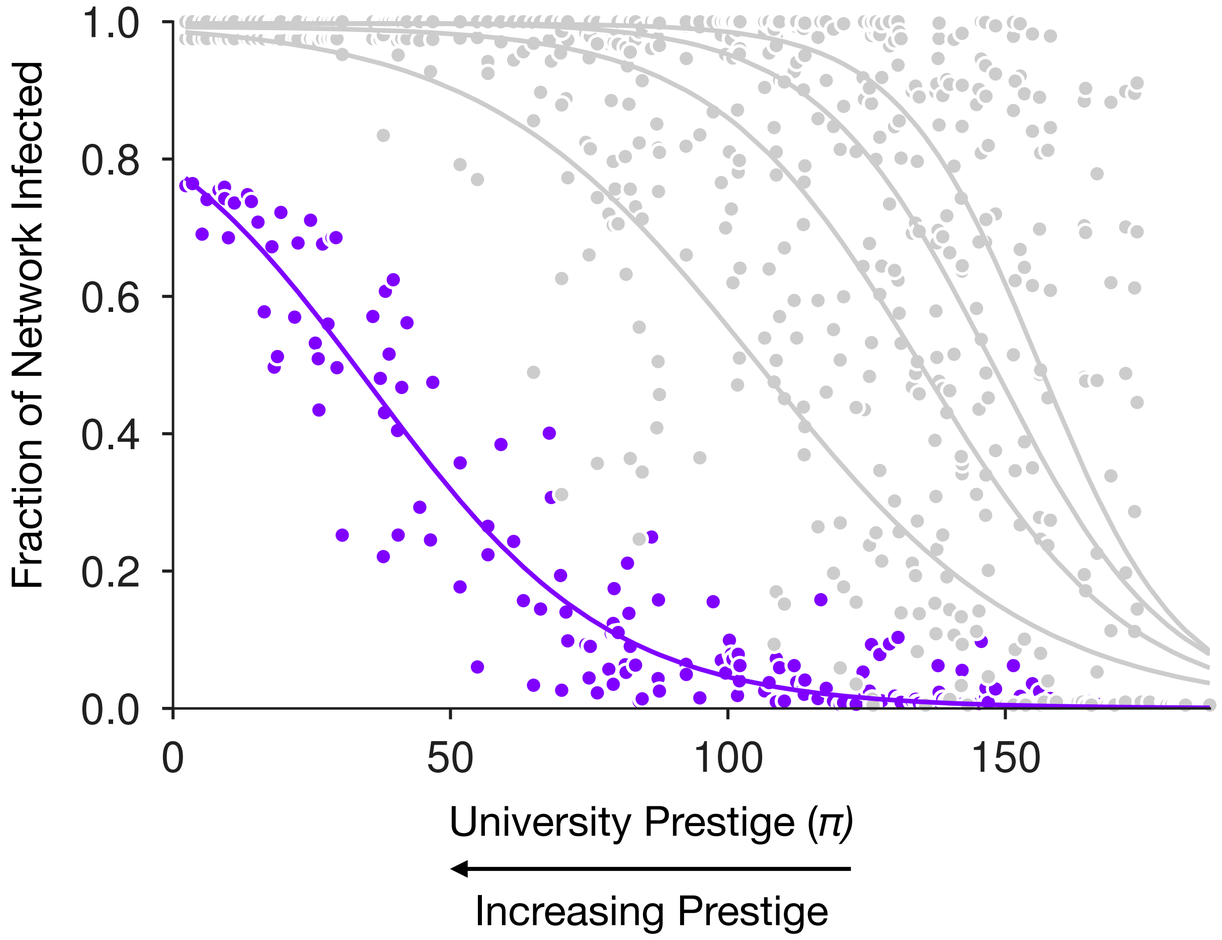
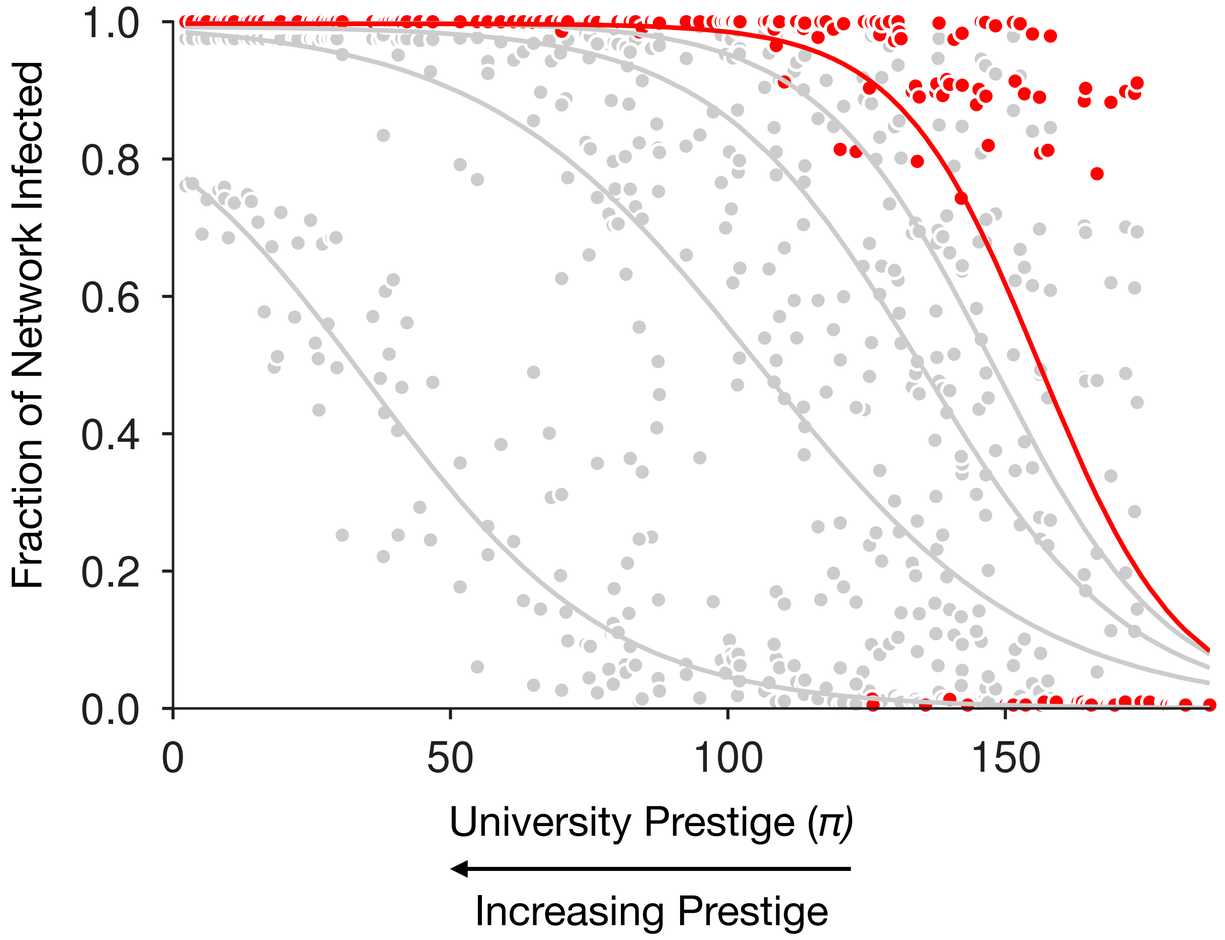
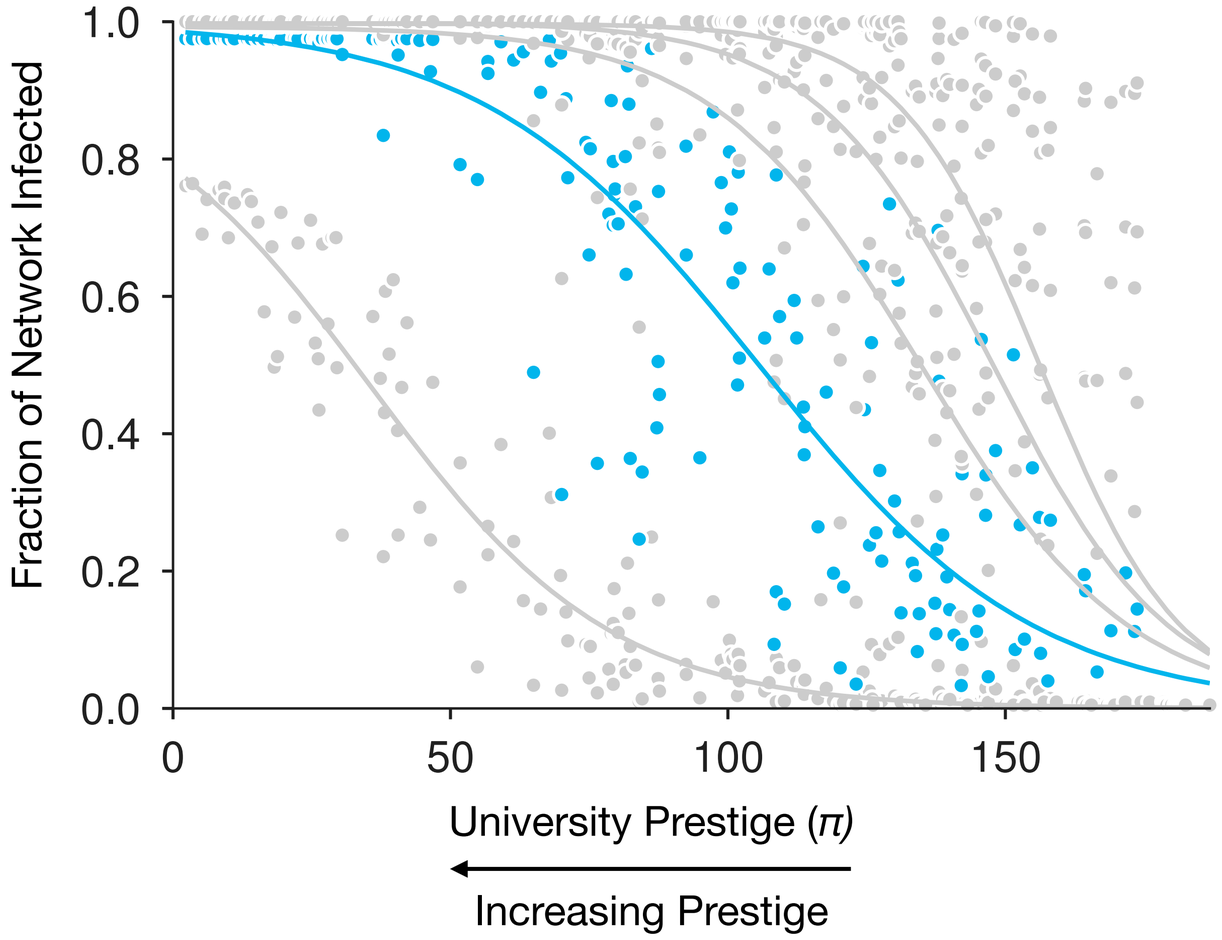


Poor quality ideas spread more easily from high-prestige universities

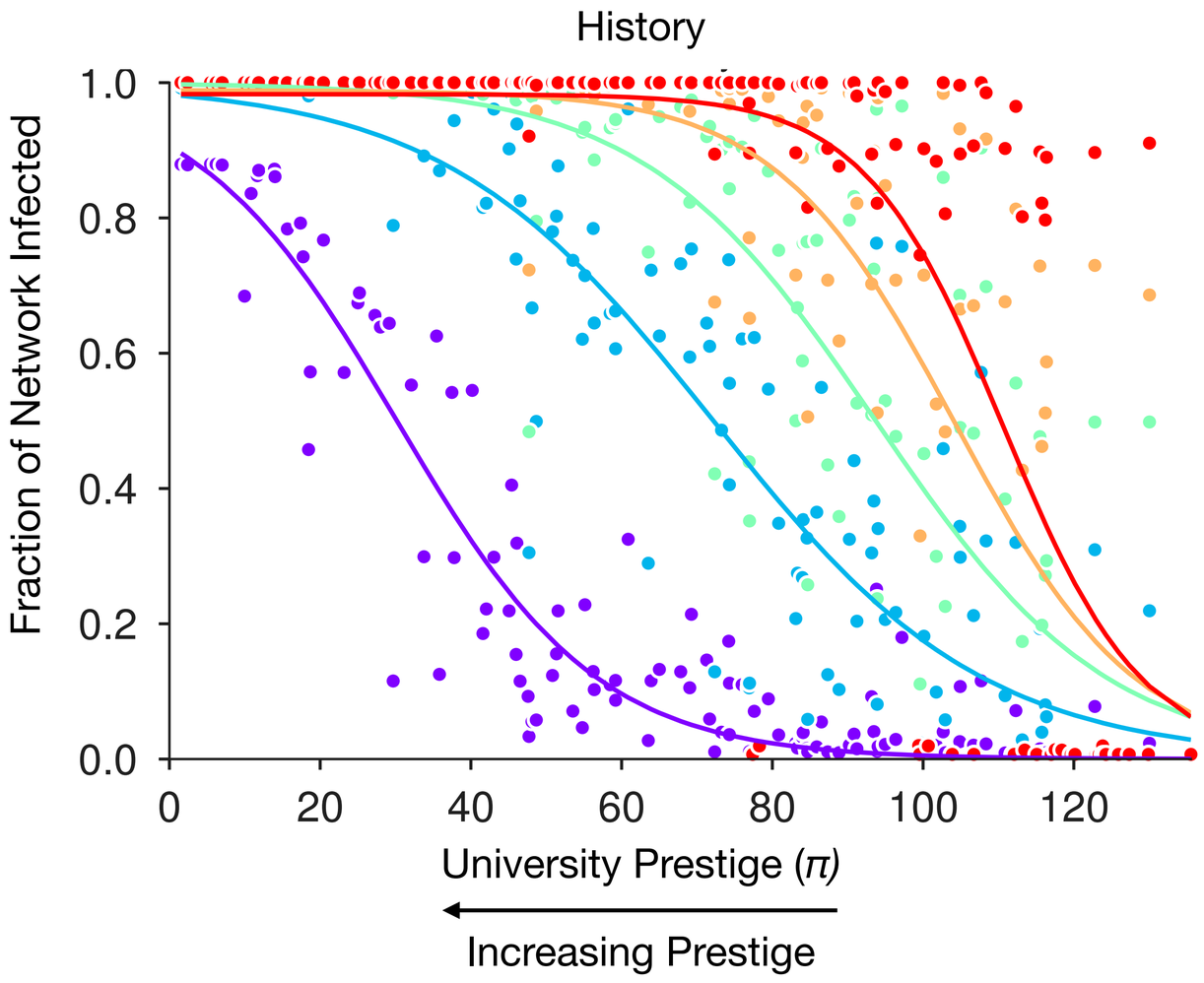


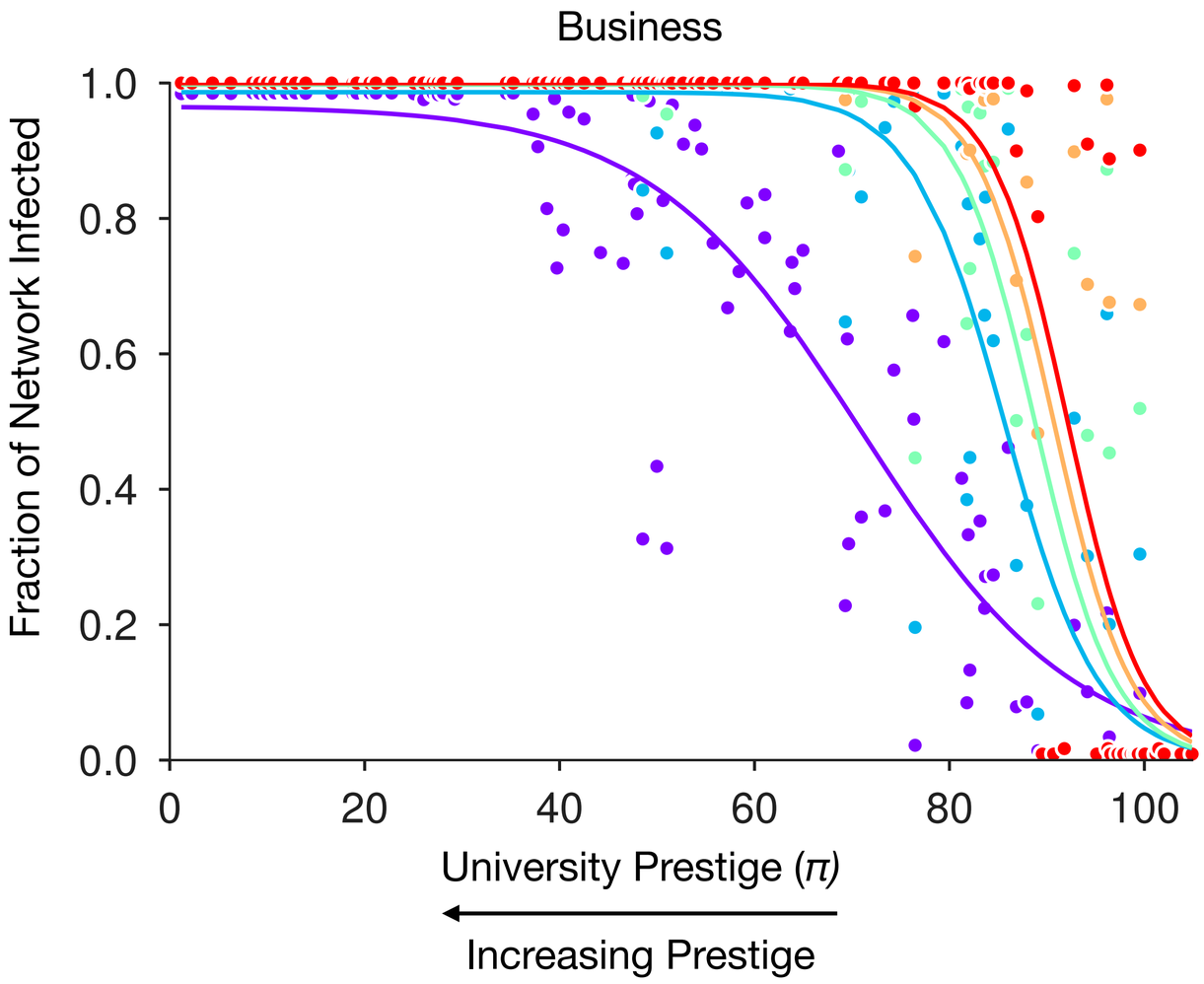
Great ideas can spread regardless of starting place



We may lose medium quality research ideas because the system structurally disallows their spread

Aside: What about other fields?





Gini coefficient for history is 0.72, business is 0.62, and computer science is 0.69.

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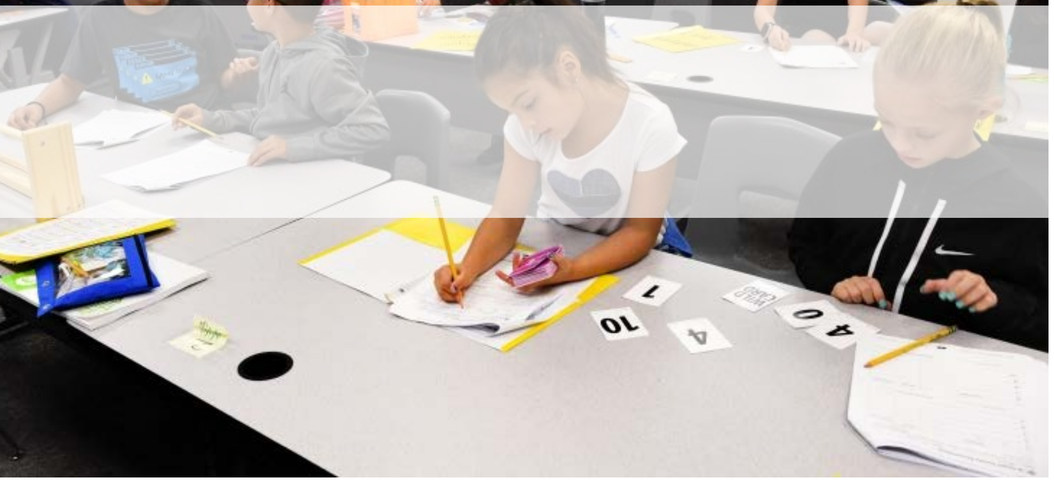
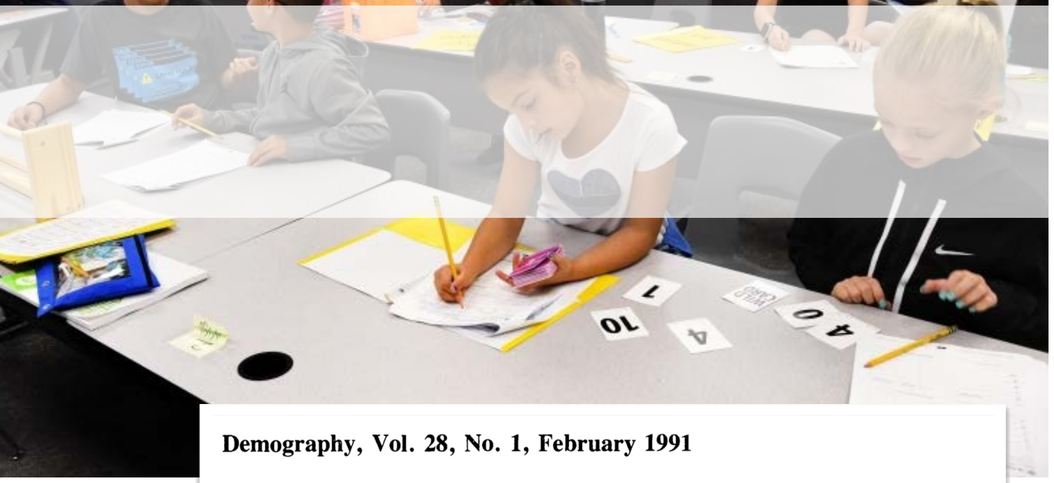


Who becomes tenure-track faculty?



Demography, Vol. 28, No. 1, February 1991

Childhood Events and Circumstances Influencing High School Completion

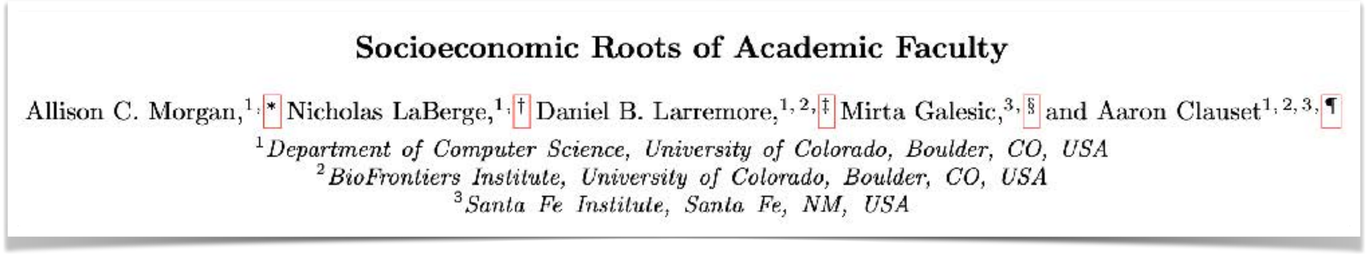
Mobility Report Cards: The Role of Colleges in Intergenerational Mobility

How elite colleges fail half of the poor students they admit

"Access isn't the same as acceptance," says Harvard professor Anthony Abraham Jack.

Who becomes tenure-track faculty?

Measuring SES among faculty



Socioeconomic Roots of Academic Faculty

Allison C. Morgan,[1,*] Nicholas LaBerge,[1,†] Daniel B. Larremore,[1,2,‡] Mirta Galesic,[3,§] and Aaron Clauset[1,2,3,¶]

[1] *Department of Computer Science, University of Colorado, Boulder, CO, USA*
[2] *BioFrontiers Institute, University of Colorado, Boulder, CO, USA*
[3] *Santa Fe Institute, Santa Fe, NM, USA*

https://osf.io/preprints/socarxiv/6wjxc

Data: Survey responses from tenure-track faculty in Anthropology, Biology, Business, CS, History, Physics / Astronomy, Psychology, and Sociology across U.S.

Information about professors' parents' education levels (N = 7218; 90.2%), and zip code of where they grew up (N = 4807; 60.0%).

Methods

Income: Linked respondent provided ZIP with average AGI from IRS (1998-2018) in the year closest to when they grew up. Adjusted for inflation.

Education: Respondent provided: What was your parents' highest levels of education? Benchmarks come from the Census Bureau and NSF SED.

Parental education

	Elementary	Some HS	HS	Some College	College	Masters	PhD
Survey of Earned Doctorates (NSF)	←	25.2	→	14.0	23.1	26.0	11.8
U.S. Population (Census)	8.7	10.5	35.6	23.1	14.6	6.5	0.9

Percentages of faculty by their parents' highest held degree, compared to the closest available data on educational attainment of the U.S. adult population when faculty were born and the education levels of the parents of doctoral recipients when faculty started their tenure-track job.

Parental education

	Elementary	Some HS	HS	Some College	College	Masters	PhD
			39% first-gen				12% PhD parents
Survey of Earned Doctorates (NSF)	←	25.2	→	14.0	23.1	26.0	11.8
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Parental education

29% first-gen

	Elementary	Some HS	HS	Some College	College	Masters	PhD
All Professors	2.6	2.9	13.7	9.5	19.5	29.6	22.2
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22% PhD parents

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Parental education

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All Professors	2.6	2.9	13.7	9.5	19.5	29.6	22.2
Anthropology Professors	0.8	2.3	14.9	7.3	19.4	32.1	23.1
Biology Professors	3.2	3.3	14.3	11.6	19.5	26.2	21.9
Business Professors	2.3	3.3	14.5	8.4	24.1	30.9	16.6
CS Professors	3.2	3.4	10.8	8.9	21.6	26.1	26.0
History Professors	1.6	1.3	10.5	8.6	17.0	34.3	26.7
Physics/Astronomy Professors	4.1	4.1	12.1	10.2	18.3	27.3	24.1
Psychology Professors	1.6	2.1	17.4	9.9	17.1	31.1	20.8
Sociology Professors	1.8	2.7	17.4	6.9	17.0	35.3	18.8
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Parental education

Blue: highest
Pink: lowest

	Elementary	Some HS	HS	Some College	College	Masters	PhD
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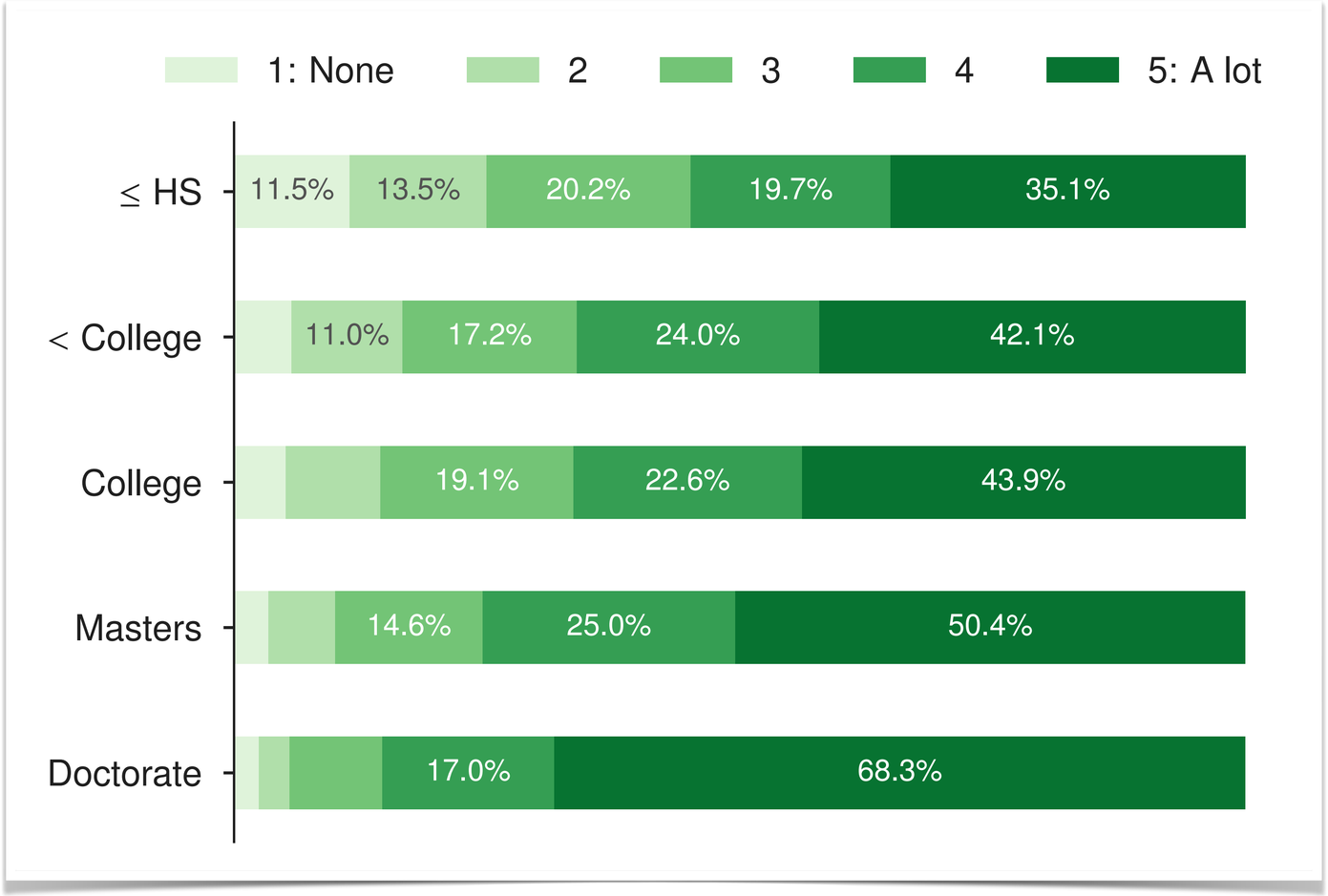
CS Professors	3.2	3.4	10.8	8.9	21.6	26.1	26.0
History Professors	1.6	1.3	10.5	8.6	17.0	34.3	26.7
Physics/Astronomy Professors	4.1	4.1	12.1	10.2	18.3	27.3	24.1
Psychology Professors	1.6	2.1	17.4	9.9	17.1	31.1	20.8
Sociology Professors	1.8	2.7	17.4	6.9	17.0	35.3	18.8
Survey of Earned Doctorates (NSF)	←	25.2	→	14.0	23.1	26.0	11.8
U.S. Population (Census)	8.7	10.5	35.6	23.1	14.6	6.5	0.9

Percentages of faculty by their parents' highest held degree, compared to the closest available data on educational attainment of the U.S. adult population when faculty were born and the education levels of the parents of doctoral recipients when faculty started their tenure-track job.

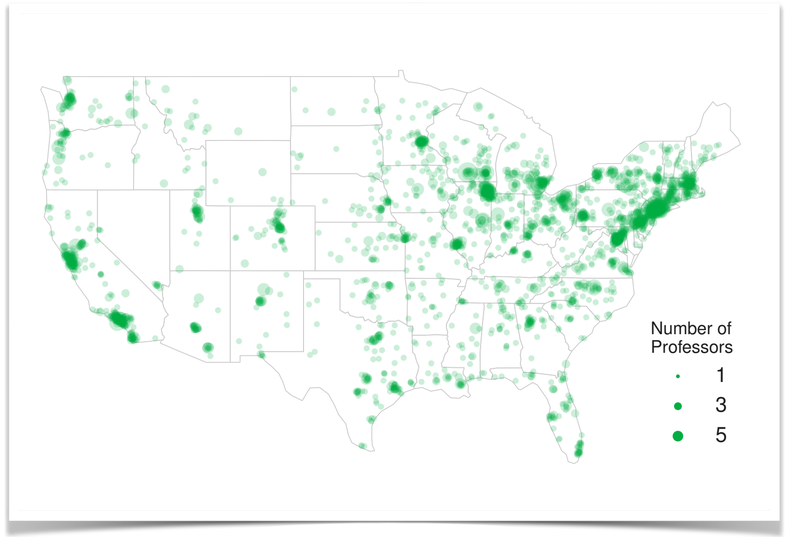
Parental education and career support

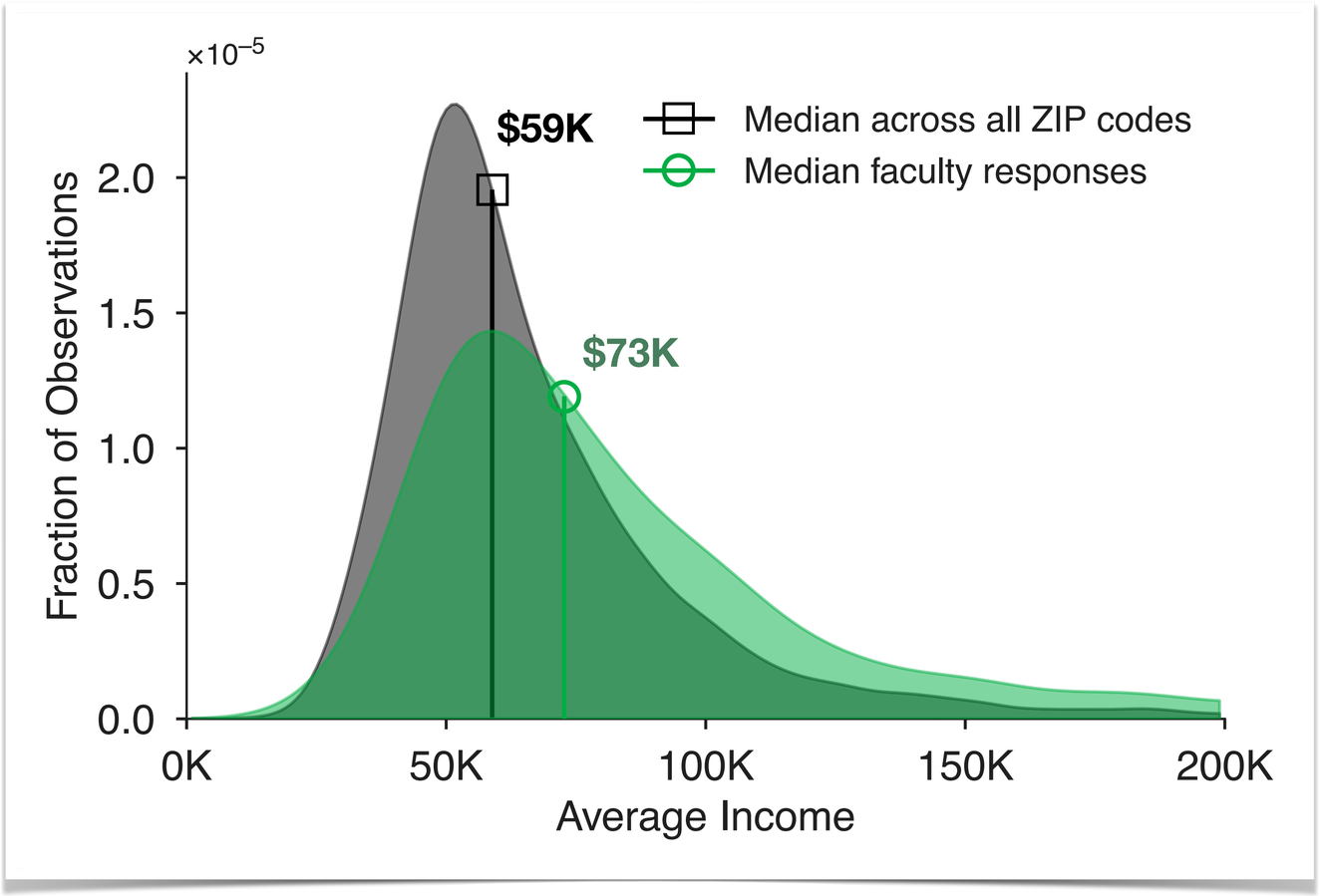
Parents' Highest Level of Education



Amount of support parents provided for academic careers on a scale of 1 (None at all) to 5 (A lot), stratified by faculty members' parents' highest education levels.

Estimated income





Average income distribution estimated using faculty members' childhood ZIP codes (green), compared with the income distribution across the 1998 U.S. population (black).

Aside: Isn't this to be expected?

Medical school admission test: advantages for students whose parents are medical doctors?

Anne Simmenroth-Nayda & Yvonne Görlich

BMC Medical Education **15**, Article number: 81 (2015) | Cite this article

7771 Accesses | **7** Citations | **11** Altmetric | Metrics

"IN MY FATHER'S FOOTSTEPS: CAREER PATTERNS OF LAWYERS"*

by

STEPHEN L. WASBY ** & SUSAN S. DALY***

12 NASCAR Kids Who Outdid Their Famous Dads (And 13 From Other Motorsports)

Check out the list below of successful NASCAR racers who are already being outshone by their offspring.

BY NATASHA BROWN
PUBLISHED DEC 29, 2018

57 Celebrities with Famous Parents

These stars practically stole the spotlight from their parents.

by CARINE LAVACHE and MEHERA BONNER ~ JAN 27, 2021

HOLLYWOOD DYNASTIES

The 25 Most Important Families in Hollywood History

From the Coppolas to the Barrymores to, yes, the Kardashians.

Kennedy family

The Kennedy family is an American political family that has long been prominent in American politics, public service, entertainment, and business. The first Kennedy elected to public office was Patrick Joseph "P. J." Kennedy in 1884, 35 years after the family's arrival from Ireland. Wikipedia

Parent family: O'Kennedy

Place of origin: Dunganstown

Current region: New England

Founder: Patrick Kennedy (1823–1858)

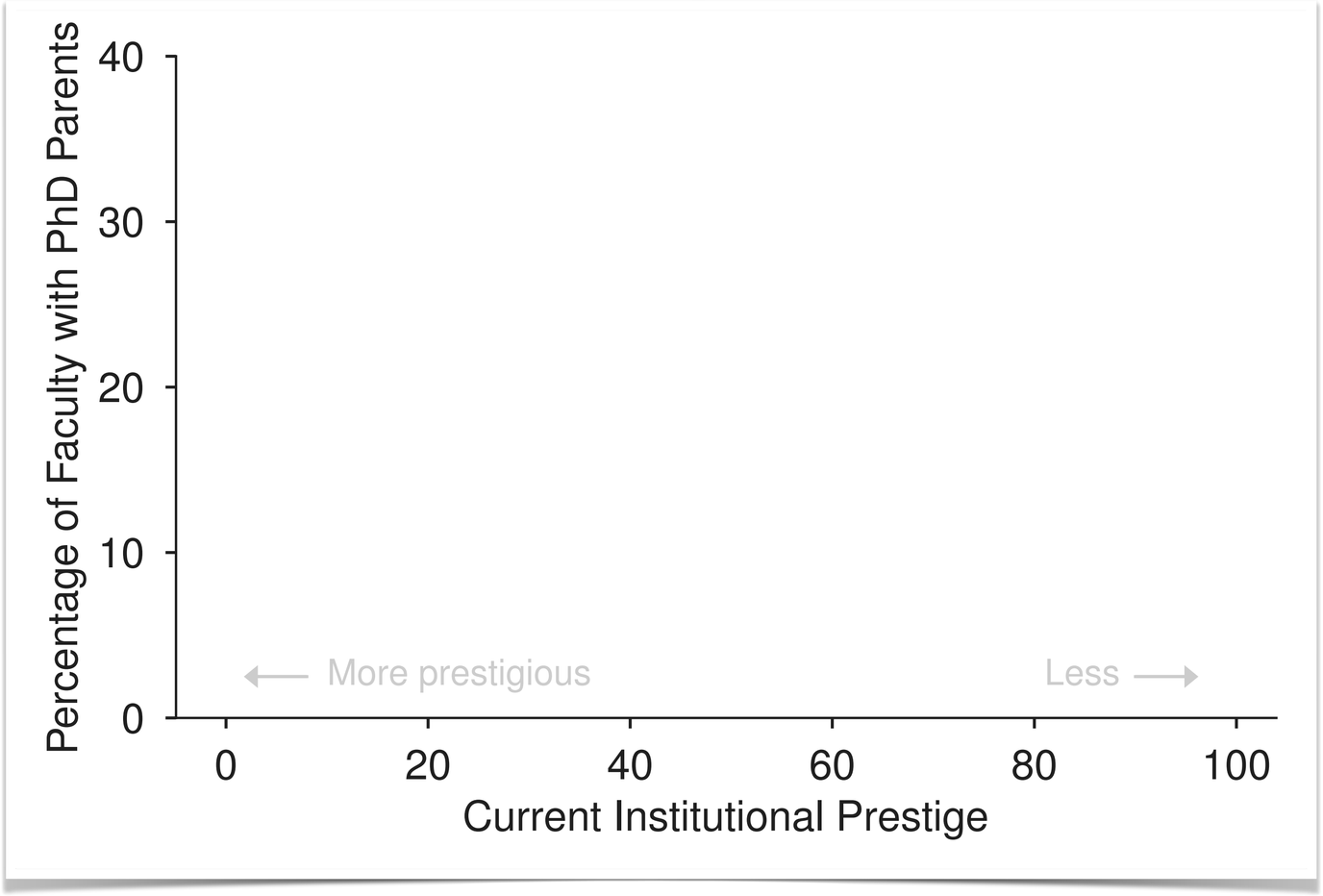
Probably.

Aside: Isn't this to be expected?

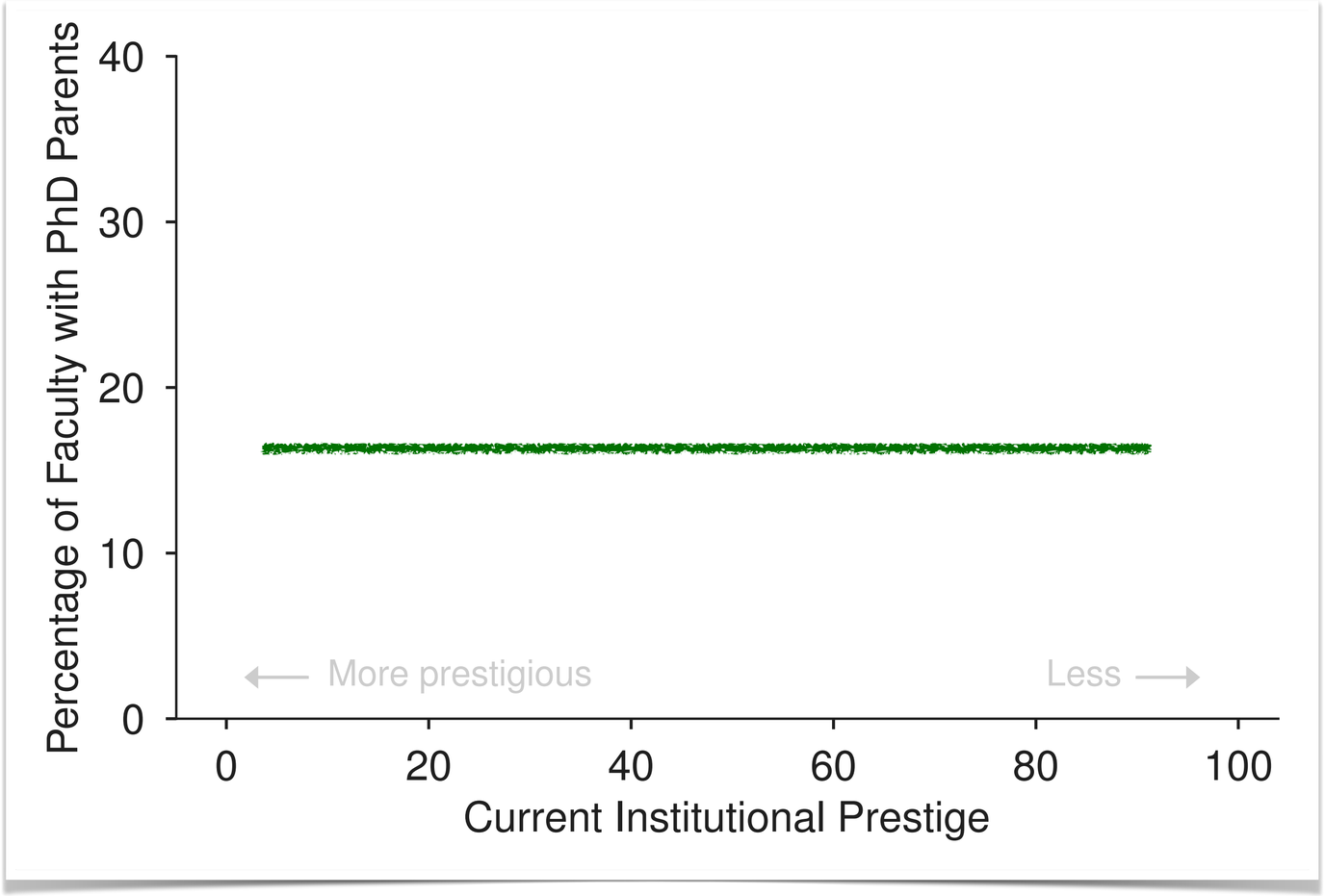
It might be tempting to take the position that the extreme microclass inequalities uncovered here are not all that objectionable. Should we really care, for example, that the child of the truck driver has a special propensity to become a truck driver while the child of a gardener has a special propensity to become a gardener? Must we truly commit ourselves to equal access to truck driving and gardening? If pressed, we would argue that all ascriptive constraints on choice, even those pertaining to purely horizontal inequalities, are inconsistent with a commitment to an open society. By this logic, *all* types of origin-by-destination association are problematic because they imply that human choice has been circumscribed, a circumscription that is wholly determined by the accident of birth. We care, in other words, that the truck driver is fated to become a truck driver at birth because that amounts to a stripping away of choice, and most of us would embrace an open society in which choices are expanded, not stripped away. Although our illustrative nonchoice (i.e., being a truck driver versus being a gardener) may not have implications for total rewards (of the sort that are *consensually* valued), it is nonetheless a fateful nonchoice that determines the texture and content of a human life. It is this commitment to an open society, sometimes left quite implicit, that underlies the discipline's long-standing interest in monitoring marital homogamy, occupational sex segregation, and many other forms of ascription that are hybrids of vertical and horizontal processes.

"It's a Decent Bet That Our Children Will Be Professors Too" Jonsson, Grusky, Di Carlo, Pollak (2009)

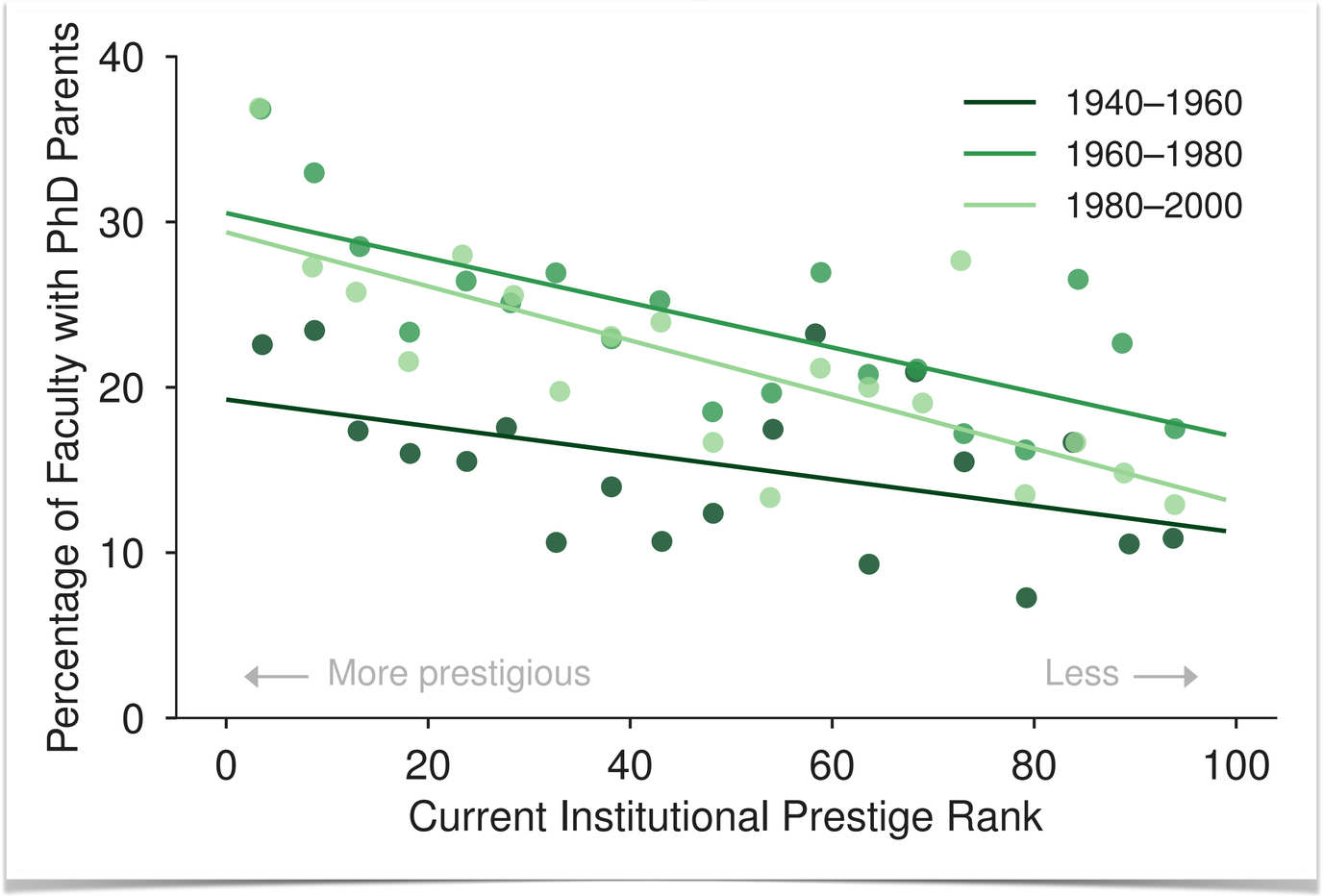
Relationship between prestige and SES



Relationship between prestige and SES

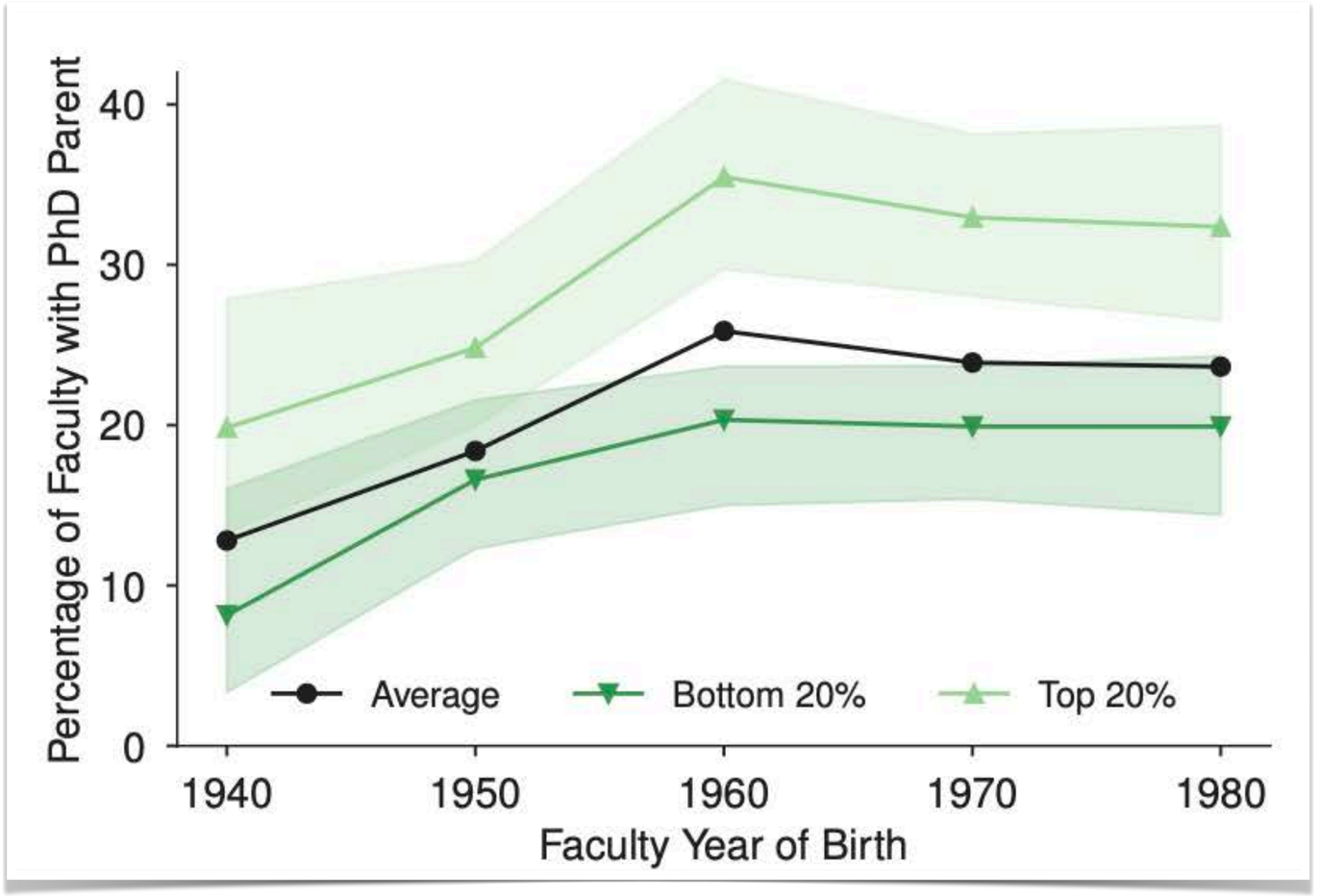


Relationship between prestige and SES



The relationship between the current institutional ranking of faculty and whether they have a parent with a PhD. Lines show the relationship for faculty born in different time periods.

Relationship between prestige and SES



Percentage of faculty with at least one parent holding a PhD, stratified by prestige of the faculty's current institution. Green upward arrows describe faculty at top 20% of institutions by USNWR or NRC ranking, and downward arrows the bottom 20% of ranked institutions. The black line describes the average proportion of faculty with PhD parents.

Relationship between prestige and SES

Linear regression of current institutional prestige as a function of neighborhood, estimated income, and parents' highest education.

	Model I	Model II	Model III
Urban neighborhood	0.129 (0.050)	0.552 (0.052)	0.914 (0.054)
Average income (standardized)		-1.447 * (0.037)	-1.352 * (0.038)
Parents' highest degree:			
Elementary			-2.946 (0.172)
Some high school			-1.816 (0.191)
High school			-4.873 * (0.065)
College			-4.416 * (0.063)
Masters			-5.177 * (0.059)
PhD			-6.889 * (0.061)
Adjusting for discipline, race / ethnicity, gender, PhD prestige	Yes	Yes	Yes
Adjusted R^2	0.105	0.107	0.109

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Outline:

1. Career trajectories and university prestige
2. Institutional prestige shapes scholarship
3. Socioeconomic status shapes academic careers
4. Discuss implications

Academic workforce

https://en.wikipedia.org/wiki/Solvay_Conference

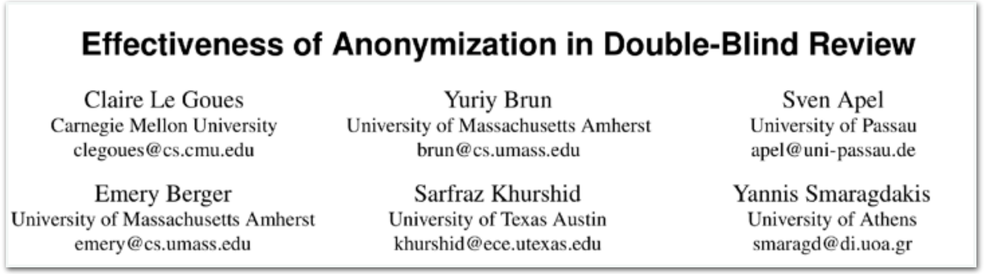
Who becomes faculty?

What influences their visibility?

Implications

Ideas spread in academia via faculty hiring. The structure of this network can privilege elite institutions.

Caveats: Model assumes quality is independent of institution and hiring decisions.



Effectiveness of Anonymization in Double-Blind Review

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https://dl.acm.org/citation.cfm?doid=3229066.3208157

The NIPS experiment

Dec 15, 2014 · Eric Price

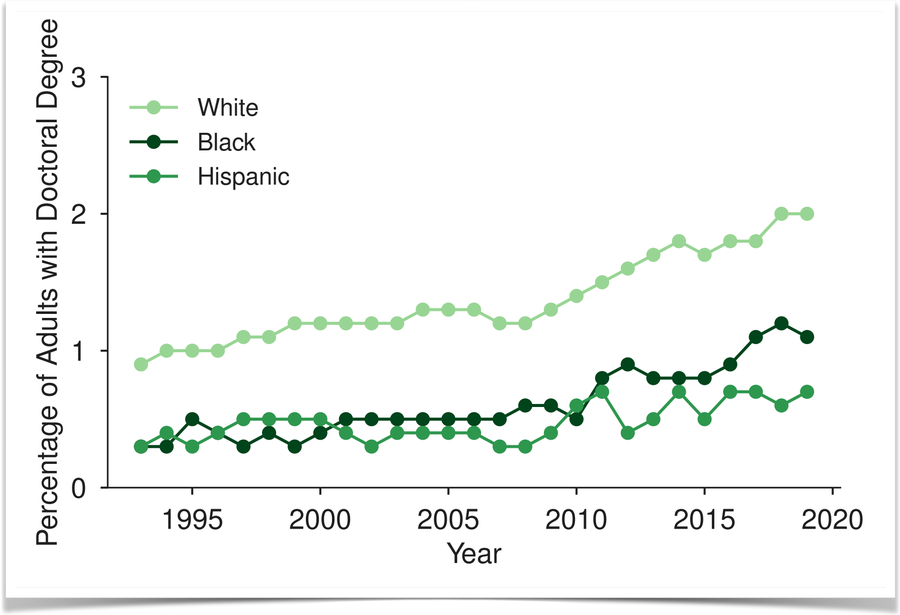
http://blog.mrtz.org/2014/12/15/the-nips-experiment.html

Reviewer bias in single- versus double-blind peer review

Andrew Tomkins[a,1], Min Zhang[b], and William D. Heavlin[a]

Proc. Natl. Acad. Sci. U.S.A. (2017)

Implications



Faculty are 2X more likely to have a PhD parent than PhD recipients.

Current placement correlates with having PhD parents.

Caveats: This study doesn't speak to barriers once individuals become faculty.

What should we do?

The Facade of Fit in Faculty Search Processes

Damani K. White-Lewis

Department of Counseling, Higher Education, and Special Education, University of Maryland, College Park, Maryland, USA

Journal of Higher Education 9:61 (2020)

Roles for Computing in Social Change

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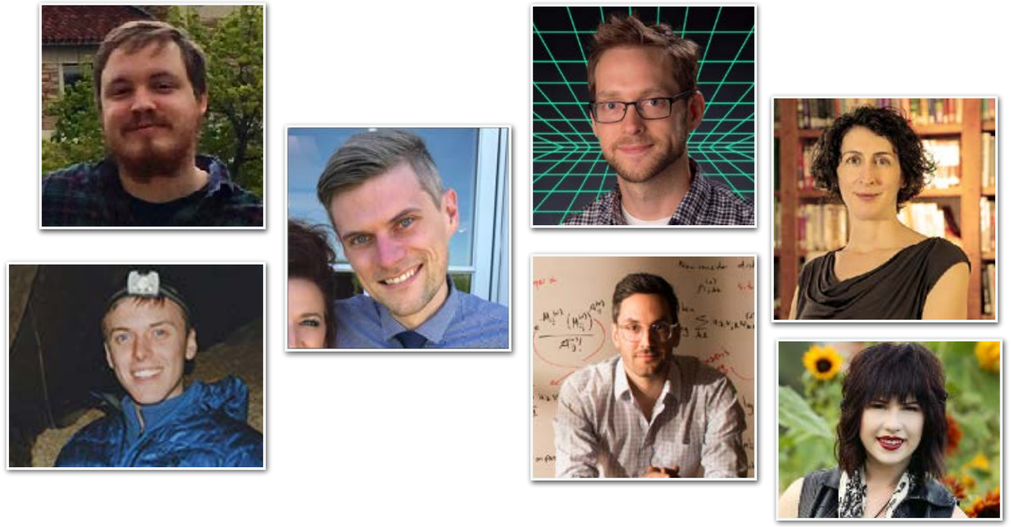
Conf. on Fairness, Accountability, Transparency (2020)

Thanks!

Collaborators: Dimitrios Economou, Samuel Way, Aaron Clauset, Daniel Larremore, McKenzie Mae Weller, Mirta Galesic, Nick LaBerge



University of Colorado **Boulder**

Systematic inequality and hierarchy in faculty hiring networks

Aaron Clauset,[1,2,3]* Samuel Arbesman,[4] Daniel B. Larremore[5,6]

Science Advances 1(1), e1400005 (2015)

Prestige drives epistemic inequality in the diffusion of scientific ideas

Allison C. Morgan[1]*, Dimitrios J. Economou[1], Samuel F. Way[1] and Aaron Clauset[1,2,3]

EPJ Data Science 7:40 (2018)

Socioeconomic Roots of Academic Faculty

Allison C. Morgan,[1,*] Nicholas LaBerge,[1,†] Daniel B. Larremore,[1,2,‡] Mirta Galesic,[3,§] and Aaron Clauset[1,2,3,¶]

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https://osf.io/preprints/socarxiv/6wjxc

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