COMMENTARY

POLICY EXPERIMENTS TO ADDRESS GENDER INEQUALITY AMONG INNOVATORS

Amy C. Madl[*] & *Lisa Larrimore Ouellette*[**]

ABSTRACT

In the twenty-fourth annual Frankel Lecture, Professor Orly Lobel set forth an intriguing hypothesis: that noncompete agreements, nondisclosure agreements, and other legal restrictions on employee exit and voice exacerbate the innovation gender gap. The unequal participation of women in science, technology, and innovation is an issue of increasing concern for many public- and private-sector stakeholders, and those interested in increasing innovation by women would be well advised to consider Professor Lobel's ideas. But as we emphasize in this Commentary, the underlying causal mechanisms for inequalities among innovators remain highly contested, and policymakers should not overstate the existing evidence for potential interventions out of a desire for rapid progress. Nor should they use this lack of evidence as an excuse for inaction. Rather, we argue that institutions interested in this issue should look for opportunities to rigorously and transparently test the most promising interventions.

TABLE OF CONTENTS

* Stanford University, J.D. 2019 and Ph.D. candidate.

** Associate Professor of Law and Justin M. Roach, Jr. Faculty Scholar, Stanford Law School. For helpful comments, we thank Tun-Jen Chiang, Dave Fagundes, Daniel Hemel, Daniel Ho, Mark Lemley, Orly Lobel, Christopher Madl, Amy Motomura, Nicholson Price, Jacob Sherkow, Samantha Zyontz, and participants at the 2019 Frankel Lecture.

I. INTRODUCTION

Inequality among innovators is a substantial social problem. Disparities in innovation by gender, race, and class raise concerns for both equity and economic growth. For example, Professor Raj Chetty's team of economists has estimated that if women, racial minorities, and people from low-income backgrounds invented at the same rate as white men from families in the top income quintile, these "lost Einsteins"—or perhaps "lost Maryam Mirzakhanis"[1]—would quadruple the rate of innovation in America.[2] But progress on increasing participation of underrepresented groups in the innovation ecosystem has been glacial. Unless something dramatic changes, gender inequality—the focus of this Commentary—will persist among American innovators in science and engineering for well over a century.[3]

---

1. *See generally Maryam Mirzakhani Prize in Mathematics*, NAT'L ACAD. SCI., http://www.nasonline.org/programs/awards/mathematics.html [https://perma.cc/L8DV-472U] (last visited Mar. 8, 2020) (Dr. Mirzakhani was "a highly accomplished and talented mathematician, professor at Stanford University, and . . . the first (and only) woman to win the Fields Medal, the most prestigious award in mathematics, often equated in stature with the Nobel Prize.").

2. Alex Bell et al., *Who Becomes an Inventor in America? The Importance of Exposure to Innovation*, 134 Q.J. ECON. 647, 653 (2019).

3. *Id.* at 649 (evaluating gender disparities based on U.S. patent inventorship rates).

Private- and public-sector stakeholders are demanding more rapid progress. Private technology firms face heightened public scrutiny of their diversity practices,[4] and universities—private and public—are under fire to increase the proportion of female academics in science and engineering.[5] Reflecting broad consensus on the need to act, two of the first bills signed by President Trump in 2017 were bipartisan efforts to advance women in Science, Technology, Engineering, and Mathematics (STEM).[6] In a similar vein, Congress charged the U.S. Patent & Trademark Office (USPTO) in 2018 with providing recommendations on how to promote increased inventorship, as evidenced through patenting, by women and minorities.[7]

Scholars of innovation law and policy have long noted a patent gender gap[8] and are increasingly examining what legal policy levers might increase women's participation in the innovation ecosystem.[9] And it is delightful to see Professor Orly Lobel apply her wide-ranging expertise to this problem. In the twenty-fourth annual Frankel Lecture, Professor Lobel argued that legal restrictions on employees' exit and voice—particularly

---

Disparities by race and ethnicity are also striking. *See id.* at 667. We suspect that transgender and nonbinary innovators are also underrepresented, but existing data does not reflect the complexities of demographic categorizations. *See generally* Lila Leatherman, *Science Has to Do Better for Its Queer, Trans, and Non-Binary Scientists*, MASSIVE SCI. (Mar. 31, 2019), https://massivesci.com/articles/trans-visibility-science-queer-lgtbqia-trans gender-inclusion [https://perma.cc/D6QN-D7R6].

4. *See, e.g.*, Megan Rose Dickey, *The Future of Diversity and Inclusion in Tech*, TECHCRUNCH (June 17, 2019), https://techcrunch.com/2019/06/17/the-future-of-diversity-and-inclusion-in-tech [https://perma.cc/CHQ7-Y2A5]; Rani Molla, *Why Women in Tech Are Being Photoshopped in Instead of Hired*, VOX (June 17, 2019, 8:00 AM), https://www.vox .com/recode/2019/6/17/18678541/women-tech-photoshop-diversity [https://perma.cc/WN6W -LWJP].

5. *See, e.g.*, Whitney H. Beeler et al., *Institutional Report Cards for Gender Equality: Lessons Learned from Benchmarking Efforts for Women in STEM*, 25 CELL STEM CELL 306, 306 (2019).

6. *See* William Thomas, *Trump Signs Legislation Promoting Women in STEM Fields*, PHYSICS TODAY (Mar. 3, 2017), https://physicstoday.scitation.org/do/10.1063/PT.5. 1108/full/ [https://perma.cc/6VL4-SRYS].

7. Study of Underrepresented Classes Chasing Engineering and Science Success Act of 2018, Pub. L. No. 115-273, 132 Stat. 4158. The legislation also singled out veterans, whose representation among innovators is less well-studied. For more details, see Lisa Larrimore Ouellette, *How Will the USPTO Study Gaps in Patenting by Women, Minorities, and Veterans Under the New SUCCESS Act?*, WRITTEN DESCRIPTION (Nov. 2, 2018), https:// writtendescription.blogspot.com/2018/11/how-will-uspto-study-gaps-in-patenting.html [htt ps://perma.cc/KH6Z-TS5A].

8. *See generally* Kara W. Swanson, *Intellectual Property and Gender: Reflections on Accomplishments and Methodology*, 24 AM. U. J. GENDER SOC. POL'Y & L. 175, 183 (2015) (noting that "gender disparity in participation in IP systems" has been "noticed and discussed for over a century").

9. *See, e.g.*, Dan L. Burk, *Diversity Levers*, 23 DUKE J. GENDER L. & POL'Y 25, 42–43 (2015).

noncompete agreements and nondisclosure agreements—hurt gender diversity among innovators, as reflected through metrics such as the gender patent gap.[10] This is an intriguing and plausible hypothesis, and we will attempt to disentangle the many moving parts of her argument below.

But the main point we want to emphasize in this Commentary is that the evidence base for most policy interventions to reduce the innovation gender gap is depressingly shallow, and that overstating this evidence out of a desire for rapid progress can do more harm than good. Does this mean that nothing should be done? No—quite the contrary. We argue that public- and private-sector institutions interested in gender inequality among innovators should look for opportunities to rigorously test the most promising interventions—including not just workplace transparency and noncompete reform, but also policies more directly targeted at increasing innovation by women.[11] These real-world policy experiments should ideally include some element of randomization to provide the most credible evidence of a policy's effects, but even transparent natural experiments would represent an improvement over the status quo.

II. WHAT EVIDENCE EXISTS ABOUT THE CAUSES OF INNOVATION GENDER GAPS?

Unsubstantiated empirical claims about innovation gaps have proliferated as eager private- and public-sector stakeholders seek fast fixes for gender inequality.[12] While much is known about representation rates across industries and at various career stages,[13] the evidence base for causes of the gender gap—as well

10. *See generally* Orly Lobel, *Exit, Voice & Innovation: How Human Capital Policy Impacts Equality (& How Inequality Hurts Growth)*, 57 HOUS. L. REV. 781 (2020). Most of Professor Lobel's discussion of this "innovation deficit" focuses on patenting activity and representation in STEM fields, though she at times refers to creative production more broadly. *Id.* In this Commentary, we focus on technical innovation, both because of the more severe gender disparities and because it is more tractable for studying. But we do not mean to downplay the importance of inequalities in creative industries. *See generally* Bridget Conor et al., *Gender and Creative Labour*, 63 SOC. REV. 1 (2015).

11. To be clear, we think the core problem with the current innovation gender gap is that there is too little innovation by women that is recognized and rewarded. But for those primarily concerned with inequality per se, the policies to be tested could include proposals to make men less innovative as well as those to spur innovation by women.

12. *See* Kelsey Piper, *The Conversation About Diversity in Tech Is Getting Hijacked by Bad Research*, VOX (Feb. 20, 2019, 6:30 PM), https://www.vox.com/2019/2/20/18232762/gender-diversity-tech-bad-research-recruiting-new-york-times [https://perma.cc/Y37A-QKQ5].

13. *See* NAT'L CTR. FOR SCI. & ENG'G STATISTICS, NSF 19-304, WOMEN, MINORITIES, AND PERSONS WITH DISABILITIES IN SCIENCE AND ENGINEERING (2019), https://ncses

as interventions that meaningfully address gendered differences in innovation rates—is shallow and contradictory.[14] Additionally, many studies focus on the science and engineering (S&E) workforce in general, rather than on innovators in particular.[15] Below, we provide a high-level overview of existing evidence related to three potential causes of innovation gender gaps: low rates of entry into the S&E workforce; challenges succeeding as a female innovator; and high rates of exit exacerbated by re-entry barriers. Readers interested in a more exhaustive survey of the literature on gender gaps in innovation are pointed to several excellent reviews on the topic.[16]

A. *Low Rates of Entry*

While the number of women who become patent inventors in America remains depressingly small,[17] levels of participation and achievement in S&E are similar between men and women early in the innovation pipeline.[18] Female representation in S&E at the student level has rapidly risen in the past two decades, with

.nsf.gov/pubs/nsf19304/assets/digest/nsf19304-digest.pdf [https://perma.cc/8PQ5-PTAD] (providing, inter alia, statistical information regarding the participation of women in science and engineering education and employment); AMY BURKE, NAT'L CTR. FOR SCI. & ENG'G STATISTICS, NSB-2019-8, SCIENCE & ENGINEERING INDICATORS 2020: SCIENCE AND ENGINEERING LABOR FORCE (2019), https://ncses.nsf.gov/pubs/nsb20198/assets/nsb20198.pdf [https://perma.cc/XY2T-NMCS] (describing the size and composition of the science and engineering workforce in the United States).

14. *See generally, e.g.*, Stephen J. Ceci et al., *Women in Academic Science: A Changing Landscape*, 15 PSYCHOL. SCI. PUB. INT. 75, 83–124 (2014) (summarizing potential explanations for low female representation in academic science and available empirical evidence).

15. "Innovation consists of 'the search for and the discovery, development, improvement, adoption and commercialization of new processes, products, and organizational structures and procedures.'" Michael A. Carrier, *Unraveling the Patent-Antitrust Paradox*, 150 U. PA. L. REV. 761, 802 (2002). Not all innovators are S&E employees, and not all S&E employees are innovators.

16. *See generally* Tessa E.S. Charlesworth & Mahzarin R. Banaji, *Gender in Science, Technology, Engineering, and Mathematics: Issues, Causes, Solutions*, 39 J. NEUROSCIENCE 7228 (2019); Nilanjana Dasgupta & Jane G. Stout, *Girls and Women in Science, Technology, Engineering, and Mathematics: STEMing the Tide and Broadening Participation in STEM Careers*, 1 POL'Y INSIGHTS FROM BEHAV. & BRAIN SCI. 21 (2014); Ming-Te Wang & Jessica Degol, *Motivational Pathways to STEM Career Choices: Using Expectancy-Value Perspective to Understand Individual and Gender Differences in STEM Fields*, 33 DEV. REV. 304 (2013); Ceci et al., *supra* note 14.

17. *See* OFFICE OF THE CHIEF ECONOMIST, U.S. PATENT & TRADEMARK OFFICE, PROGRESS AND POTENTIAL: A PROFILE OF WOMEN INVENTORS ON U.S. PATENTS 4 (2019), uspto.gov/sites/default/files/documents/Progress-and-Potential.pdf [https://perma.cc/T2RA-2KBD] (noting that only 12% of U.S. patent inventors in 2016 were women).

18. *See Statistics*, NAT'L GIRLS COLLABORATIVE PROJECT, https://ngcproject.org/statistics [https://perma.cc/Z537-XLF9] (last visited Mar. 8, 2020).

women now earning over 50% of S&E degrees.[19] However, the gender gap widens when men and women enter the workforce. Despite currently holding over 40% of awarded S&E degrees, women represented only 29% of the S&E workforce in 2017.[20]

The disparity between degree holders and workforce members partially reflects field of study differences between men and women.[21] Relatively few women pursue degrees in the most industry-relevant subfields, with women holding only about 20% of bachelor's degrees in computer science and engineering disciplines.[22] Instead, women concentrate in S&E subfields (e.g., life sciences disciplines) with relatively low research and development (R&D) workforce transition rates for members of both genders.[23] Because women leave innovative industries at higher rates than men across subfields,[24] gendered clustering in disciplines with poor overall retention exacerbates the S&E workforce gender gap.

---

19. *See* BURKE, *supra* note 13, at 9. Of note, the National Science Foundation includes social scientists within its definition of the S&E workforce. *See id.* at 10. Sources cited throughout this Commentary vary slightly in what occupations they include within their definitions of S&E, and many refer to these same occupations as STEM (Science, Technology, Engineering, and Mathematics) occupations. We use S&E and STEM interchangeably throughout. However, small definitional changes may be partially responsible for some of the conflicting results reported in the literature, along with the frequent consolidation of various STEM industries with different workplace environments and qualifications for study purposes.

20. *See id.* at 9.

21. *See id.* at 47–50 (highlighting how female representation varies across fields of science and engineering).

22. *See id.*

23. *See* Sharon Sassler et al., *The Missing Women in STEM? Assessing Gender Differentials in the Factors Associated with Transition to First Jobs*, 63 SOC. SCI. RES. 192, 199, 200 fig.1 (2017) ("In contrast to the above finding that male STEM majors were significantly more likely than women to transition into STEM occupations, there are no significant gender differences across specific STEM majors in transitions to STEM employment."). Sassler and co-authors excluded the health professions from their definition of STEM. *See id.* at 199 tbl.2. However, as the authors noted, "[l]imiting what constitutes 'science' occupations to exclude health related jobs may be one way of gendering what is defined as science," with transition rates for female biology majors more than tripling (to 45.1%) when health occupations were included in the definition of STEM occupations. *See id.* at 201. However, transition rates represent only one step in the emergence of the gender gap, with many women exiting health professions due to work-life imbalance later in the pipeline. *See* Amy Paturel, *Why Women Leave Medicine*, AAMC (Oct. 1, 2019), https://www.aamc.org/news-insights/why-women-leave-medicine [https://perma.cc/TF66-DNFM] (noting that "within six years of completing training, 22.6% of women physicians were not working full-time compared to 3.6% of male physicians").

24. *See* Jennifer L. Glass et al., *What's So Special About STEM? A Comparison of Women's Retention in STEM and Professional Occupations*, 92 SOC. FORCES 723, 723–24 (2013) (noting that analyses of S&E workers find that "women are more retention-sensitive to parenthood, long work hours, and residential moves than men").

Why do women select different S&E subfields than men? We do not know.[25] One possibility is that a combination of implicit bias and stereotype threat directs women away from certain "brilliance-required" subfields: Across a variety of studies, respondents are more likely to associate men with brilliance, and women are less likely to pursue degrees in fields where brilliance is regarded as necessary for success (e.g., high quantitative ability subfields such as physics and mathematics).[26] Another possibility is that women with high quantitative skills consider different career options than similarly proficient men. Individuals of both genders with high math skills and high verbal skills—as measured by standardized tests—are less likely to pursue STEM careers than individuals with high math skills and moderate verbal skills, and more women than men have both high math and high verbal test scores.[27] This relative strength trend is not uniquely American, with one recent study of sixty-seven countries and regions finding that "girls performed about as well or better than boys did on science in most countries," but that in all but two countries, "boys' best subject was science, and girls' was reading."[28] The same study noted that women in countries with greater gender equality were less likely to choose careers in STEM than their counterparts in less progressive societies, possibly reflecting

---

25. *Cf.* Sapna Cheryan et al., *Why Are Some STEM Fields More Gender Balanced Than Others?*, 143 PSYCHOL. BULL. 1, 5–18 (2017) (arguing that masculine culture, insufficient early educational experience, and relatively large gender gaps in self-efficacy contribute to women's underrepresentation in computer science, engineering, and physics but noting that the evidence on several factors is mixed).

26. *See* Sarah-Jane Leslie et al., *Expectations of Brilliance Underlie Gender Distributions Across Academic Disciplines*, 347 SCI. 262, 262–64 (2015) (providing data and suggesting that "field-specific ability beliefs may lower women's representation at least in part by fostering the belief that women are less well-suited than men to be leading scholars and by making the atmosphere in these fields less welcoming to women"); *see also* Daniel Storage et al., *The Frequency of "Brilliant" and "Genius" in Teaching Evaluations Predicts the Representation of Women and African Americans Across Fields*, PLOS ONE (Mar. 3, 2016), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0150194 [https://perma.cc/P4G4-9F6P] (finding that the frequency of the word "brilliant" and "genius" in over 14 million reviews on RateMyProfessors.com predicted women's representation in a field). The association between gender and brilliance manifests as young as age six, by which point young girls are less likely than young boys to believe members of their gender are "really, really smart." *See* Lin Bian et al., *Gender Stereotypes About Intellectual Ability Emerge Early and Influence Children's Interests*, 355 SCI. 389, 389 (2017).

27. *See* Ming-Te Wang et al., *Not Lack of Ability but More Choice: Individual and Gender Differences in Choice of Careers in Science, Technology, Engineering, and Mathematics*, 24 PSYCHOL. SCI. 770, 773–74 (2013).

28. *See* Olga Khazan, *The More Gender Equality, the Fewer Women in STEM*, ATLANTIC (Feb. 18, 2018), https://www.theatlantic.com/science/archive/2018/02/the-more-gender-equality-the-fewer-women-in-stem/553592/ [https://perma.cc/R2HF-M6JP] (discussing Gijsbert Stoet & David C. Geary, *The Gender-Equality Paradox in Science, Technology, Engineering, and Mathematics Education*, 29 PSYCHOL. SCI. 581 (2018)).

underlying career preferences.[29] Yet another possibility is path-dependence, with women choosing to leave male-dominated fields early in the training process. In one study on attrition from STEM Ph.D. programs at public institutions in Ohio, researchers found that women without female peers in their cohort were 12% less likely to complete a Ph.D. than their male counterparts within six years, and one standard deviation in the share of female students increased the six-year female graduation rate by about 5%.[30]

B. Challenges Succeeding as an Innovator

Women electing to enter the S&E workforce face several potential barriers to success, although the nature and magnitude of those challenges are disputed.[31] Illustratively, women may confront higher hurdles near the career starting line than men, with many studies suggesting implicit or explicit bias hamstrings women during traineeships and the hiring process.[32] For example, one identical-resume study found that faculty members asked to imagine they were evaluating a lab manager candidate for their own labs were significantly less likely to say they would hire the female candidate, offered her less money, and were less willing to mentor her relative to an otherwise identical male candidate.[33] Another study found that elite male faculty members in the

---

29. *See id.*

30. *See* Colleen Flaherty, *'Nevertheless She Persisted?,'* INSIDE HIGHER ED (Sept. 18, 2018), https://www.insidehighered.com/news/2018/09/18/new-analysis-suggests-womens-success-stem-phd-programs-has-much-do-having-female [https://perma.cc/W6ZT-ZLW3].

31. *See* Ming-Te Wang & Jessica L. Degol, *Gender Gap in Science, Technology, Engineering, and Mathematics (STEM): Current Knowledge, Implications for Practice, Policy, and Future Directions*, 29 EDUC. PSYCHOL. REV. 119, 125–26 (2017) (considering the roles of family-work balance and lifestyle values on female representation in S&E); Zuleyka Zevallos, *The Myth About Women in Science? Bias at Work in the Study of Gender Inequality in STEM*, LSE IMPACT BLOG (May 5, 2015), https://blogs.lse.ac.uk/impactofsocialsciences/2015/05/05/women-in-science-gender-inequality-stem/ [https://perma.cc/GC3T-L324] (discussing contradictory empirical evidence on gender bias in hiring and noting that academics studying bias, like everyone else, are subject to unconscious gender bias).

32. *See, e.g.*, Shelley J. Correll et al., *Getting a Job: Is There a Motherhood Penalty?*, 112 AM. J. SOC. 1297, 1331–35 (2007) (finding discrimination against mothers in marketing and business position hiring through an audit study); Corinne A. Moss-Racusin et al., *Science Faculty's Subtle Gender Biases Favor Male Students*, 109 PROC. NAT'L ACAD. SCI. 16474, 16477–78 (2012) (describing the results of a controlled experiment in which "both male and female faculty judged a female student to be less competent and less worthy of being hired than an identical male student, and also offered her a smaller starting salary and less career mentoring"); Rhea E. Steinpreis et al., *The Impact of Gender on the Review of the Curricula Vitae of Job Applicants and Tenure Candidates: A National Empirical Study*, 41 SEX ROLES 509, 522–26 (1999) (finding that male and female academic psychologists were more likely to vote to hire an entry level male job applicant than a female job applicant with an identical record, although this bias did not translate to a more experienced candidate).

33. *See* Moss-Racusin et al., *supra* note 32, at 16475 fig.1, 16477.

biological sciences (i.e., those funded by Howard Hughes Medical Institute, elected to the National Academy of Sciences, or bestowed with a major career award), where many female scientists cluster, trained significantly fewer women than other male faculty members, a bias not observed for elite female faculty.[34] However, a national survey experiment in which faculty were asked to rank hypothetical applicants for assistant professorships showed a faculty preference for women on the S&E track,[35] suggesting that gender bias affects decision-making differently across industries and job levels.

Once hired, women may struggle to advance due to geographic and temporal constraints. S&E jobs are highly concentrated, with twenty metropolitan areas accounting for 42% of jobs, compared to about 31% across all occupations.[36] Within the biotechnology industry, where women are relatively well-represented, geographical clustering is even more acute, with two regions (Boston and San Francisco) representing a large segment of the talent market.[37] Women are more likely to be geographically constrained and to move for a spouse's job opportunity than men,[38] so industry concentration may create a retention barrier for women unable to find appropriate S&E employment in their spouse's preferred location. Moreover, male scientists and engineers are more likely to work very long hours in their mid-thirties, placing their female counterparts at a competitive disadvantage.[39] Twice as many female scientists and engineers are

34. *See* Jason M. Sheltzer & Joan C. Smith, *Elite Male Faculty in the Life Sciences Employ Fewer Women*, 111 PROC. NAT'L ACAD. SCI. 10107, 10108, 10110 (2014) (noting the gender disparity in hiring by male faculty and noting that such bias reduces the number of highly competitive female faculty candidates in the biological sciences).

35. Wendy M. Williams & Stephen J. Ceci, *National Hiring Experiments Reveal 2:1 Faculty Preference for Women on STEM Tenure Track*, 112 PROC. NAT'L ACAD. SCI. 5360, 5362–65 (2015).

36. BURKE, *supra* note 13, at 28.

37. Bruce Booth, *Why Biotech's Talent, Capital and Returns Are Consolidating into Two Key Clusters*, FORBES (Mar. 21, 2017, 8:24 AM), https://www.forbes.com/sites/brucebooth/2017/03/21/inescapable-gravity-of-biotechs-key-clusters-the-great-consolidation-of-talent-capital-returns [https://perma.cc/ZLL3-3Y9J] (noting that biopharma R&D employment grew by 30% in Boston and San Francisco between 2007 and 2014 while declining 6.2% in the rest of the United States).

38. *See* Colin Schultz, *Why Do Families Move for Men's, but Not Women's, Careers?*, SMITHSONIAN (Dec. 1, 2014), https://www.smithsonianmag.com/smart-news/why-do-families-move-mens-not-womens-careers-180953490/ [https://perma.cc/KXS7-K4NF].

39. *See* Wendy M. Williams & Stephen J. Ceci, *When Scientists Choose Motherhood*, 100 AM. SCIENTIST 138, 141–43 (2012), https://www.americanscientist.org/article/when-scientists-choose-motherhood [https://perma.cc/SMX9-FYVD] (summarizing prior findings that female graduate students view the ability to have a part-time career as more important than their male counterparts and that roughly twice as many 33-year-old men who were in the top 1% of quantitative ability during adolescence reported working more than fifty hours per work compared to similar high-aptitude women).

employed part time (2.9 million women vs. 1.5 million men), consistent with more time-intensive family responsibilities reported by women in S&E.[40]

Furthermore, women in the S&E workforce may not receive the same amount of credit or recognition as their male counterparts even when they perform similar work.[41] Despite relatively high representation rates in the life sciences, more men named Michael (twenty-two) gave company presentations at the 2018 J.P. Morgan Healthcare Conference than female CEOs (twenty), with men representing 94% of overall speakers and 77% of special sessions speakers at the high-profile industry conference.[42] Even women who have reached the top of the academic pinnacle struggle for recognition relative to their male peers. For example, an internal study at the Massachusetts Institute of Technology found that many tenured women faculty felt marginalized and excluded from significant roles in their departments,[43] a chilly climate concern echoed by women across S&E positions[44] and reflected in pay disparities between the sexes.[45] After controlling for differences in field of highest degree, degree-granting institution, field of occupation, employment sector, and experience, women earn 9% less than men among S&E degree holders with a highest degree at the bachelor's or doctoral levels.[46] Furthermore, sexual harassment problems may

40. *See* NAT'L CTR. FOR SCI. & ENG'G STATISTICS, *supra* note 13, at 12.

41. *See* Angela Saini, *Once, Most Famous Scientists Were Men. But That's Changing*, NAT'L GEOGRAPHIC (Oct. 2019), https://www.nationalgeographic.com/science/2019/10/women-stem-gaining-recognition-feature [https://perma.cc/2KCJ-Z2Q5] (describing science's "woeful record" at acknowledging the contributions of women).

42. *See* Rebecca Robbins & Meghana Keshavan, *Men Named Michael Outnumber Female CEOs Presenting at #JPM18*, STAT (Jan. 7, 2018), https://www.statnews.com/2018/01/07/jpm-gender-diversity/ [https://perma.cc/VYG6-V99N].

43. *See A Study on the Status of Women Faculty in Science at MIT*, 11 MIT FAC. NEWSL. (Mass. Inst. Tech., Cambridge, Mass.), Mar. 1999, at 4, 13. Notably, this view was not shared by junior colleagues. *See id.* at 6, 9–11. More recently, women at the Salk Institute have described a similar culture of marginalization, including sexual harassment and bias in resource allocation. *See* Mallory Pickett, *'I Want What My Male Colleague Has, and That Will Cost a Few Million Dollars,'* N.Y. TIMES (Apr. 18, 2019), https://www.nytimes.com/2019/04/18/magazine/salk-institute-discrimination-science.html [https://perma.cc/4Z39-DR6J].

44. *See* Cary Funk & Kim Parker, *Women and Men in STEM Often at Odds over Workplace Equity*, PEW RES. CTR. (Jan. 9, 2018), https://www.pewsocialtrends.org/2018/01/09/women-and-men-in-stem-often-at-odds-over-workplace-equity/ [https://perma.cc/EQ6L-GXXG] (describing inequalities perceived by women in science, technology, engineering, or math workplaces, including gender discrimination and sexual harassment).

45. BURKE, *supra* note 13, at 55–57.

46. *See id.* Notably, this pay discrepancy may be less than that observed in other industries, although the magnitude of the pay gap varies significantly based on study methodology. *See The State of the Gender Pay Gap in 2019*, PAYSCALE, https://www.pay

compound recognition disparities, leading to reduced innovative output by talented women.[47]

Male entrepreneurs also raise more money than female entrepreneurs,[48] a gap partially explained by investors' gendered treatment of fundraisers. Investors tend to ask men more promotion-focused questions and female entrepreneurs more prevention-focused questions.[49] Regardless of gender, funding outcomes diverge based on the types of questions asked, with prevention-focused questions significantly limiting founders' ability to raise capital.[50] Moreover, the vast majority of venture capitalists (VCs) who invest in promising new enterprises are male,[51] and women seeking funds from VCs often contend with unwanted advances from male fund managers.[52] In the academic

---

scale.com/data/gender-pay-gap [https://perma.cc/4BWK-SNMW] (last visited Nov. 21, 2019) (comparing controlled gender pay gaps, which represent the amount a woman earns per $1.00 made by an equivalent man after accounting for factors such as job title, years of experience, and location across industries, and finding a $0.99 and $1.00 controlled gender gap in engineering and science and tech, respectively, compared to $0.97 and $0.98 controlled gender gaps in retail and customer service and consultancies and agencies, respectively).

47. Whether sexual harassment is more common in STEM fields relative to non-STEM fields is disputed, but the perception that it is common in STEM may result in fewer women entering the field and a more hostile work environment for those who do. *See* Funk & Parker, *supra* note 44 (noting that "[d]iscrimination and sexual harassment are seen as more frequent, and gender is perceived as more of an impediment than an advantage to career success [in STEM]" but "[w]omen in STEM and non-STEM jobs are equally likely to say they have experienced sexual harassment at work").

48. *See* Hayden Field, *98 Percent of VC Funding Goes to Men. Can Women Entrepreneurs Change a Sexist System?*, ENTREPRENEUR (Oct. 23, 2018), https://www.entrepreneur.com/article/315992 [https://perma.cc/DVB6-58F5] (citing PitchBook research indicating that only 2% of the $85 billion raised from venture capitalists in 2017 went to U.S. female-backed startups, and that women raise $7 million less than men on average in funding rounds); *see also* Malin Malmstrom et al., *VC Stereotypes About Men and Women Aren't Supported by Performance Data*, HARV. BUS. REV. (Mar. 15, 2018), https://hbr.org/2018/03/vc-stereotypes-about-men-and-women-arent-supported-by-performance-data [https://perma.cc/5JTP-CUZK] (noting that "venture capitalists adopt markedly different stereotypical notions of female and male entrepreneurs during their decision-making processes" and, as a result, "female entrepreneurs may face difficulties in gaining credibility because different standards are used to evaluate their performance").

49. *See* Dana Kanze et al., *Male and Female Entrepreneurs Get Asked Different Questions by VCs — and It Affects How Much Funding They Get*, HARV. BUS. REV. (June 27, 2017), https://hbr.org/2017/06/male-and-female-entrepreneurs-get-asked-different-questions-by-vcs-and-it-affects-how-much-funding-they-get [https://perma.cc/CG6S-PBLX] (finding that "67% of the questions posed to male entrepreneurs were promotion-oriented, while 66% of those posed to female entrepreneurs were prevention-oriented").

50. *See id.* ("Entrepreneurs who were asked promotion questions received twice as much funding as those who were asked prevention questions.").

51. *See* Ainsley Harris, *Bros Dominate VC, Where 91% of Decision-Makers Are Male*, FAST CO. (Mar. 7, 2018), https://www.fastcompany.com/40540948/91-of-decision-makers-at-u-s-venture-capital-firms-are-men [https://perma.cc/G432-MFDZ].

52. *See* Joan C. Williams, *Why Sexual Harassment Is More of a Problem in Venture*

fundraising context, evidence is decidedly more mixed, with some studies suggesting prejudice in grant funding and others finding no evidence of a gender gap after accounting for differences in resources and experience.[53]

Beyond money matters, many women must surmount heightened standards to obtain other markers of S&E success. Mixed evidence exists regarding gender bias in manuscript review. A 2014 literature review concluded that there is no evidence of sex discrimination when comparing women and men with similar resources.[54] However, a recent report suggests that, at least in economics, women are held to higher standards vis-à-vis writing quality, and that female authored papers published in top journals spend longer in peer review.[55] In less quantifiable—but no less important for promotion and inclusion—domains, some studies suggest that, when there is ambiguity about the quality of a woman's contribution to a joint, stereotypically male task, the woman's role is downplayed.[56] Perhaps partially reflecting exclusion in instances of ambiguity, women are significantly less likely than men to be named inventors on patents, and patent applications with female inventors are less likely to issue.[57]

Capital, HARV. BUS. REV. (July 12, 2017), https://hbr.org/2017/07/why-sexual-harassment-is-more-of-a-problem-in-venture-capital [https://perma.cc/642T-J3ZK].

53. *See* Ceci et al., *supra* note 14, at 112–15 (summarizing the mixed evidence on sex biases in grant funding rates in Europe and the United States and concluding that "[n]otwithstanding [bias] claims . . . , there are no systematic sex differences in grant-funding rates").

54. *See id.* at 111–12 (noting no sex differences have been demonstrated for actual journal acceptance rates, although student subjects have rated manuscripts with a male author more favorably than the same manuscript with a female author). Women are more likely than men to lack resources, with women being more likely to hold faculty positions at teaching-intensive institutions. *See* Stephen J. Ceci & Wendy M. Williams, *Understanding Current Causes of Women's Underrepresentation in Science*, 108 PROC. NAT'L ACAD. SCI. 3157, 3158 (2011) (arguing that "the critical variable [in journal reviewing] is not sex per se, but rather access to resources, which correlates with sex because women are more likely to work as adjuncts or at teaching-intensive institutions with limited resources").

55. *See* Erin Hengel, Publishing While Female: Are Women Held to Higher Standards? Evidence from Peer Review 19, 22–23 (Jan. 2020) (unpublished Ph.D dissertation, University of Cambridge), http://www.erinhengel.com/research/publishing_female.pdf [https://perma.cc/YYW9-7KC5] (observing that higher standards for female authors could play a role in "academia's 'Publishing Paradox'").

56. *See* Madeline E. Heilman & Michelle C. Haynes, *No Credit Where Credit Is Due: Attributional Rationalization of Women's Success in Male–Female Teams*, 90 J. APPLIED PSYCHOL. 905, 914–16 (2005) (finding that "women were thought to be generally less competent, less influential in arriving at the successful team outcome, and less apt to have taken on a leadership role in the task than were their male counterparts" under most circumstances across three studies).

57. *See* Kyle Jensen et al., *Gender Differences in Obtaining and Maintaining Patent Rights*, 36 NATURE BIOTECHNOLOGY 307, 307, 308 fig.1 (2018).

C. High Rates of Exit and Re-Entry Barriers

While considerable attention is paid to upstream pipeline leaks for young women in S&E, the downstream gusher of women out of the S&E workforce is often overlooked. Women in S&E not only leave the workforce at higher rates than men, they leave for non-S&E jobs at higher rates than men.[58] More troublingly, 50% of women who initially work in S&E exit to other fields after twelve years, compared to about 20% exit in other professions.[59] Much of this gap has been attributed to poor persistence among female engineers, who disproportionally move out of S&E occupations but not out of the workforce compared to other professional women.[60] One study attributed the persistence problem in engineering to dissatisfaction with pay and promotion prospects rather than work-family factors;[61] in another, women exiting engineering cited work-life imbalance (16%), loss of interest in engineering work (12%), lack of advancement opportunities (11%), and dislike of job tasks (9%) as reasons for exit.[62]

Regardless of their reasons for leaving the workforce, female scientists and engineers often discover that the S&E door only opens outward. Because technology changes rapidly, barriers to re-entry after a career break are often high.[63] Bias against working mothers, including commitment concerns, compound the skill gap that can emerge during time away.[64]

To enable high-potential individuals to re-enter biomedical research careers after an "interruption," the National Institutes of Health (NIH) awards Re-Entry Supplements "designed to bring a

---

58. *See* Glass et al., *supra* note 24, at 725.

59. *See id.* at 734, 736 fig.1.

60. *See id.* at 725.

61. *See id.*

62. Nadya A. Fouad et al., *Women's Reasons for Leaving the Engineering Field*, FRONTIERS PSYCHOL., June 2017, at 1, 4.

63. *See* Karen Horting, *How Nonprofits Can Bridge the Career Re-Entry Gap with 'Returnships*,*'* SWE: ALL TOGETHER (July 26, 2018), https://alltogether.swe.org/2018/07/how-nonprofits-can-bridge-the-career-re-entry-gap-with-returnships/ [https://perma.cc/BF5K-G5BV] (noting that "[r]elaunchers are often unqualified technically, and employers may not have time to get them up to speed"). In some industries where fundamental tools do not turn over rapidly, the perception of rapid technological change may not reflect practical skill disparities.

64. *See* Lesley Evans Ogden, *Working Mothers Face a 'Wall' of Bias—but There Are Ways to Push Back*, SCI. (Apr. 10, 2019, 3:00 PM), https://www.sciencemag.org/careers/2019/04/working-mothers-face-wall-bias-there-are-ways-push-back [https://perma.cc/4ZQW-JBHP].

scientist's existing research skills and knowledge up-to-date."[65] However, the program is small and targeted only at women who held postdoctoral or faculty positions when they exited the scientific workforce.[66] In a similar vein, the STEM Re-Entry Task Force matches female engineers with "returnships"—short-term internships to enable women "to get their technical skills up to speed."[67] Its short-term results have been impressive, with 60% to 100% of re-entry interns being hired as long-term employees by participating companies.[68] But, similar to the NIH Re-Entry program, the STEM Re-Entry Task Force reaches only a small number of the potential female innovators who exited the S&E workforce over the past decade.

III. WHAT INTERVENTIONS MIGHT REDUCE GENDER INEQUALITY AMONG INNOVATORS?

In short, gender disparities persist throughout the STEM career pipeline: women are less likely to pursue STEM employment in the first place, and those who do are more likely to drop out of the STEM workforce. These problems could be tackled through a vast array of policies, including those focused on reducing social inequality more broadly. We will not attempt to canvas the full range of interventions that could be targeted at the innovation gender gap. Rather, we focus here on two policy recommendations stemming from Professor Lobel's lecture: increasing workplace transparency, such as by limiting the information that is protected through nondisclosure agreements (NDAs), and promoting worker mobility by limiting the enforceability of noncompete agreements. We then describe two other interventions more directly targeted at increasing innovation by women: pipeline programs for women in STEM and grants or prizes to increase resources and incentives for female innovators.

65. *See Re-Entry into Biomedical Research Careers*, NAT'L INST. HEALTH, https://orwh.od.nih.gov/career-development/re-entry-biomedical-research-careers [https://perma.cc/WT9N-62CS] (last visited Nov. 13, 2019).

66. *See id.*

67. *See* Erin Spencer, *'40-Year-Old Interns' Are Helping STEM Companies Achieve Gender Parity*, FORBES (July 22, 2019, 11:37 AM), https://www.forbes.com/sites/erinspencer1/2019/07/22/40-year-old-interns-are-helping-stem-companies-achieve-gender-parity [https://perma.cc/X8AF-DJST].

68. *See* HONNA EICHLER GEORGE, SOC'Y OF WOMEN ENG'RS, AN INTERVENTION STRATEGY TO RE-ENGAGE WOMEN ENGINEERS IN THE WORKFORCE 3 (2017), https://reentry.swe.org/wp-content/uploads/sites/3/2017/04/STEM-Re-entry-White-Paper-Exec-Summary-and-Needs-Statement.pdf [https://perma.cc/RGP3-RF3M].

A. Increase Workplace Transparency

Professor Lobel highlights three particular kinds of information whose protection through NDAs and related contracts may exacerbate gender inequality among innovators: (1) information about claims of sexual misconduct; (2) diversity data and strategies; and (3) salary information.[69] She does not explicitly lay out the mechanisms under which lack of transparency about each type of information affects the innovation gender gap, so we begin by trying to unpack these effects.

First, on sexual misconduct, Professor Lobel states that many of the claims that have emerged through the #MeToo movement had been hidden by NDA-protected settlement agreements and mandatory arbitration.[70] As we understand it, her hypothesis is that lack of transparency about these claims allowed harassers to continue in their employment and contributed to hostile work environments in which women did not feel welcome or comfortable, making them less likely to join or remain at these firms. This conjecture is plausible and consistent with reports that women in STEM perceive a less positive and supportive climate than similarly situated men, although it would be strengthened by showing that the problem extends beyond a few compelling examples of women in the entertainment industry breaking their contractually enforced silence about ongoing sexual harassers.[71] And even if NDA-protected sexual misconduct claims are pervasive in R&D-focused workplaces, this effect cannot explain women's choices to switch to non-STEM careers unless the problem of silencing accusations against harassers is *more* pervasive among innovators than among noninnovators or women's intra-STEM exit options are significantly constrained. There are at least some reasons to believe that harassment may be more prevalent in male-dominated R&D workplaces,[72] but we

69. Lobel, *supra* note 10, at 787, 790–91.

70. *Id.* at 787–88.

71. If NDAs are used to quietly remove sexual harassers from employment rather than to silence their victims, the net effect of this secrecy on workplace gender dynamics becomes even more difficult to predict. For example, greater publicity could cause some women to overestimate the true risk of harassment. NDAs might also make it easier for victims to remain within the industry.

72. *See generally* NAT'L ACADS. OF SCI., ENG'G & MED., SEXUAL HARASSMENT OF WOMEN: CLIMATE, CULTURE, AND CONSEQUENCES IN ACADEMIC SCIENCES, ENGINEERING, AND MEDICINE 65 (2018) (noting that "[a]cademic science, engineering, and medicine exhibit at least four characteristics that create higher levels of risk for sexual harassment to occur": (1) a "[m]ale-dominated environment"; (2) "[o]rganizational tolerance for sexually harassing behavior"; (3) "[h]ierarchical and dependent relationships between faculty and their trainees"; and (4) "[i]solating environments"). *Compare* Phyllis L. Carr et al., *Faculty*

have not seen reliable data on this issue, much less on the relative use of NDAs in settlement agreements and mandatory claim arbitration across industries.

If it turns out to be correct that NDA-protected settlement agreements and mandatory arbitration of sexual harassment claims depress innovation by women, then this problem might be addressed by prohibiting these practices, as in recent laws passed in California, New York, and Washington.[73] But before clear policy conclusions could be drawn, it would also be necessary to understand the effects of these laws beyond innovation outcomes, such as whether they increase litigation costs by discouraging settlement or make it more difficult for victims of sexual harassment to recover compensation for their injuries and thus also reduce deterrence.[74]

The second kind of information Professor Lobel highlights is diversity data and strategies. She argues that greater transparency would "allow workers to make informed decisions," provide greater information to competitors (presumably about how best to increase their own workforce diversity), and aid reviewers who want to "showcase successes" through better rankings of the most diverse workplaces.[75] We think it is worth disentangling the different kinds of diversity information available and the different audiences for that information.

To the extent strategies for recruiting and retaining diverse talent from a limited pool provide a competitive advantage, the conventional economic logic of IP would suggest that allowing these strategies to be protected through trade secret law incentivizes their production.[76] Arguing that secrecy for diversity-

---

Perceptions of Gender Discrimination and Sexual Harassment in Academic Medicine, 132 ANNALS INTERNAL MED. 889, 889, 892 (2000) (noting that more than half of female faculty in academic medicine reported experiencing some form of workplace sexual harassment), *with* Press Release, ABC News, One in Four U.S. Women Reports Workplace Harassment (Nov. 16, 2011), http://www.langerresearch.com/uploads/1130a2WorkplaceHarassment.pdf [https://perma.cc/WK9H-WGH6] (reporting that one in four women experiences harassment in the workplace). Additionally, some studies suggest that men working in STEM occupations possess more traditional views on gender roles than their female coworkers, a potential source of friction in the male-dominated STEM workplace. *See* Sassler et al., *supra* note 23, at 198–99 ("Women STEM majors were more likely than their male counterparts to expect to have no children, while male STEM majors had more traditional gender ideologies than female STEM majors.").

73. *See* Lobel, *supra* note 10, at 788 (describing this legislation).

74. *See generally* Saul Levmore & Frank Fagan, *Semi-Confidential Settlements in Civil, Criminal, and Sexual Assault Cases*, 103 CORNELL L. REV. 311 (2018) (discussing the potential effects of disclosure laws on the incentives of victims and defendants in sexual harassment cases).

75. Lobel, *supra* note 10, at 791.

76. *See generally* Mark A. Lemley, *The Surprising Virtues of Treating Trade Secrets as IP Rights*, 61 STAN. L. REV. 311 (2008).

enhancing strategies leads to less diversity is conceptually similar to arguing that trade secrecy protection for pharmaceutical research plans hinders pharmaceutical research. Whether the argument is correct depends on the disputed costs and benefits of trade secrecy protection.[77] To be sure, trade secrecy has costs, which may not be outweighed by the incentive benefit in the case of diversity strategies or more broadly in the case of innovation. But this cannot be resolved as a matter of theory, and we are unaware of any data on point.

For the outcome of these strategies—data about the diversity of different workforces—we think the arguments in favor of allowing secrecy are weak, even if there are plausible benefits associated with protecting the strategies underlying diversity outcomes. To the extent secrecy regarding diversity data, rather than diversity strategies, provides a competitive advantage to some firms, we imagine it does so by either limiting workers' abilities to make employment decisions based on the relative diversity (or homogeneity) of their current and prospective employers or by minimizing outside pressure—from vendors, consumers, and policymakers—to diversify. Even relatively diverse firms, which might be competitively advantaged through disclosure of diversity data, might prefer secrecy if *absolute* diversity falls far short of ideal. Secrecy regarding outcomes then may mitigate incentive effects provided by secrecy around production (i.e., diversity strategies), counteracting the potentially pro-competitive benefits of protecting the strategies in the first place and counseling against trade secrecy for diversity data even if strategies should be protected under the conventional economic logic of IP.[78]

Finally, on salary information, Professor Lobel builds on her argument from a separate *Columbia Law Review* article on the connection between transparency and gender pay equity.[79] Greater transparency can include protecting workers who voluntarily share their salaries as well as mandating that

---

77. *See generally* Robert G. Bone, *The (Still) Shaky Foundations of Trade Secret Law*, 92 TEX. L. REV. 1803, 1831 (2014) (discussing normative arguments for and against trade secrecy law and observing that "we simply do not have enough empirical information to predict consequences with sufficient confidence to be able to compare expected costs and benefits" in the context of trade secrecy).

78. If most of the pro-competitive benefits derived from diversity strategies flow directly from having a diverse workforce—rather than recruitment benefits or virtue signaling—the (dis)incentive effect may be minimal. We are unaware of literature directly addressing the relative benefits firms expect from diversifying their workforce.

79. Orly Lobel, *Knowledge Pays: Reversing Information Flows & the Future of Pay Equity*, 120 COLUM. L. REV. (forthcoming 2020) (manuscript at 18), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3373160 [https://perma.cc/ZZA7-9296].

employers share aggregated salary information. There is some evidence that state bans on pay secrecy reduce the gender wage gap,[80] although the net effect of full transparency can be to lower overall salaries[81] and decrease overall worker satisfaction.[82] We are unaware, however, of any evidence about the effect of pay transparency on gender disparities in innovation. Even if pay transparency increases women's salaries, addressing pay concerns currently reported by some women who exit engineering for non-STEM workplaces,[83] it may do little to reduce the current flow of women to non-STEM careers if it also makes those nontechnical careers more attractive.

B. Limit the Enforceability of Noncompete Agreements

In addition to advocating for greater workplace transparency, Professor Lobel recommends promoting innovation by women through limits on noncompete agreement enforceability. It is worth noting at the outset that the effect of noncompetes on the innovation gender gap is likely small compared with their broader social effects. Professor Lobel has argued in prior work that noncompete agreements depress overall innovation,[84] and if that is correct, more widespread adoption of California-like bans on noncompete agreements may be the right public policy regardless of gender diversity effect. Here, we limit our focus to that of

80. *See* Marlene Kim, *Pay Secrecy and the Gender Wage Gap in the United States*, 54 INDUS. REL. 648, 664–65 (2015).

81. *See* Michael Baker et al., *Pay Transparency and the Gender Gap* 6–7 (Nat'l Bureau of Econ. Research, Working Paper No. 25834, 2019), https://www.nber.org/papers/w25834 [https://perma.cc/N84C-QKXB]; Zoë B. Cullen & Bobak Pakzad-Hurson, Equilibrium Effects of Pay Transparency in a Simple Labor Market 6 (May 2019) (unpublished manuscript), https://www.hbs.edu/faculty/Pages/item.aspx?num=52648 [https://perma.cc/28KQ-NZPK]; Alexandre Mas, *Does Transparency Lead to Pay Compression?*, 125 J. POL. ECON. 1683, 1685 (2017).

82. David Card et al., *Inequality at Work: The Effect of Peer Salaries on Job Satisfaction*, 102 AM. ECON. REV. 2981, 3001 (2012).

83. *See* Glass et al., *supra* note 24, at 725.

84. *See, e.g.*, ORLY LOBEL, TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE LEAKS, RAIDS, AND FREE RIDING 68–69 (2013). For support on this point, see, for example, Bruce Fallick et al., *Job-Hopping in Silicon Valley: Some Evidence Concerning the Microfoundations of a High-Technology Cluster*, 88 REV. ECON. & STAT. 472 (2006); Mark J. Garmaise, *Ties That Truly Bind: Noncompetition Agreements, Executive Compensation, and Firm Investment*, 27 J.L. ECON. & ORG. 376 (2011); Ronald J. Gilson, *The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete*, 74 N.Y.U. L. REV. 575 (1999); Matt Marx et al., *Regional Disadvantage? Employee Non-Compete Agreements and Brain Drain*, 44 RES. POL'Y 394 (2015); and ANNALEE SAXENIAN, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128 (1994). For counterarguments, see Jonathan Barnett & Ted Sichelman, *The Case for Noncompetes*, U. CHI. L. REV. (forthcoming 2020) (manuscript at 103–04), https://ssrn.com/abstract=3516397 [https://perma.cc/6BJX-4JL4].

Professor Lobel's Frankel Lecture: whether this policy intervention seems effective for increasing innovation by women.

Professor Lobel's argument on the effect of noncompete enforceability on the innovation gender gap depends heavily on three unpublished manuscripts, which she says "consistently confirm that noncompetes harm women more than men."[85]

Two of these drafts focus on the pay gap, although neither is focused on STEM industries, the topic of this Commentary. Matthew Johnson, Kurt Lavetti, and Michael Lipsitz look at the effect of state-level enforceability of noncompete agreements on reported incomes across all workers and found that moving from the ninetieth to tenth percentile of noncompete enforceability accounts for about 6 to 7% of the gender wage gap.[86] And in a separate study, Michael Lipsitz and Evan Starr found that the 2008 Oregon ban on noncompete agreements for low-wage hourly workers led to wage increases of 3.5% for women relative to 1.5% for men.[87] These studies reflect a substantial effort at understanding the relationship between noncompetes and gender. But even if these results withstand the robustness checks demanded by the economics peer review process and can be translated to the STEM workforce (which is less likely to include

---

85. Lobel, *supra* note 10, at 802. These provide the most direct evidence of the effect of noncompetes on women. Noncompetes may also affect market concentration, and Professor Lobel cites studies suggesting that women "are negatively affected by labor market concentration." *Id.* While her statement is plausible, of the three studies she notes, only one study from Norway seems to provide some support for this point, although it is focused on the wage gap across all workers rather than innovation. *See* Erling Barth & Harald Dale-Olsen, *Monopsonistic Discrimination, Worker Turnover, and the Gender Wage Gap*, 16 LABOUR ECON. 589, 596 (2009). A second study she cites points in the opposite direction, or at least fails to confirm a gender difference in the effects of noncompetes. *See* Sydnee Caldwell & Emily Oehlsen, Monopsony and the Gender Wage Gap: Experimental Evidence from the Gig Economy 1 (Nov. 29, 2018) (unpublished manuscript), https://sydneec.github.io/Website/Caldwell_Oehlsen.pdf [https://perma.cc/N7CB-39Y4] ("These results fail to support the hypothesis that gender differences in labor supply response are important for pay gaps for low-skilled workers."). And the third study does not specifically discuss the gender effects of labor market concentration. *See* David Card et al., *Firms and Labor Market Inequality: Evidence and Some Theory*, 36 J. LAB. ECON. S13, S55–57 (2018). It is possible that reducing the enforceability of noncompetes could decrease market concentration, which might decrease the gender pay gap by increasing competition for labor and women's negotiation position, which—if it increased wages in innovation-related fields more than others—might incentivize more innovation by women. But given the lack of evidence for the links in this causal chain, we do not think this would be high on the list of hypotheses to test for a policymaker specifically interested in boosting female innovation, rather than addressing adverse outcomes associated with monopsony more generally.

86. Matthew S. Johnson et al., The Labor Market Effects of Legal Restrictions on Worker Mobility 28 (Sept. 22, 2019) (unpublished manuscript), https://ssrn.com/abstract=3455381 [https://perma.cc/4TNX-PJQV].

87. Michael Lipsitz & Evan Starr, Low-Wage Workers and the Enforceability of Non-Compete Agreements 21–22 (Dec. 2019) (unpublished manuscript), https://ssrn.com/abstract=3452240 [https://perma.cc/WQS8-5RYZ].

low-wage workers), they at most suggest that noncompete enforceability is responsible for a small percentage of the gender pay gap. As we noted above, closing this gap across industries may do little to increase *innovation* by women if it also makes noninnovation work more attractive.

The third draft manuscript, by Matt Marx, finds that women are less likely to start a new firm following dissolution of their prior employer, but are *more* likely to do so in states that have recently increased enforcement of noncompete agreements.[88] He interprets these results as showing that noncompetes cause women to postpone starting rival businesses.[89] The behavior of women required to make an employment change may not be the best evidence from which to make generalizations about women on average, but Marx nicely illustrates the need for a fine-grained understanding of how noncompetes are used, interpreted, and enforced across industries. More importantly, like wages, employment outcomes are not the same as *innovation* outcomes. Establishing a disparate effect of noncompetes on innovation requires a few more evidentiary links in the causal chain.

In sum, there are reasons to believe that reducing restrictions on workers' exit and voice opportunities may increase innovation by women, although the most plausible causal mechanisms involve a number of steps, only some of which have evidentiary support and all of which operate against a backdrop of pre-existing local and industry norms. Anecdotally, California—with its famous long-standing ban on enforcing noncompetes—ranked below seven other states in share of female patent inventors residing in the state between 2012 and 2016; Delaware, the state with the highest female inventor rate among residents, enforces reasonable noncompetes.[90] California is also not in the top ten

88. Matt Marx, Employee Non-Compete Agreements, Gender, and the Timing of Entrepreneurship 2, 16 (May 4, 2018) (unpublished manuscript), https://ssrn.com/abstract=3173831 [https://perma.cc/AF3Q-FJFQ].

89. *Id.* Marx suggests numerous mechanisms to explain these effects, including "higher levels of risk aversion," that women "have fewer financial resources to defend against potential lawsuits," and that "[w]omen who abandon firms they founded to return to paid employment face a wage penalty whereas men appear to be rewarded for such experience." *Id.* at 24.

90. The USPTO defines the actual female inventorship rate as "percent of unique women inventors across all patents granted in a given year," with an "adjusted women inventor rate equal to one indicat[ing] that the proportion of women inventors is equal to the proportion of women in the workforce." *See* OFFICE OF THE CHIEF ECONOMIST, *supra* note 17, at 4, 7, 13 ("Delaware, the District of Columbia, and New Jersey actually exhibit the highest women inventor rates (both actual and adjusted). For 2012–2016 patent grants, women accounted for just over 18% of inventors residing in Delaware and 17% of inventors residing in each of the District of Columbia and New Jersey."). Industry concentration by

states based on the share of female self-employed workers[91] or various measures of the economic impact of women-owned businesses.[92] Thus, while reducing employee restrictions may have broader social benefits beyond the effects on the innovation gender gap, policymakers focused on the problem of women's low participation in innovation ecosystems should also consider interventions more directly targeted at this problem.

C. Create Pipeline Mentorship Programs for Women in STEM

One targeted policy that has attracted significant recent interest is pipeline mentorship programs for women in STEM, as well as corresponding programs for underrepresented racial minorities.[93] The Institute for Women's Policy Research recently profiled numerous programs focused on gender diversity in patenting and entrepreneurship, including mentorship and training programs for STEM undergraduate and graduate students, faculty, and other potential innovators.[94] For example,

---

state appears to be an important factor behind differences in female inventorship rates. *See* Tom Temin, *How Come Men Do All the Inventing?*, FED. NEWS NETWORK (Feb. 28, 2019, 10:07 AM), https://federalnewsnetwork.com/tom-temin-commentary/2019/02/how-come-men-do-all-the-inventing/ [https://perma.cc/CCZ4-YGXL] ("Delaware, where many chemical and pharmaceutical companies are headquartered, has the highest women inventor rate at about 20 percent. The District is second, which [USPTO economist Amanda] Myers speculated was because the federal government tends to foster female science participation at higher rates than industry."). While Delaware is home to a robust biopharmaceutical industry, California's technology industry, which otherwise serves as a poster child for the benefits of banning noncompetes, is notorious for gender and racial disparities in its workforce. *See* Sinduja Rangarajan, *Here's the Clearest Picture of Silicon Valley's Diversity Yet: It's Bad. But Some Companies Are Doing Less Bad*, REVEAL NEWS (June 25, 2018), https://www.revealnews.org/article/heres-the-clearest-picture-of-silicon-valleys-diversity-yet/ [https://perma.cc/6KJF-54PG].

91. *See* U.S. CHAMBER OF COMMERCE, WOMEN-OWNED BUSINESSES: CARVING A NEW AMERICAN BUSINESS LANDSCAPE 12 fig.2 (2014), https://www.uschamberfoundation.org/sites/default/files/Women-Owned%20Businesses%20Carving%20a%20New%20American%20Business%20Landscape.pdf [https://perma.cc/4W3G-VA24].

92. *See* AM. EXPRESS, THE 2019 STATE OF WOMEN-OWNED BUSINESSES REPORT 13–14 (2019), https://about.americanexpress.com/sites/americanexpress.newshq.businesswire.com/files/doc_library/file/2019-state-of-women-owned-businesses-report.pdf [https://perma.cc/F4GQ-T73N].

93. *See, e.g.*, Bonnie Marcus, *Mentors Help Create a Sustainable Pipeline for Women in STEM*, FORBES (Mar. 28, 2014, 9:12 AM), https://www.forbes.com/sites/bonniemarcus/2014/03/28/mentors-help-create-a-sustainable-pipeline-for-women-in-stem [https://perma.cc/8QW5-XUZS]; Charlie Wood, *Can Female Mentors Patch the Leaky STEM Pipeline*, CHRISTIAN SCI. MONITOR (June 6, 2017), https://www.csmonitor.com/Science/2017/0606/Can-female-mentors-patch-the-leaky-STEM-pipeline [https://perma.cc/CBT3-BJWB].

94. ELYSE SHAW & CYNTHIA HESS, INST. FOR WOMEN'S POLICY RESEARCH, CLOSING THE GENDER GAP IN PATENTING, INNOVATION, AND COMMERCIALIZATION 6 (2018), https://iwpr.org/wp-content/uploads/2018/07/C471_Programs-promoting-equity_7.24.18_Final.pdf [https://perma.cc/X6CH-KZJK].

MyStartupXX at the University of California San Diego is a six-month accelerator program that helps women-led teams create innovation-based startups through biweekly workshops about the commercialization process, networking events, and small seed grants.[95] Other STEM mentorship programs are focused on girls earlier in the pipeline.[96]

One might think that widespread programs specifically focused on the innovation gender gap would be supported by solid evidence of effectiveness and that we mention these mentorship programs to contrast Professor Lobel's policy recommendations with those that have a stronger empirical foundation. Not so. We mention these programs to illustrate that even the most straightforward interventions have surprisingly little support.

Unfortunately, despite marketing reports about "how well such support programs can work" to "support young girls and women as they dream of STEM careers and struggle to make those dreams come true,"[97] there is little evidence of the effectiveness of this kind of pipeline initiative. Many programs track participant outcomes, albeit without a standardized endpoint, but with no valid comparison group, interpreting the results is difficult.[98] One of the few relevant studies is of the six-week Minority Medical Education Program, which found that participation was associated with an increase in medical school acceptance (controlling for college grades, MCAT scores, and other factors known to relate to acceptance), although selection into the program was nonrandom.[99] Much more work should be done to

95. *Id.* at 19–21.

96. *See, e.g.*, *Role Models and Mentoring*, NAT'L GIRLS COLLABORATIVE PROJECT, https://ngcproject.org/role-models-and-mentoring [https://perma.cc/U93W-BU8M] (last visited Feb. 3, 2020). One of us (Ouellette) used to run the Expanding Your Horizons Conference at Cornell University, through which hundreds of middle-school girls are matched with a science graduate student buddy and given the chance to participate in hands-on STEM workshops. *See Expanding Your Horizons at Cornell*, EXPANDING YOUR HORIZONS, https://www.eyh.cornell.edu/index.php [https://perma.cc/LC32-X9UA] (last visited Feb. 2, 2020).

97. STEMCONNECTOR, WOMEN IN STEM: REALIZING THE POTENTIAL 25 (2014), https://www.millionwomenmentors.com/sites/default/files/facts/Women_in_STEM_-_Realizing_the_Potential.pdf [https://perma.cc/JEY5-QUJS].

98. *See* SHAW & HESS, *supra* note 94, at 7. The most in-depth outcome analysis cited is a Ph.D. dissertation focused on a ten-week program at University of Florida, but this study was just based on interviews with participants. *See* Cheryl D. Calhoun, "We Are EWITS—Hear Us Roar!": Empowering Women in Technology Startups (EWITS) as an Experiential Learning Model to Challenge Gendered Social Norms in the Field (2017) (unpublished Ph.D. dissertation, University of Florida), https://ufdc.ufl.edu/UFE0051699/00001 [https://perma.cc/C3HG-W98N].

99. Joel C. Cantor et al., *Effect of an Intensive Educational Program for Minority College Students and Recent Graduates on the Probability of Acceptance to Medical School*, 280 JAMA 772, 772–73, 775–76 (1998).

validate these programs—including studies on what specific program aspects are most cost-effective.

D. Target Grants and Prizes at Female Innovators

A different suite of targeted interventions is grants and prizes for women innovators.[100] If part of the innovation gender gap is driven by insufficient economic resources or incentives, then the most natural solution would be to address those financial problems directly rather than through policy reforms that have a more tangential effect on the returns to innovation.

While there is mixed evidence on the role of gender in general grantmaking,[101] targeted awards could be better used to promote female innovators in academia. Existing female-focused grants and prizes are targeted mainly at early-career women (e.g., graduate students and postdoctoral scholars) and women in the biomedical sciences, where the pipeline still includes many women.[102] The NIH and the National Science Foundation also offer supplemental awards to support underrepresented minority trainees, including women of color.[103] However, funding specifically directed at women later in the pipeline is rare, and economic resources and incentives for women in STEM outside academia are similarly scarce.[104]

---

100. The key difference between grants and prizes is whether the transfer to innovators is made *ex ante*, before the results of their R&D projects are known, or *ex post* for only R&D projects that turn out to be successful. For a thorough discussion of this dimension of innovation policy, see Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents–Prizes Debate*, 92 TEX. L. REV. 303, 333–45 (2013). One factor that affects the policy choice is the risk aversion and optimism bias of innovators. *See id.* at 340–42. If women are more risk averse—as suggested by some but not all studies—there could be a gender difference in the response to innovation inducement prizes. *See generally* Muriel Niederle, *Gender* 7 (Nat'l Bureau of Econ. Research, Working Paper No. 20788, 2014) ("The evidence on gender differences in risk aversion is also much less clear than one might expect.").

101. *See* Ceci et al., *supra* note 14, at 112–15.

102. *See, e.g.*, Melissa Mertl, *Grants for Women in Science*, SCI. (May 31, 2000, 8:00 AM), https://www.sciencemag.org/careers/2000/05/grants-women-science [https://perma.cc/US6H-NYGR].

103. *See Division of Chemistry Broadening Participation Resources*, NAT'L SCI. FOUND., https://www.nsf.gov/mps/che/broadening_participation/index.jsp [https://perma.cc/9PL3-RP2V] (last visited Nov. 19, 2019); *NIH Diversity/Minority Supplements for Your R01*, EDGE FOR SCHOLARS, https://edgeforscholars.org/nih-diversityminority-supplements-for-your-r01/ [https://perma.cc/T8V8-FWV4] (last visited Feb. 2, 2020).

104. NAM D. PHAM & ALEX J. TRIANTIS, U.S. CHAMBER OF COMMERCE FOUND., REACHING THE FULL POTENTIAL OF STEM FOR WOMEN AND THE U.S. ECONOMY 16, 26 (2015), https://www.uschamberfoundation.org/sites/default/files/Reaching%20the%20Full%20Potential%20of%20STEM%20for%20Women%20and%20the%20U.S.%20Economy.pdf [https://perma.cc/T5HW-NNQM]. Coding camp scholarships for female career switchers are one exception, albeit a narrowly tailored one. *See Coding Bootcamp Scholarships for*

Several prizes already exist for women in STEM.[105] However, despite a relatively large number of prizes specifically directed at female mathematicians,[106] women remain severely underrepresented in mathematics. One possible explanation is that prizes for women are less prestigious than general awards and come with less money attached. Very few women receive the top STEM prizes (e.g., the Nobel Prize and the Fields Medal)[107]—when Donna Strickland was awarded a 2018 Nobel Prize in Physics, she was the first woman to be so honored in over half a century.[108] In fact, only eighteen of the 599 Nobels awarded in all scientific disciplines since 1901 went home with female scientists.[109] Female prizewinners in science also receive less money as a result of their awards than their male counterparts. Among the top 5% of awards by financial value, one study found that only 14.6% of recipients were women.[110] Worse, "female prizewinners received an average of 64.4 cents of the prize money for every dollar a man received (on average, women received US$161,782 compared with $251,115 for men)."[111] While the increasing number of female prizewinners is encouraging, more work is needed to effectively balance the financial and reputational scales for male and female scientists.

IV. HOW CAN THESE HYPOTHESES BE TESTED?

As we have explained so far, the unequal participation of women in science, technology, and innovation is an issue of increasing concern for many public- and private-sector stakeholders, and those interested in increasing innovation by women would be well advised to consider Professor Lobel's ideas. But the key point we want to emphasize in this Commentary is that the underlying causal mechanisms for inequalities among

---

Women, THINKFUL, https://www.thinkful.com/blog/coding-bootcamp-scholarships-for-women/ [https://perma.cc/HW4T-FGHL] (last visited Feb. 2, 2020).

105. *See List of Science and Technology Awards for Women*, WIKIPEDIA, https://en.wikipedia.org/wiki/List_of_science_and_technology_awards_for_women [https://perma.cc/W89A-D5P8] (last updated Feb. 1, 2020).

106. *See id.*

107. *See* Yifang Ma et al., *Women Who Win Prizes Get Less Money and Prestige*, NATURE (Jan. 16, 2019), https://www.nature.com/articles/d41586-019-00091-3 [https://perma.cc/V98H-MCZF] (finding that "[o]f the top 50% most-prestigious prizes [based on Wikipedia page views for the prize between July 2015 and December 2017], women received only 11.3% of awards across all 5 decades," with 17.4% of awards going to women between 2008 and 2017).

108. *See id.*

109. *See id.*

110. *See id.*

111. *See id.*

innovators remain highly contested, and policymakers should not overstate the existing evidence for potential interventions out of a desire for rapid progress. Rather, we argue that governments and other institutions interested in this issue should look for opportunities to rigorously and transparently test the most promising interventions.

In prior work, one of us made the case for more robust use of policy experimentation to make empirical progress on patent and innovation policy[112] and conducted an actual field experiment in which hundreds of scientists were recruited to provide input on U.S. patent applications.[113] Here, we explore how different institutions could test Professor Lobel's ideas, as well as the other interventions described above.

Among stakeholders, federal and state governments are best positioned to engage in robust policy experimentation by, for example, randomizing implementation across regions or industries. While policy experimentation at the government level may seem like a dramatic departure from current practice, hundreds of government-designed policy experiments have already been conducted.[114] Some of these experiments are nonrandom; for example, Medicaid waivers allow individual states to test specific policy proposals, such as value-based pricing and work requirements, with state-level results informing future congressional decisions regarding Medicaid policy.[115] But the Centers for Medicare and Medicaid Services has also shown a willingness to pilot policies in ways that leverage randomized controlled trials.[116] Expanding the tradition of states as

---

112. Lisa Larrimore Ouellette, *Patent Experimentalism*, 101 VA. L. REV. 65, 127–28 (2015); *see also* Michael Abramowicz et al., *Randomizing Law*, 159 U. PA. L. REV. 929, 933 (2011); Colleen V. Chien, *Rigorous Policy Pilots: Experimentation in the Administration of the Law*, 104 IOWA L. REV. 2313, 2348–50 (2019).

113. Daniel E. Ho & Lisa Larrimore Ouellette, *Improving Scientific Judgments in Government: A Field Experiment of Patent Peer Review*, J. EMPIRICAL LEGAL STUD. (forthcoming 2020) (manuscript at 1, 5–6, 8), https://ssrn.com/abstract=3548921 [https://perma.cc/7H3Z-S6JN]. The results of this policy experiment "were substantially weaker and resource costs substantially higher than anticipated in the literature," illustrating the importance of this kind of rigorous evaluation of policy proposals. *Id.* For another model policy experiment, see Daniel E. Ho, *Does Peer Review Work? An Experiment of Experimentalism*, 69 STAN. L. REV. 1, 49–73 (2017).

114. For summaries of 240 social experiments completed by 2003, see DAVID GREENBERG & MARK SHRODER, THE DIGEST OF SOCIAL EXPERIMENTS (3d ed. 2004).

115. *See* Anne F. Weiss, *There's a Lot to Learn from State Medicaid Experiments, but Only if They're Carefully Evaluated*, HEALTH AFF. (Mar. 19, 2018), https://www.healthaffairs.org/do/10.1377/hblog20180314.287490/full/ [https://perma.cc/VS95-H422].

116. *See, e.g.*, *Medicare Care Choices Model*, CTRS. FOR MEDICARE & MEDICAID SERVS., https://innovation.cms.gov/initiatives/Medicare-Care-Choices/ [https://perma.cc/M9W2-2PKY] (last updated Jan. 8, 2020).

laboratories of democracy[117] to encompass more randomized experiments (e.g., in the context of NIH Re-Entry Supplements, randomizing policy across different Institutes and evaluating outcomes in the areas of health research supported by the different Institutes) would provide clearer evidence of policy efficacy than natural experiments. And randomized policy experiments need not be rigid or costly, as demonstrated by Daniel Ho's research team at Stanford.[118]

Furthermore, deliberate policy experimentation might mitigate the adverse effects of "bad" policies by rolling them out on a small trial basis. Illustratively, the recent Massachusetts Equal Pay Act may benefit women in the state by preventing their salary histories from following them to future jobs.[119] Or it may not, resulting in lower presumed wages and offers for female employees,[120] similar to the unintended stereotyping consequences observed in some jurisdictions that ban employers from asking about criminal records in job applications.[121] Performing controlled policy experiments may unearth unintended consequences earlier and enable more rapid course correction. While some may object to the unfairness of randomizing legal rights, people would have equal chance of receiving the treatment, and *ex ante*, it is unclear whether it is better to be in the treatment group.[122]

---

117. New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting) ("It is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.").

118. Cassandra Handan-Nader et al., Feasible Policy Evaluation by Design: A Randomized Synthetic Stepped-Wedge Trial in King County 1, 14–15, 30–31 (Nov. 16, 2018) (unpublished manuscript), https://dho.stanford.edu/wp-content/uploads/feasible_policy_evaluation.pdf [https://perma.cc/UZ3M-8AJN] ("Evidence-based policy is limited by the perception that randomized controlled trials (RCTs) are expensive and infeasible. We argue that carefully tailored research design can overcome these challenges and enable randomized evaluations of policy implementation.").

119. *See Learn More Details About the Massachusetts Equal Pay Act*, MASS.GOV, https://www.mass.gov/service-details/learn-more-details-about-the-massachusetts-equal-pay-act [https://perma.cc/RYY9-REVF] (last visited Feb. 2, 2020).

120. *See* Jeffrey A. Mello, *Why the Equal Pay Act and Laws Which Prohibit Salary Inquiries of Job Applicants Can Not Adequately Address Gender-Based Pay Inequity*, SAGE OPEN, July–Sept. 2019, at 1, 2–3.

121. *See* Amanda Agan & Sonja Starr, *Ban the Box, Criminal Records, and Racial Discrimination: A Field Experiment*, 133 Q.J. ECON. 191, 194–96 (2018) (describing a field experiment in which policies banning inquiries about criminal records increased the gap between callbacks for white and black applicants from 7% to 43%). In separate work, Professor Lobel has argued that banning reliance on prior salary to justify salary disparities, coupled with greater transparency in salary reporting, will be more effective than bans on inquiry about prior salaries. Lobel, *supra* note 79.

122. *See* Aguayo v. Richardson, 473 F.2d 1090, 1109 (2d Cir. 1973) (Friendly, J.)

However, governments are not the only stakeholders capable of policy experimentation. Nonprofit organizations, private employers, social media platforms, and academic institutions are all equipped to study the gendered effects of promising interventions—and many are motivated to do so. For example, nonprofit organizations such as the Bill and Melinda Gates Foundation and the Chan-Zuckerberg Initiative could create large "X prizes" for women in a random set of technological fields and see how that changes the gender distribution of innovation in those areas as measured by metrics such as the number of female inventors on patents in the space.[123]

Beyond philanthropic institutions interested in advancing female participation in the innovation ecosystem, private employers are well-positioned to study the effects of firm policy on female employees, and growing scrutiny of diversity practices from the public and from their own employees may give firms sufficient motivation to do so.[124] Any private employer with distinct units of R&D-focused employees (e.g., departments at a university or divisions at a tech firm) could engage in randomized experiments to test the effects of pay transparency within their organization by randomly publishing salary distributions for certain positions with multiple employees in some departments and not others and tracking gender effects on recruitment and retention between different departments at the firm. Though it is not obvious how a world in which one firm publishes salaries compares with one in which all firms are required to publish salaries, which might occur if a government implemented the experiment, both worlds would provide more information on the gendered effects of salary disclosure than the world we currently live in.

(stating that "the Equal Protection clause should not be held to prevent a state from conducting an experiment designed for the good of all, including the participants, on less than a statewide basis" and that concerns of unfairness "are inapposite to the selection, on a random but rational basis, of certain areas of the state to try out a program for the very purpose of determining whether it, or some variation of it should be made applicable to all"); Abramowicz et al., *supra* note 112, at 963–74 (providing a thorough discussion of the ethical and equity concerns with randomizing law); Ouellette, *supra* note 112, at 94, 96 (suggesting that analogizing any new benefits "to lottery tickets would make them more politically palatable" and that given the stakes of innovation policy, it seems "unethical *not* to pursue such experiments").

123. *See* Ouellette, *supra* note 112, at 92–95 (proposing randomization across similar technologies as a way to evaluate different innovation policies). For a review of the academic literature on innovation inducement prizes such as the X prizes, see generally Heidi Williams, *Innovation Inducement Prizes: Connecting Research to Policy*, 31 J. POL'Y ANALYSIS & MGMT. 752 (2012).

124. *See supra* note 4 and accompanying text. If firms partner with interested academics, such policy experiments could be implemented at very low cost to the firm.

Employment platforms like LinkedIn and Glassdoor may be uniquely suited to testing interventions around noncompetition agreements. There is little correlation between the incidence of noncompetes and level of enforcement, such that even in states that do not enforce like California and North Dakota, an estimated 19.3% of labor force participants have noncompete clauses in their employment agreements.[125] Just as a team of economists randomly informed University of California workers about an existing salary database to study effects of pay transparency,[126] an employment platform could randomly inform innovation workers in California about nonenforceability of noncompetes and study the rate of lateral moves among informed innovation workers compared to similarly situated workers (including workers with a similar amount of self-reported experience in similar roles) who did not receive the information.

Similarly, institutions running pipeline initiatives are well-positioned to study the effectiveness of early interventions, either using past data for their program (such as a regression discontinuity analysis with waitlisted applicants) or introducing randomization into future program acceptances. While pipeline programs may not have outcomes data on hand for all applicants, partnerships between pipeline programs and employment platforms may enable programs to track career trajectories without resorting to surveys.

Many academics would be excited to collaborate on these kinds of projects with institutional partners who are interested in building a robust evidence base both to increase their own social impact and to improve innovation policymaking more generally. The most effective policy experiment will depend on the institutional partner, but many public- and private-sector institutions seem well-poised to tackle the issue of inequality among innovators in terms of both their public expressions of interest in the innovation gender gap and their potential impact. We can envision successful collaborations not only with organizations whose primary mission is STEM diversity, but also with numerous government agencies, academic and private-sector STEM employers, science funding organizations, publishers, and patent-related offices.

---

125. J.J. Prescott et al., *Understanding Noncompetition Agreements: The 2014 Noncompete Survey Project*, 2016 MICH. ST. L. REV. 369, 461.

126. Card et al., *supra* note 82, at 2985–86.

V. CONCLUSION

Hundreds of academic papers are written every year on innovation and inequality.[127] However, isolated academic studies have been unable to resolve most of the core problems of innovation policy,[128] and we are still losing Maryam Mirzakhanis. The problem of inequality among innovators is daunting, but it is at least more tractable than most innovation-related problems because the desired outcome is clear: increasing the participation of underrepresented groups in the innovation ecosystem, including women—the focus of this Commentary—as well as racial minorities and people from low-income backgrounds. There are many policy interventions that might plausibly address this problem and many institutions that could implement tests of these interventions. We think legal scholars are well-positioned to work with these institutions to tackle this pressing social problem. And we should. Effective solutions, including effective laws, are unlikely to arise organically, and the alternative to dramatic, evidence-based policy change is grave: another century of inequality among American innovators—and those they innovate for.

127. Illustratively, a November 2019 Google Scholar search for "innovation and inequality" returned almost 75,000 non-patent literature references since 2015, with over 20,000 results from 2019 alone.

128. *See* Ouellette, *supra* note 112, at 75–87 (describing this empirical uncertainty).