Diversity & Innovation - A Research Perspective

Mike Schuster (Asst. Prof. of Legal Studies, UGA)
@Prof_Schuster; Mike.Schuster@UGA.edu
Benefits of Innovation

• Innovation drives labor productivity and economic growth.

• Innovation drives firm performance.

• Information spillovers drive follow-on innovation.
Outline

1. Descriptive data on inventors
2. STEM education
3. Impediments to invention
4. Social exposure and innovation
5. Differences in patent outcome
6. Losses to lack of diversity
Gender Disparities

• 1923, Dep’t of Labor – <2% female inventors over ten years
  • Data Limit – names with “no doubt of their sex.”
  • These ~5,000 patents exceeded all patents granted to women before that.

• USPTO – 12.1% in 2016 & 12.8% in 2019
  • Gender gap in repeat inventors likewise decreasing.
  • Slow pace towards parity (Bell, et al.)

Racial Disparities

• In 1970 to 2008:
  • African Americans awarded ~6 patents per million
  • Women awarded ~40 patents per million
  • Population at large awarded ~235 patents per million
  • Cook & Kongcharoen, *The Idea Gap in Pink and Black*, NBER (2010).

• From 1999–2003:
  • 2.7% of male college graduates applied for a patent.
  • Hispanic and black male inventors applied ~50% that rate.
STEM Education

• A STEM degree is commonly viewed as a step toward invention in many areas.

• 2013 - women accounted for 33.5% of science, technology, engineering, and math degrees.
  • Increases to 48% of STEM degrees if include health fields.
STEM Education

• As of 2017, percent of degrees conferred:
  • Black - 8.4% (13.4% of population as of 2019)
  • Hispanic - 13.3% (18.5%)
  • Asian - 12.4% (5.9%)

• U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); U.S. Census Data.
Why don’t certain groups patent?

• 2003 Survey of College Graduates
  • 7.5% of patents to women; 5.5% of commercialized patents
  • STEM educated women less likely to work in patent-centric fields (e.g., electrical engineering)
  • Female STEM grads less likely to work in their field (3%)
  • Female STEM grads less likely to work where a STEM degree is required (-13.5%) and less likely to spend >10% of work in R&D.

• Findings – STEM education gap accounts for some of the patent gap, but differences among STEM grads accounts for more.

Why don’t certain groups patent?

• ~4,200 random life science faculty members over 30-years
• 13.00% of men studied had a patent (2.98 patents each)
• 5.65% of women studied had a patent (1.80 patents each)

• Female professors patented at 40% the rate of male counterparts. Why?
• Controlled for: research, university, coauthors, industry exposure, field, etc.

• Interview data identified two potential explanations:
  • Women maintained fewer industry connections, and
  • Fear that patenting might interfere with teaching/research.

Lost Einsteins

- Analyzes patenting rate as a function of parent’s income, race, and gender. Controls for standardized test scores
- How do environmental factors influence this effect?
  - Parent an inventor? 9X (more likely to follow in same area)
  - Parent work in an inventive sector?
  - Neighborhood of inventors? More likely, even if move away.
  - Neighborhood of male or female inventors?

- Differences in exposure help “explain why talented children in low-income families, minorities, and women are significantly less likely to become inventors.”

Lost Curies

• Citizens of Denmark & European patents – same gender gap

• Parent Attributes
  • Parent with a STEM education leads to kids’ STEM education, but largely gender specific (mom/daughter or dad/son)
  • Either parent inventor leads to inventorship, but mom/dad both disproportionately influence sons (2-3x)

• Family Attributes and Daughters
  • Q: Do parents treat sons and daughters differently?

• Hoisl et al., *Lost Marie Curies: Family, Education, and the Probability of Becoming Inventors* (draft)
Lost Curies

• Family Attributes and Daughter’s Inventorship
  • Does an inventor parent influence daughter/daughter v. daughter/son?
  • Daughter/son – no inventorship influence from parental inventors

• Possible Mechanisms
  • Latent(?) stereotypes of parents
  • Allocation of resources

• Hoisl et al., *Lost Marie Curies: Family, Education, and the Probability of Becoming Inventors* (draft)
Disparities in Patenting Outcomes

• Studied ~2.7M applications (2001–14)

• Gender via Social Security data and commercial databases.
  • Set as male/female at a 95% threshold.

Disparities in Patenting Outcomes

Female applicants/patentees:
• Less likely to appeal a rejected application
• Less likely to be maintained
• Smaller portion of claims allowed
• More words added to claims
• Received fewer forward citations

Disparities in Patenting Outcomes

• Forward Citations – identification of related technology
  • Evidence of continued development in field
  • Common proxy for patent value
  • So what is the citation discrepancy telling us?
  • Look to rare names? (20%)

• Follow-up – look to “relatedness” of citations?

Disparities in Patenting Outcomes

• Women had patents granted 7–21% percent less often.
  • Where does this discrepancy come from?

• Follow-ups:
  • Does inventor order matter? (See e.g., Solomon Asch’s work)
  • Does aggregate “masculinity” of a name matter?
  • Do interviews matter for gender ambiguous names?

Disparities in Patenting Outcomes

- Identified highly gender and race-specific names (> 90%)
- Female inventor grant rate
- Racial minority inventor grant rate
  - Domestic v. foreign applications
- Controlled for technology, domestic, small entity
- Robust – varied thresholds at 95%, 90%, 85%, 80%, and 75%
Disparities in Patenting Outcomes

• What causes this disparity? Applicant? Examiner?

• Race-neutral name v. race-specific names.
  • Voter rolls of states that include self-identified race in their public information (i.e., Florida, Georgia, and North Carolina).
  • Compared name and location.

• No evidence that, among non-white applicants, those with non-white, race-specific names are less likely to have their patent granted.

• Findings similar to Jensen for common and rare gendered names.

Disparities in Trademark Outcomes

• Evaluated individual trademark applications
• Results as a function of race and gender

• No evidence of bias

• Why might this difference occur?

Future Research in Patent Outcomes

• Access to capital to fund application?
  • Look to inventor location? Look to tax records?

• Access to capital to continue prosecution?
  • Look to first action grant rate? Eliminates need for significant additional attorney fees.
Losses to Lack of Diversity

• Biomedical patents – 1976–2010
  • Used medical keyword database, including male/female-centric areas
• Female inventors were 35% more likely to inventor in women’s health.
• Similar findings for upstream research (2002–20).

• Koning et al., Who Do We invent for? Patents by Women Focus More on Women’s Health, but Few Women Get to Invent, 372 Sci. 1345 (2021).
Thank you.

Questions?
Mike.Schuster@UGA.edu
@Prof_Schuster