Finding Female Inventors and Inventions

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Today's Talk

1. Research Questions
2. Existing observational work on gender and innovation
3. Experimental Design
4. Conclusion

Research Questions

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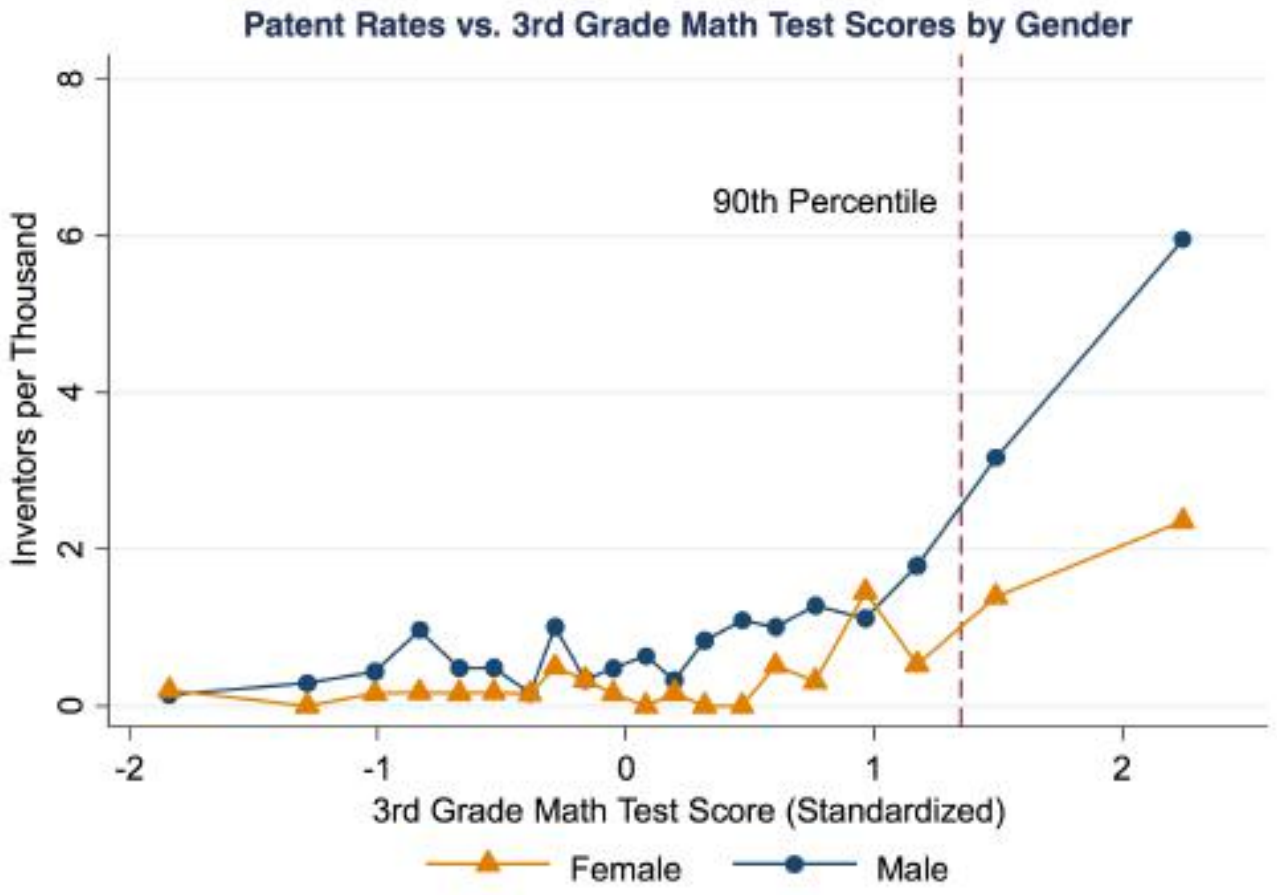
- **Question 2:** If we diversify the downstream players—lawyers, VCs, entrepreneurs—in the innovation pipeline can we diversify both who chooses to innovate and the ideas that are commercialized?

Existing observational work on gender and innovation

The inventor gender gap (Bell et al., 2019)



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- The careers of female scientists are stunted (Long and Fox '95; Hunt '16; Azoulay, Ganguli, and Graff Zivin, '17; Lerchenmueller Sorenson '18)
- Female scientists patent and commercialize less (Ding, Murray, and Stuart, 06; Murray and Graham ' 07; Jensen, Kovacs, and Sorenson '18)

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- Thus gaps in who innovates might drive gaps in what gets invented.
- In particular, women might be especially likely to focus on diseases and conditions that impact women.

Female inventors invent for women

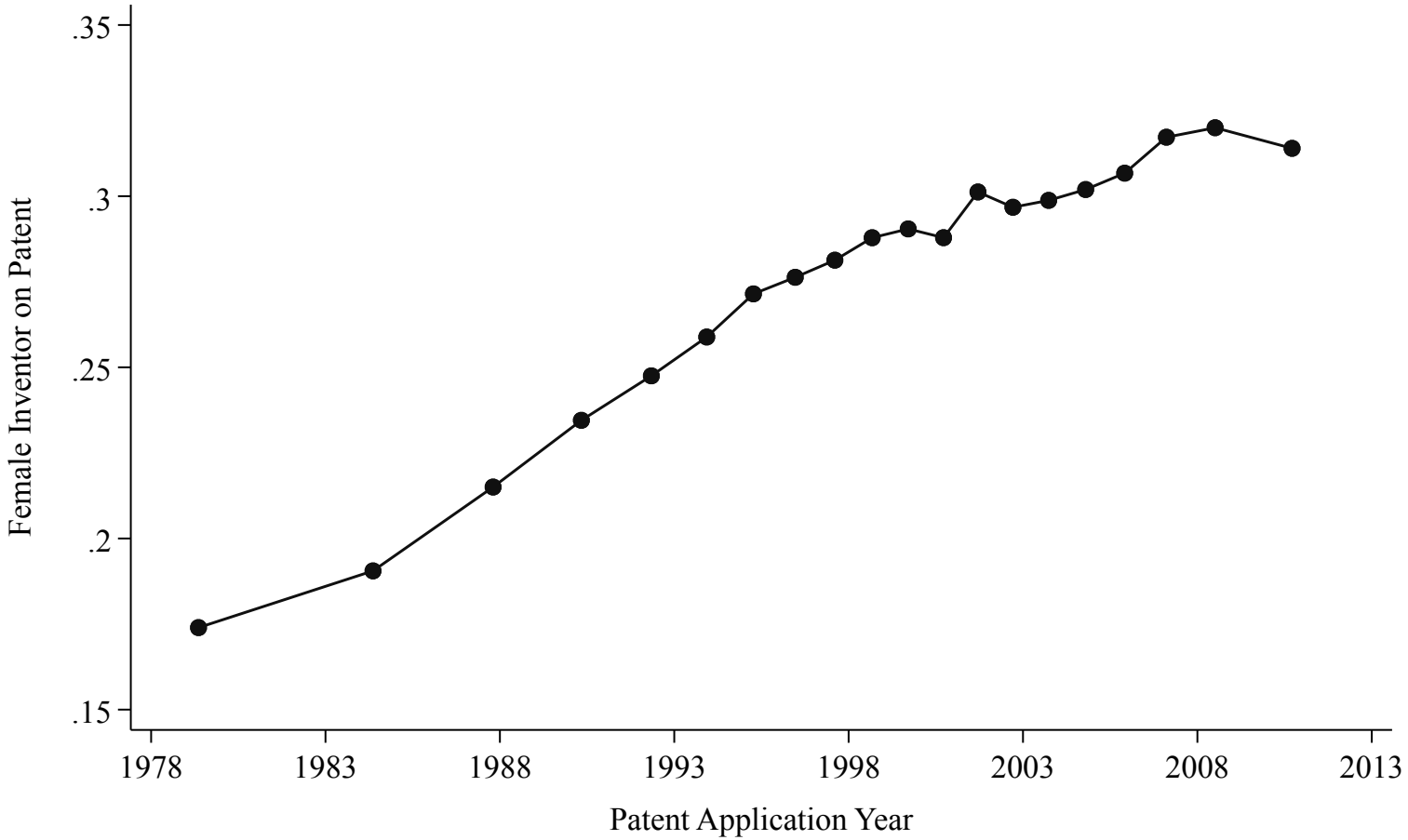
Table 1: Does the patent focus on female diseases and conditions?

	(1) Female MeSH	(2) Female Top MeSH	(3) Female Patent Keyword	(4) Female Disease MeSH
Female Inventor (Lead)?	0.028***	0.010***	0.008***	0.008***
	(0.002)	(0.001)	(0.001)	(0.001)
Female Inventor (Non-Lead)?	0.013***	0.005***	0.003*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Number of MeSH Terms	Yes	Yes	Yes	Yes
Team Size FE	Yes	Yes	Yes	Yes
Year × Subcategory FE	Yes	Yes	Yes	Yes
Observations	441,493	441,493	441,493	326,194
Mean of D.V.	0.128	0.043	0.092	0.043

Patent-level regressions. Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The increase in female inventors and inventions



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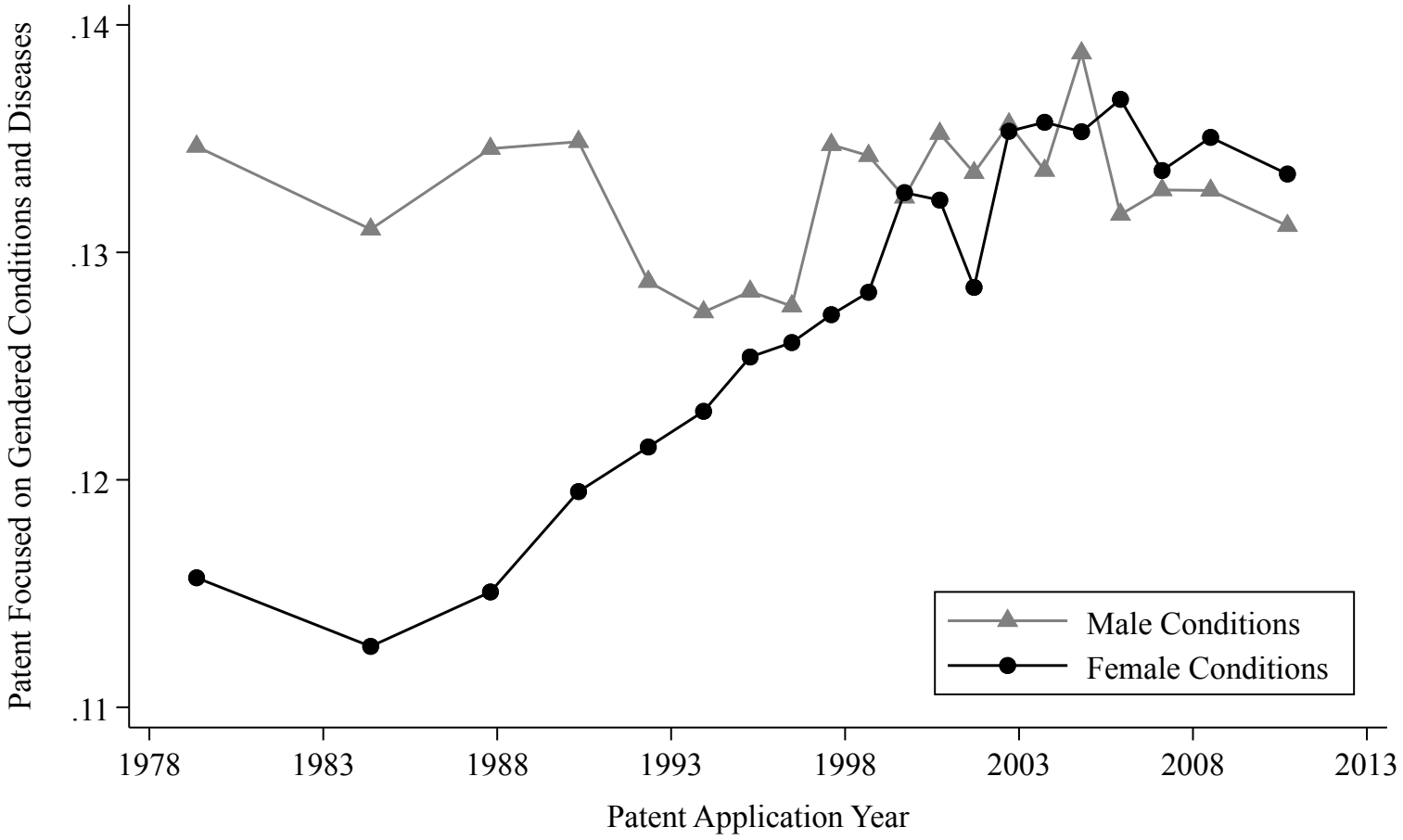


Mind the gap: What comes next?

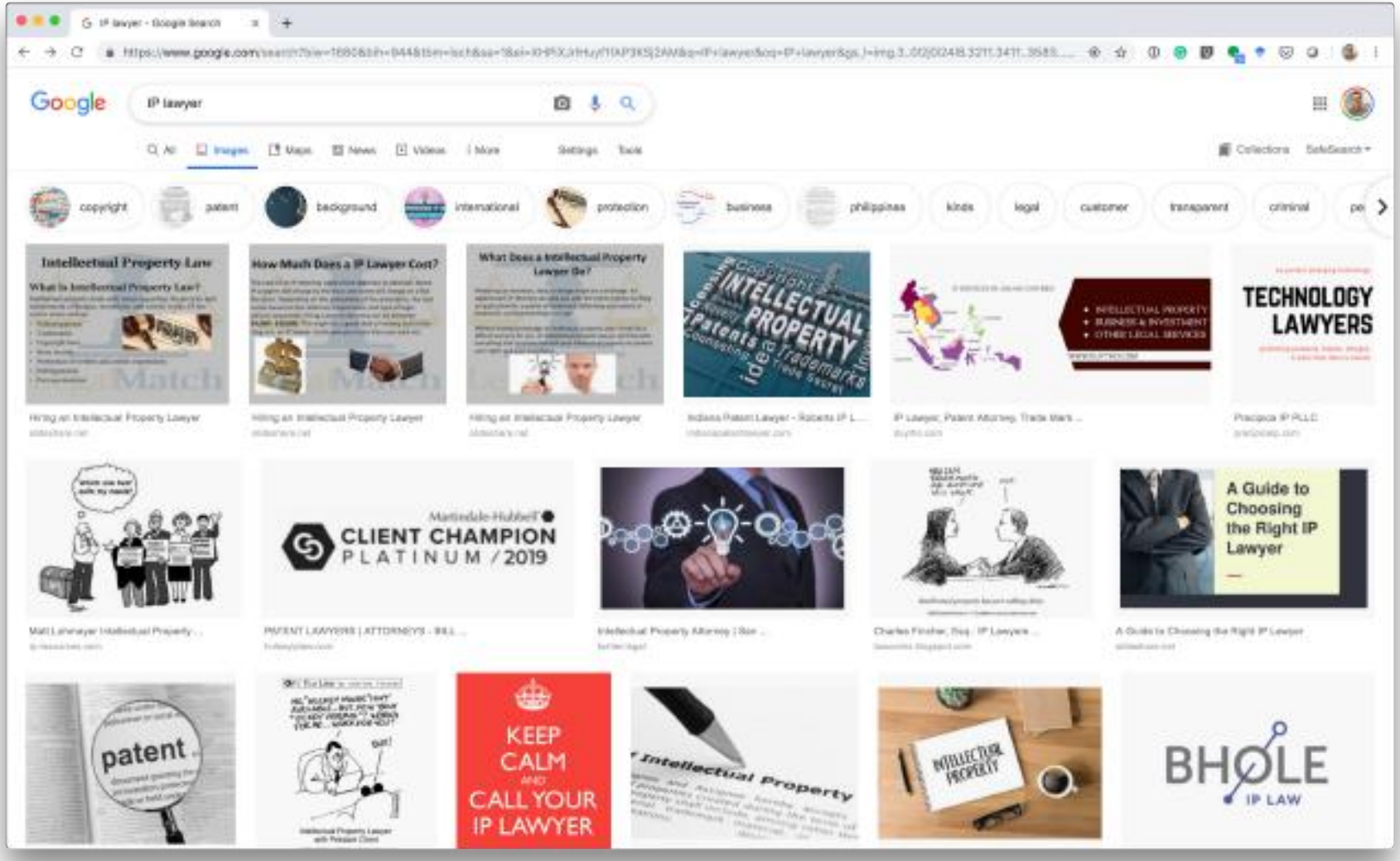
What policies can further reduce this gender gap?

Experimental Design

Innovation is a social process

- Scientists rarely take an idea to market on their own
- First, they might talk to lawyers in the university's technology transfer office.
- Then they might seek advice from entrepreneurs.
- Finally, they might pitch the idea to venture capitalists.

IP Lawyers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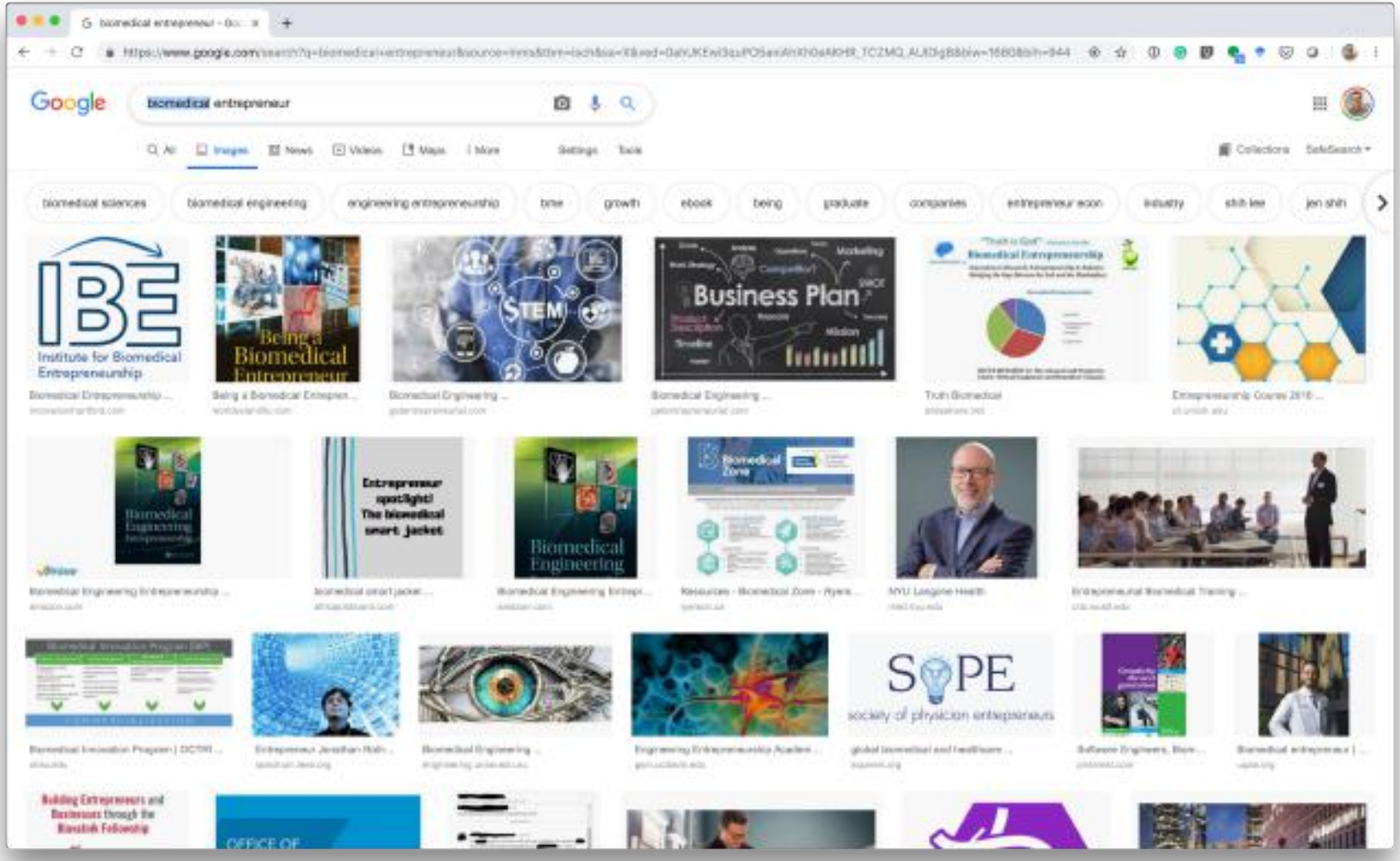
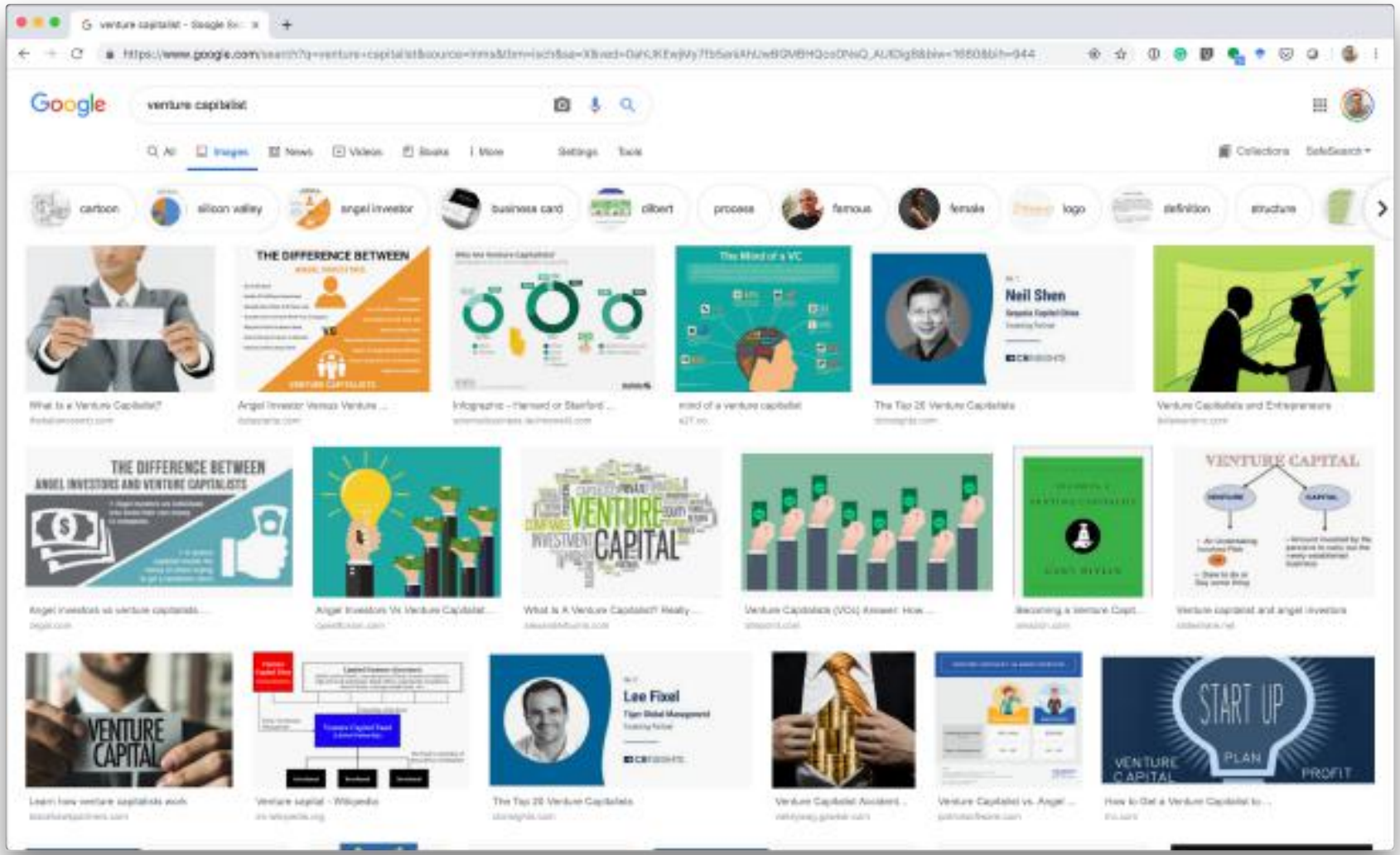
Entrepreneurs



VCs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THE DIFFERENCE BETWEEN
Neil Shen
THE DIFFERENCE BETWEEN
ANGEL INVESTORS AND VENTURE CAPITALISTS
VENTURE CAPITAL
VENTURE CAPITAL
Lee Fixel
START UP
PLAN
PROFIT

Does changing who asks shift who enters the pipeline?

Does increasing the number of female VCs, entrepreneurs, and lawyers reduce the gender gap in innovation?

- Reduces networking frictions for female scientists
- Reduces belief by female scientists that they are wasting their time pitching to biased male investors
- Increases belief that research targeted towards women will be understood and knowledgeably evaluated.

How can we experimentally shift the composition of these downstream innovation players?

Research setting: RFP from a Commercialization Support Fund

- Leverage a nascent “Commercialization Support Fund” at Harvard’s Laboratory for Innovation Sciences (LISH).
- The support fund will send request for proposals (RFP) to targeted scientists asking them to submit research idea they are interested in commercializing. Scientists will have 6 months to respond to the RFP.
- Will use the content of RFP to shift gender composition by varying (1) if the downsteam players described on on the RFP are men or women and (2) if the example ideas are female-oriented or not.

Sample and Experimental arms

- 10,000 biomedical scientists who have published in PubMed but, who have never patented or started a business.
- Control: Non-RFP control: 6,000 scientists
- Each of RFP arms will target 1,000 scientists
    - **RFP control:** Will show male investors, entrepreneurs, and lawyers. Example ideas will be gender "neutral."
    - **RFP female-role-models:** Will show female investors, entrepreneurs, and lawyers.
    - **RFP female-oriented:** Example ideas will explicitly focus on ideas that are female-oriented
    - **RFP female-role-models and female-oriented:** Will show female investors, entrepreneurs, and lawyers and example ideas will explicitly focus on ideas that are female-oriented

Measuring outcomes

- Building on prior work, we expect proposal submission rates to be about 10% (100 submissions per arm).
- Compare proposal rates across by scientist gender.
- Compare effort (number of words) put into proposal to test if women are more likely to invest more effort when pipeline is "gendered-matched."
- Compare these outcomes across role-model versus idea-orientation treatments.
- Compare idea novelty using proposal text to see if targeting female scientists yields unexpected ideas compared to proposals in the control group.
- Longer-term, track patenting and publication outcomes.

Design Considerations

- **Spillover:** RFP will be directed to an individual scientist, what if they share? Can measure collaboration and spatial network so can test for localized spillovers.
- **Power:** Ideas for increasing power? Matching beforehand? Longitudinal measures?
- **Intervention alternatives:** Too light touch? Have sessions with men or women? Focus more on ideas?

Conclusion

Discovering lost ideas

- **Question 1:** Are there female inventors and ideas that the current innovation pipeline systematically overlooks?
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