Research Agenda

Geraldine Guarin, PhD in Economics Student, Northeastern University

These three chapters form a cohesive research program examining frictions in innovation production:

Human Capital Frictions (Chapter 1 / JMP): Gender-specific mobility constraints distort mentoring and knowledge transmission

Adoption Frictions (Chapter 2): Barriers to technology diffusion reduce returns to invention

Financial Frictions (Chapter 3): Credit market imperfections create misallocation across firms

My work combines reduced-form causal inference with structural modeling, allowing me to both identify credible micro-effects and assess aggregate implications. This dual approach positions me to contribute to policy debates on innovation, diversity, and industrial policy—questions of central importance to economists and policymakers alike.

These ongoing projects and will benefit tremendously from insights to be gained from the boot camp.

1 Working with the Marie Curies: Gender, Knowledge Transmission, and Innovation

Job market paper. Results from US Census is not reported here pending disclosure.

Abstract

Knowledge transmission is central to innovation, and the role of female experts in shaping this process merits closer examination. Using U.S. patent data from 2000–2015, this paper studies gender differences in learning within innovation teams, exploiting quasi-random variation in exposure to female experts induced by examiner assignment. I document three empirical facts. First, a one-percentage-point increase in the share of female experts raises patent quality by 0.097 standard deviations. Second, in teams composed exclusively of female experts, exposure increases female junior inventors' skills by 0.025 log points and male juniors' skills by 0.376 log points. Third, exposure to male experts generates no statistically significant effects once endogeneity is addressed. Complementarity analyses further show that mixed-gender and mixed-experience teams generate the highest innovation output. To interpret these findings, I develop an innovation-led endogenous growth model in which experts choose between mentoring and search. Gender-specific mobility frictions shape mentoring decisions, knowledge spillovers, and aggregate innovation.

Empirical Strategy

I exploit quasi-random variation in team exposure to female experts induced by patent examiner assignment, using U.S. patent data linked to US Census LEHD and LBD from 2000–2015.

My identification strategy leverages examiner fixed effects and instrumental variables to address endogenous team formation, isolating the causal effect of expert gender composition on innovation outcomes.

Key Findings

1. A one-percentage-point increase in female expert share raises patent quality by 0.097 standard deviations
2. In all-female expert teams, exposure increases female junior skills by 0.025 log points and male junior skills by 0.376 log points—revealing asymmetric learning patterns
3. Mixed-gender, mixed-experience teams generate the highest innovation output, suggesting strong complementarities
4. Male expert effects disappear once endogeneity is addressed, highlighting selection concerns in prior literature

Theoretical Framework

I develop an innovation-led endogenous growth model where experts allocate time between mentoring and search activities. Gender-specific mobility frictions—reflecting differences in outside options and career constraints—shape mentoring incentives. The model generates predictions about knowledge spillovers, skill accumulation, and aggregate innovation that I take to the data.

Contributions

This paper makes three contributions. First, it provides the first causal evidence on gender differences in knowledge transmission within innovation teams, addressing selection bias. Second, it identifies complementarities between gender diversity and experience mixing that inform optimal team design. Third, it develops a tractable framework linking mentoring decisions to aggregate innovation, offering a foundation for policy evaluation.

2 From Invention to Impact—Health Innovation Adoption

Ongoing work

Motivation

While patents capture the creation of new knowledge, their ultimate value depends on real-world adoption. The healthcare sector provides an ideal laboratory: innovations are well-documented through patents, and adoption is tracked through clinical usage data. Understanding adoption patterns is essential for evaluating innovation policy and forecasting returns to R&D investment.

Research Question

What determines the speed and extent of health innovation adoption? How do patent characteristics—such as inventor composition, citation patterns, and technological breadth—predict diffusion into clinical practice?

Empirical Strategy:

Link U.S. patent data to real-world adoption metrics spanning clinical trials, FDA approval, and Medicare claims. For immune checkpoint inhibitors, I track the foundational CTLA-4 patent (1995) through trial initiation, FDA approval (ipilimumab, 2011), and clinical diffusion. Exploiting within-inventor variation with inventor fixed effects, I estimate how patent characteristics predict adoption speed. Patent quality is instrumented using examiner stringency to address endogeneity concerns.

Potential Extensions

- Analyze geographic spillovers: do innovations adopted in leading medical centers diffuse more rapidly?
- Extend analysis to patent process reforms, health outcomes for breakthrough patents in health (e.g. ICI for cancer patients)

Contributions

This chapter bridges innovation economics and healthcare, providing micro-evidence on how invention characteristics shape technology diffusion. It offers a framework for evaluating which types of patents generate the highest social returns, informing both patent policy and R&D portfolio decisions.

3 Financial Misallocation and Innovation Efficiency

Co-authored work with Zuqian Wang (Ongoing work)

Motivation

Credit market frictions may distort the allocation of resources across firms, reducing aggregate innovation. While small firms receive subsidies and preferential credit access in many countries, it remains unclear whether these policies enhance or hinder innovation efficiency. This question has first-order implications for industrial and innovation policy.

Research Question

Do credit expansion policies targeted at small firms create misallocation that reduces aggregate innovation output? What efficiency gains could be achieved through optimal reallocation of financial resources?

Theoretical Framework

We adapt a heterogeneous-firm model where financial constraints bind differentially across the firm size distribution. In this setting, policies that channel credit to small firms may amplify misallocation if large firms have higher innovation productivity. I derive a sufficient statistic for welfare analysis based on observable firm-level moments.

Empirical Strategy

We use firm-level data from China (ASIE) and the United States (Compustat) to measure innovation productivity—the elasticity of innovation output with respect to R&D expenditure—across the firm size distribution. We then quantify potential efficiency gains from counterfactual reallocations.

For causal identification, we exploit China's 2008 credit expansion as a quasi-natural experiment. This policy generated sharp variation in credit access across firm types, allowing me to estimate treatment effects on innovation outcomes using difference-in-differences and event study designs.

Contributions

This chapter provides the first comprehensive quantification of financial misallocation in innovation production. It demonstrates that size-based credit policies may reduce innovation efficiency. The framework we develop can be applied to evaluate other forms of misallocation (e.g., across regions, technologies, or demographic groups).

Courses Taken:

Geraldine Guarin, PhD in Economics Student, Northeastern University

Table 1: Coursework

Semester	Courses
Fall 2023	Advanced Math & Statistics for Economics; Advanced Microeconomic Theory; Advanced Macroeconomic Theory
Spring 2024	Advanced Applied Econometrics; Microeconomic Theory 2; Macroeconomic Theory 2
Fall 2024	Labor Market Analysis; Framework Industrial Organization; Directed Study with Prof. Santiago Caicedo on Innovation
Spring 2025	Applied Econometrics 2; Topics in Labor Economics; Public Policy Toward Business
Summer 2025	Research
Fall 2025	Topics in Information Economics; Economics of Ideas, Innovation and Entrepreneurship*
Spring 2026	Research

* Audited the class

Also attending the Geography of Innovation Networks Reading Group with Prof. Scott Stern (Spring 2026)

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NBER Innovation Research Boot Camp Selection Committee

Re: Letter of Recommendation for Geraldine Guarin

Dear Selection Committee:

I enthusiastically recommend Geraldine Guarin for the NBER Innovation Research Boot Camp. I am Santiago Caicedo, Associate Professor of Economics at Northeastern University, and Geraldine has worked as my research assistant for the past year on innovation and growth projects.

Geraldine is an exceptional third-year PhD candidate whose research agenda centers on understanding the micro-foundations of innovation and knowledge diffusion. Her job market paper examines how team gender composition affects knowledge transfer, skill development, and career trajectories in inventor teams. Using patent data linked with restricted U.S. Census Bureau records, she combines structural models of team production with quasi-experimental variation in firm gender composition. Her findings show that female inventors act as "career catalysts." Their intensive mentoring enhances junior inventors' productivity and mobility despite facing higher career constraints themselves. This work speaks directly to fundamental questions about how knowledge flows through organizations, how human capital accumulates through collaboration, and how talent allocation shapes aggregate innovation outcomes.

Beyond gender dynamics, Geraldine's broader research interests span firm dynamics, inventor mobility and knowledge spillovers, the quality-quantity tradeoff in innovation, and team production more generally. She is developing a second project on how diversity affects innovation through changes in inventor age composition and knowledge accumulation

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patterns. Her approach consistently combines rich microdata with structural modeling to understand mechanisms. This is exactly the skillset needed to contribute to innovation economics.

As my research assistant, Geraldine has demonstrated outstanding technical abilities managing large-scale innovation datasets and implementing advanced econometric and computational methods. She is hard-working, intellectually creative, and an excellent communicator.

The boot camp would be transformative for Geraldine at this critical career stage. While she has deep expertise in labor economics and empirical methods, she has had limited formal training in innovation economics as a distinct field. The lectures by Azoulay, Jones, and Bryan on knowledge diffusion, endogenous growth, and innovation measurement would provide theoretical foundations to complement her empirical work. Williams' and Kling's session on innovation policy would help her connect her findings to policy debates. Most importantly, exposure to the innovation research community at the Summer Institute would help her position her work within the field and identify promising directions as she enters the job market next year. I give her my highest recommendation.

Sincerely,

Santiago Caicedo
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