To Whom it May Concern,

I am writing to express my interest in attending the NBER Innovation Research Boot Camp this summer. I am currently a third-year Economics PhD student at the University of California, Berkeley, specializing in health and innovation economics, with a broader background in Industrial Organization and Labor Economics.

I developed an interest in innovation economics through working as a research assistant to Carolyn Stein and Ben Handel. I assisted with a project aiming to empirically test if high churn rates in commercial insurance discourages insurers from covering expensive, single-use treatments, as well as a project looking into how the clinical trials results an insurer cities to justify their coverage generosity (e.g. step therapy requirements) compares with the universe of trial results for a given drug-indication.

My interest in innovation research was solidified after taking a course on it, Special topics in IO, taught by Carolyn Stein. Material from this course inspired my current research on follow-on indications and how pricing structures tailored to specific drug indications can affect market dynamics and consumer welfare.

The seminar speakers planned for the innovation bootcamp are covering several topics I would like to dive deeper into that relate to my own project such as institutional details regarding NIH funding and methods of calculating the societal benefits/returns to innovation. I would also look forward to the opportunity to meet and chat with other graduate students interested in this area of research.

Thank you for considering my application, and please do not hesitate to reach out if you would like me to provide any further information. You may contact me via phone (631-402-3932) or email (sfrick@berkeley.edu, sarahjfrick@gmail.com). My recommendation letter writer is Carloyn Stein (Assistant Professor at Berkeley Econ and Haas).

Thank you,
Sarah Frick

My main research project investigates the profit incentives a pharmaceutical firm faces when researching a new potential (follow-on) indication for an already approved drug. In the future I would like to extend this project to investigate "missing" innovations: What indications/disease types would be socially beneficial to have additional drugs approved to treat, but would not be profitable for pharmaceutical firms to conduct clinical trials on? What policies could be implemented to direct public spending towards research on these missing indications?

Prior research has studied the market expansion effect of adding an additional indication to a drug label. Even though a drug does not need to be FDA approved to treat a specific disease in order to be prescribed for that disease,[1] adding a new indication to an FDA label increases utilization of that drug for the new indication by 40% (Berger et al. 2021). This increase in utilization in addition to patent extensions that may come with the new indication are apparent motivating factors for why a pharmaceutical company may invest in the phase 2 and 3 trial(s) necessary to obtain FDA approval for a new indication.

A key unknown factor influencing a pharmaceutical company's decision to research additional indications is how the price of a drug changes when a new indication is added to its label, given the rarity and severity of the indication. The FDA has released annual reports (PDFs) of FDA label changes changes since 1998 which I cross reference with historial label changes in order to identify the timing of additional indication[2] application, approval, and disease type. Of drug brands initially approved after 1990, roughly 500 brands have added at least one indication between 1998 and 2023. I plan to measure how the effect of adding an indication on prices[3] differs by the market price of the new indication using an event study framework.

Given the widespread practice of off-label prescribing and the fact that physicians quickly respond to positive clinical trial evidence regardless of labelling status (McKibbin 2023), there may be significant consumer welfare gains from redirecting publicly funded research towards new indication trials. I would like to model a pharmaceutical firm's decision to research (enter) into an additional indication market in order to identify the characteristics of indications in terms of disease rarity or severity for which it would not be profitable for a pharmaceutical company to pursue. In addition to targeted public funding, another counterfactual policy I am interested in is that of druf price discrimination by indication. Roughly 2% of on-patent drugs price discriminate by creating multiple different brand names that are approved to treat different indications. How would policy that allows drugs to be priced at the innovation level affect innovation incentives and consumer welfare?

I think the NBER innovation bootcamp will be a great learning experience - Heidi William's work on underinvestment in long term research has inspired some of my own ideas, and I would be grateful to learn from her on her colleagues about innovation research; specifically models of entry under uncertainty, institutional details regarding NIH funding, and social returns to innovation.

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[1] Off-label prescriptions account for between 21% and 43% of overall prescriptions (Radley, Finkelstein, and Stafford (2006); Berger, Chandra, and Garthwaite (2021).

[2] I am also looking into patient population changes (e.g. pediatric expansions)

[3] I am working on getting net pricing data from SSR health.

Graduate Course List

Fall 2022

- ECON 201A: Economic Theory
- ECON 202A: Macroeconomics
- ECON 204A: Mathematical Tools for Economics
- ECON 240A: Econometrics

Spring 2023

- ECON 201B: Economic Theory
- ECON 202B: Macroeconomics
- ECON 210A: Introduction to Economic History
- ECON 240B: Econometrics

Fall 2023

- ECON 220A: Industrial Organization
- ECON 221: Seminar in Industrial Organization: Regulation and Public Enterprise
- ECON 250B: Labor Economics
- ECON 375: GSI Pedagogy Workshop

Spring 2024

- ECON 220B: Industrial Organization
- ECON 220C: Special Topics in Industrial Organization (Health and Innovation)
- ECON 250A: Labor Economics

Fall 2024

- ECON 244: Applied Econometrics

Spring 2025

- ECON 226: Health Economics

SARAH FRICK

linkedin.com/in/sarah-frick

EDUCATION

University of California, Berkeley — Berkeley, CA
Ph.D. candidate in Economics GPA: 3.53 | GRE: 169Q, 164V — *2022 – 2028 (expected)*

Miami University — Oxford, OH
B.S. in Quantitative Economics, Minors in Statistics and Japanese — *2016 – 2020*
Overall GPA: 3.88 | Major GPA: 3.98 | ACT: 36

Kansai Gaidai University — Osaka, Japan
Asian Studies Program — *January – June 2018*

RESEARCH INTERSTS

Health Economics, Labor Economics, IO, Technology/Innovation

PUBLICATIONS

"*Pirate and Chill: The Effect of Netflix on Streaming"* (with Deborah Fletcher and Austin Smith)
Journal of Economic Behavior & Organization 209 (2023): 334-347

RESEARCH and TEACHING EXPERIENCE

University of California, Berkeley — Berkeley, CA
Graduate Student Researcher — *May 2023 –*

- As a GSR to Benjamin Handel and Carolyn Stein working on a project to test if high churn rates in commercial insurance discourages insurers from covering expensive, single-use treatments
    - Ran simulations for a model of disease cure vs. ongoing treatment coverage decisions
    - Cleaned and analyzed Specialty drug insurance coverage policy data
    - Consolidated CMS Medicare part D spending data, CalPERS claims data, and insurance coverage data to assess the relationship between drug approval date, drug price, and age distribution of beneficiary
    - Reconstructed the CMS Medicare risk score algorithm in Stata
    - Edited working papers

Graduate Student Instructor — *January 2024 –*

- As a Graduate Student in Instructor for ECON 191 (Topics in Economic Research), each semester I gave 6 (80-100 person) lectures on research methods such as linear regression, RCTs, IVs, and more.
- I one-on-one advised approximately 20-30 of these students for whom I held weekly office hours and provided detailed feedback on paper progress 5 times throughout the semester.

Princeton University Industrial Relations Section — Princeton, NJ
Senior Research Specialist — *2020 - 2022*

- As a research assistant to David Lee
    - For the paper, "Valid t-ratio Inference for IV" by Lee, McCrary, Moreira, and Porter
        - Generated code to numerically approximate the "tF" function which smoothly relates the 2SLS standard error and first stage F statistic
        - Collected first and second stage IV results from AER papers that used just identified single IV specifications
        - Verified analytical expression for the tF function in Mathematica
        - Generated tables and figures for the paper and formatted content in Overleaf
    - Assembled materials for Master's level Quantitative Analysis class
- As a research assistant to Dr. Alexandre Mas
    - Supervised an RCT which notified individuals via call, text, email and letter of their criminal record expungement under California's Proposition 47 law
        - Coordinated notification process with a team in California and San Joaquin's Public Defenders office and ensured notifications and follow-up surveys were approved by Princeton's IRB

- Cleaned and analyzed historical criminal record data from Maryland and Pennsylvania which involved linking charges and cases across court levels and individuals and connecting with District Attorneys in those states to clarify legal procedures

Miami University Economics Department Oxford, OH
Research Assistant *November - December 2017*

- Gathered and analyzed information from the Curriculum Vitaes of Economic PhD students

HONORS & AWARDS

Chancellor's Fellowship *2023*
Fulbright Research Grant to Japan *2020*

- My research proposal presented a strategy to evaluate the effect of a unique community-based health care initiative in Japan on reducing elderly admission rates into long-term care facilities.

George W. Thatcher Prize for Distinguished Economics Undergraduate *2020*

- "As the most outstanding graduating economics major based on academic record, intellectual curiosity, breadth of scholarship, and cooperative attitude with one's peers."

Phi Beta Kappa *2020*
Miami University Economic Scholar *2019*
Miami University Japanese Student of the Year *2019*

LEADERSHIP & COMMUNICATION EXPERIENCE

Graduate Economics Association Berkeley, CA
Co-Chair *2023-2024 (expected)*

- Created social activities for Economics graduate students such as the Little Big Game (a sporting competition against Stanford Economics PhD students)

Women in Economics Oxford, OH
Corporate Relations Director *2019 – 2020*

- Organized networking events, economic talks, and moderated a QA panel and discussion

Ernst & Young New York, NY
Intern *June - August 2019*

- Consulted at a major international bank on a Current Expected Credit Loss implementation project with a focus on residential loans

Miami University Economics Department Oxford, OH
Microeconomics Undergraduate Assistant *2018*

- Held weekly office hours and graded exams

Haver Analytics New York, NY
Intern *June – August 2018*

- Added macroeconomic time series from emerging countries into Havers' database
- Corresponded with Central Bank and Statistical Office contacts regarding time series discrepancies

SKILLS & LANGUAGES

Computer: Python, Stata, LaTeX, Mathematica, MATLAB
Language: Japanese (Intermediate)

To Whom It May Concern:

I am writing to enthusiastically recommend Sarah Frick as a participant in the NBER Innovation Research Bootcamp. Sarah is a third year PhD student in the economics department at UC Berkeley. I have had the pleasure of teaching Sarah in my graduate class, and interact with her regularly in the IO workshop and in office hours. She also worked as a research assistant for me for six months. We meet regularly to discuss her research interests.

A new project that Sarah has been pursuing sits squarely at the intersection of IO and innovation. She is interested in studying how drugs that are approved for multiple indications are priced. Are the prices different depending on the indication? Or is it not possible for firms to price discriminate based on the indication? What are some barriers that might prevent this? What are the welfare and upstream innovation consequences if firms cannot price discriminate? These are all questions that Sarah is investigating in this context.

Given her strong interests in pharmaceutical innovation, I think she would benefit tremendously from the bootcamp. Thank you for considering her application.

Sincerely,

Carolyn Stein

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Carolyn Stein

Assistant Professor

Haas School of Business and Department of Economics

UC Berkeley

carolynstein.github.io