January 31st, 2023

Dear Prof. Bryan, Prof. Ganguli and Prof. Myers,

I am writing this letter to apply for the NBER Innovation Research Boot Camp 2023. I am a third-year Ph.D. student at the Wharton School, University of Pennsylvania. My research interests are in understanding the connection between market structure and the innovation in health care market, as well as its implications on social welfare and government regulations.

I am very excited for the opportunity to learn from the leading-edge speakers as well as interact with peers with similar interests in the economics of innovation. This boot camp will benefit my research and foster conversations. Communications and collaborations pave the way to progress and innovation in understanding the economics of innovation itself. This boot camp provides a fertile ground for such synergies to happen, and I hope to join as part of it.

My recommendation letter writer is my advisor, Alexander Olssen, who is an assistant professor at the Wharton School in University of Pennsylvania. His office number is 215-573-6859 and his email is olssen@wharton.upenn.edu.

Thank you for your consideration.

Sincerely,

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EDUCATION

Ph.D. Health Care Economics — Expected 2025
Wharton School of Business, University of Pennsylvania

M.P.H. Health Policy — 2020
Yale School of Public Health

M.S. Social Policy — 2018
School of Social Policy & Practice, University of Pennsylvania

B.S. Economics — 2017
Beihang University

WORK IN PROGRESS

Ruochen Sun. Taxing on Prescription Drugs: Evidence from NY Opioid Tax

Abby Alpert, Ruochen Sun. The Effects of Prior Authorization on Medicaid Prescription Drug Access

WORKING PAPER

Tianyu Wang, Ke Wen, Qiuming Gao, Ruochen Sun. Small Money, Big Change: The Distributional Impact of Differentiated Doctor Visit Fee on Primary Care Utilization. (*R&R in Social Science and Medicine*)

Tianyu Wang, Ruochen Sun, Xi Chen, Jody Sindelar. Occupational Differences in the Effects of Retirement on Hospitalizations for Mental Illness: Evidence from Administrative Data. (Submitted)

RESEARCH EXPERIENCE

Research Assistant, Wharton School of Business, University of Pennsylvania — Aug 2022 -
Supervised by Prof. Alexander Olssen

Research Assistant, Wharton School of Business, University of Pennsylvania — May 2021 -
Supervised by Prof. Abby Alpert

Associate Fellow, The Leonard Davis Institute of Health Economics — Aug 2020 -

Research Assistant, Yale School of Public Health — Jun 2019 - May 2020
Supervised by Prof. Xi Chen and Prof. Jody Sindelar

Research Assistant, University of Pennsylvania, Health Equity and Policy Lab — Oct 2017 - Aug 2018
Supervised by Prof. Jennifer Ruger

Intern Research Analyst, China National Health Development Research Center, National Health Commission of the People's Republic of China — Jun 2016 - Sep 2016

Research Assistant, Beijing Normal University — July 2015 - Sep 2016
Supervised by Prof. Chenggang Jin

AWARDS AND FELLOWSHIPS

1^{st} Prize, 2019 MIT Policy Hackathon — 2019

Student Fellow, Yale Law School Solomon Center of Health Law and Policy — 2019

Student Fellow, Yale Climate Change and Health Initiative — 2019

Outstanding Undergraduate Thesis Award, Beihang University — 2017

Honorable Mention, US Mathematical Contest in Modeling — 2016

Academic Competition Scholarship, Beihang University — 2016

Innovation & Entrepreneurship Prize, Beihang University — 2016

Academic Scholarship 3^{rd} Prize, Beihang University — 2014

List of Completed PhD course

The course instructor is listed in the parenthesis.

Fall 2020

- Microeconomic Theory (Steven Matthews)
- Econometrics I: Foundations (Karun Adusumilli)
- Econometric II: Foundations (Xu Cheng)
- Proseminar in Health Care Economics: Models and Methods (Guy David)

Spring 2021

- Game Theory & Applications (Kevin He)
- Economics of Health Care & Policy (Alexander Olssen)
- Empirical Models in Marketing – Part A (Eric Bradlow)
- Empirical Models in marketing – Part B (Raghuram Iyengar)

Fall 2021

- Topics in Applied Microeconomics (Hanming Fang)
- Empirical Industrial Organization (Aviv Nevo)
- Econometrics III: Advances (Petra Todd)
- Seminar in Organization Behavior and Theory in Healthcare (Ingrid Nembhard)

Spring 2022

- Proseminar in Health Care Economics: Applied Econometrics (Atul Gupta)
- Industrial Organization of Health Care (Claudio Lucarelli)
- Independent study: Machine Learning & Economics (Atul Gupta)
- Topics in Industrial Organization (audit; Juan Camilo Castillo & Juan Pablo Atal)

Fall 2022

- Behavioral Economics and Policy Analysis (Alex Rees-Jones)

I am a third-year Ph.D. student at the Wharton School, University of Pennsylvania. My research interests are in understanding the connection between market structure and the direction and efficiency of innovation in health care market, in order to speak to social welfare and government regulations.

Driven by these long-standing interests, I am pursuing two independent projects. The first project examines **the impact of joint ownership on prescription drug innovation and downstream competition**. It is common among pharmaceutical firms to build partnerships on drug development, forming joint ownership for the drug. Although mergers and acquisitions have been intensively studied in many industries, joint ownership is understudied empirically (Azar, et al., 2018; Cunningham et al., 2021; Li, et al.,2023). Understanding the welfare impact of joint ownership will inform anti-trust regulations to promote a sustainable growth of drug innovation and a continual access of consumers to innovative drugs.

The welfare impact of joint ownership is theoretically ambiguous, *ex ante*. On the one hand, joint ownership may foster innovation by generating synergy between firms, spreading the risk from development, and alleviating the constraint on R&D capacity for small firms. On the other hand, joint ownership may constrain downstream competition since large pharmaceutical companies are expanding partial ownership in more market segments. Empirically, identifying the effect of joint ownership on welfare is challenging because the decision to build partnership with other firms is endogenous to R&D uncertainty and expectation of profit shares. To overcome this challenge, I use the pipeline of large pharmaceutical firms and the release of positive trial results in emerging pharmaceutical firms as the instruments. I am also working on developing a bargaining model between firms to understand the time of building partnership and the split of profits.

The second independent project examines the **voluntary regulation of health devices.** I study this question in the context of laboratory-developed tests (LDT), a type of diagnostic test that can follow two different regulatory pathways: undergoing rigorous clinical trial testing as a Class III device, or seeking pre-market clearance as a Class II device. The decision on regulatory pathway is endogenously determined by the expected profit gains from a tight quality signal obtained from clinical trials and the expected profit loss from the delayed entry. The main goal of the project is to understand innovators' private incentives to obtain FDA official approval, and further examine if these private incentives align with social incentives of improving access to innovative products.

In order to obtain a broad understanding of the innovation in pharmaceutical industry, I am also working with Prof. Alexander Olssen and Prof. Mert Demirer studying **the economics of scope in prescription drug development**—the impact of drug portfolios developed by pharmaceutical companies on the success rate of innovation. This project aims to first document the existence and size of the economics of scope in the pharmaceutical industry. We will then structurally model the pharmaceutical companies' decisions on drug portfolio management and optimization so that we can estimate the fixed cost of developing drugs that is endogenous to the firm's drug portfolio.

Attending this boot camp is a great opportunity for me to gain a deeper and more systematic understanding of the economics of innovation, not only in health care, but also in a wide range of other fields. This will help me build a more comprehensive perspective on this topic that will support my current and future research. Additionally, learning from leading-edge speakers as well as interacting with peers with similar interests in the economics of innovation will be both inspiring and beneficial to my career as a researcher.

Reference:

AZAR, JOSÉ., SCHMALZ, MARTIN., & TECU, ISABEL. (2018). Anticompetitive effects of common ownership. *The Journal of Finance*, *73*(4), 1513–1565.

Cunningham, C., Ederer, F., & Ma, S. (2021). Killer Acquisitions. *Journal of Political Economy*, *129*(3), 649–702.

Li, X., Liu, T., & Taylor, L. A. (2023). Common ownership and Innovation Efficiency. *Journal of Financial Economics*, *147*(3), 475–497.

To whom it may concern,

I am writing to ***strongly*** recommend Rucohen Sun to the NBER Innovation Research Boot Camp 2023.

I have known Rucohen for two years. Ruochen is an extremely motivated and talented young researcher. She is very ***entrepreneurial at collecting data*** – she has submitted many FOIA requests to get information on state Medicaid programs. As a research assistant, she takes initiative and often goes beyond my requests. She is also the only student to have completed the optional exercises on the problem sets that I assign in my PhD class on health economics.

Best,
Alexander Olssen
Assistant Professor, The Wharton School
https://hcmg.wharton.upenn.edu/profile/olssen/