Application for Entrepreneurship Research Boot Camp

Applicant Name: Xizhao Wang

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School: Kellogg School of Management, Northwestern University

Area of Interest: Economics of Innovation and Entrepreneurship

Year of Entry into Ph.D. Program: 2020

Expected Year of Completion: 2026

Reference

Professor Benjamin F. Jones
Gordon and Llura Gund Family Professor of Entrepreneurship
Professor of Strategy
Kellogg School of Management
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847-491-3177

Thank you for considering my application. I look forward to the opportunity to participate in the Entrepreneurship Research Boot Camp 2026. Please feel free to contact me if you require any additional information.

Xizhao Wang

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Education

Northwestern University - Kellogg School of Management **2020-2026(expected)**
Ph.D., Managerial Economics and Strategy
Advisors: Benjamin F. Jones, Dimitris Papanikolaou, Dashun Wang, Ryan Hill

NBER Doctoral Dissertation Fellow **2025-2026**

The University of Chicago - Harris School of Public Policy **2018-2020**
M.A., Public Policy with Certificate in Research Methods (Honors), GPA Rank: 1/25

Southwestern University of Finance and Economics **2014-2018**
BEcon., Economics, GPA Rank: 1/122

ISCTE - Instituto Universitário de Lisboa **2016**
Exchange Student

Publications

[1] The Pivot Penalty in Research, *Nature (2025)* [paper link]
(with Ryan Hill, Yian Yin, Carolyn Stein, Dashun Wang, and Benjamin Jones)

Working Papers

[2] Patenting and Information Disclosure (sole-authored) [paper link]

- Best PhD Student Paper (Vithala Rao Award), Winner, 2024 AIM Conference
- Selected for Best Paper Proceedings, 2024 AOM Conference
- Best Conference Paper, Nominee, 2024 AOM Conference
- Best PhD Paper, Nominee, 2024 AOM Conference
- Best Poster, Winner, 2023 ICSSI Conference

Abstract: Invention disclosure facilitates knowledge spillovers, supporting future progress but potentially limiting appropriability for the inventor. In this paper, I examine invention disclosure behavior by analyzing the readability of patent texts, using both traditional and novel AI-based readability scores. Using two difference-in-differences analyses, I find that following the 1980 Bayh-Dole Act and the establishment of Technology Transfer Offices, university-affiliated inventors reduced the readability of patent detailed descriptions. This decrease in readability does not extend to patent summary texts, suggesting that university inventors strategically limit information on how to make and use the invention. The findings reveal the potential for strategic disclosure behavior not just in the decision of whether to patent or keep inventions as trade secrets, but also in the degree of patent information disclosure. Institutional changes lead inventors to selectively adjust the information disclosed in their patents and obfuscate core techniques. Underlying mechanisms and effects on follow-on innovation are further explored.

[3] Human Capital and Firm's Innovation Direction (sole-authored) [paper link]

- Best PhD Student Paper, Winner, 2024 SMS Conference

Abstract: This paper examines how the loss of personnel impacts the direction of innovation within firms. I introduce three distance measures to quantify shifts in firms' innovation trajectories. I then analyze changes in the innovation direction of U.S. public firms following personnel deaths in a difference-in-differences framework. The results reveal that the death of upper-tail inventors significantly alters a firm's innovation trajectory, while deaths among lower-tail inventors and management personnel do not. Further analyses suggest that a firm's innovation direction is shaped by the aggregation of individual inventors' expertise and the collaborative dynamics within teams. The findings – characterized by reduced invention in the technology fields of upper-tail inventors, a lack of new inventors in affected firms, and declines in firm performance – highlight the hard-to-replace nature of inventive human capital and underscore its role in firms' dynamic capabilities. Moreover, this paper provides evidence that lower invention output leads to weaker sales and profitability within firms.

[4] Knowledge as Output and as Input: Artificial Intelligence and Quantum Computing [paper link]
(with Daniel Spulber)

- **Presentation:** International Industrial Organization Conference (Washington DC), Economics of QIT Conference (USC Marshall), Northwestern (AI@NU)

Abstract: This paper explores the contributions of Artificial Intelligence (AI) and Quantum Computing (QC) knowledge capital to the production of knowledge and the production of output within firms. Using the Artificial Intelligence Patent Dataset from the USPTO, the study matches AI and QC patents with firm characteristics data from the CRSP/Compustat Merged database to quantify the AI and QC knowledge adoption and the impact of these forms of knowledge capital on firms. We present five stylized facts about knowledge as an input and as an output. Our regression findings indicate that both AI and QC knowledge stocks are positively associated with their own knowledge production, with AI knowledge stocks positively associated with QC innovation but not vice versa. The impact of the two forms of knowledge capital on firm productivity and growth differs, with AI positively correlating with firm output while QC is an investment that does not impact output immediately. Our study implies that knowledge capital has heterogeneous effects on both knowledge and output production, and with different time scales. This study stands in contrast to common practices that treat knowledge capital as homogeneous, emphasizing the need to distinguish different types of knowledge capital.

Selected Work in Progress

[5] Talent Mobility and Democratic Incentives (sole-authored)

- NBER Doctoral Dissertation Fellowships, 2025-2026

[6] Law Firms and Corporate Innovation Disclosure
(with Farzana Afrin, Muskan Chawla)

Awards and Honors

NBER Doctoral Dissertation Fellowships **2025-2026**
AOM STR PhD Travel Grant Award **2025**
Northwestern TGS PhD Travel Grant **2024-2025**
Northwestern Kellogg PhD Travel Grant **2024-2025**
Winner, Best PhD Student Paper (SMS Conference) **2024**
Winner, Best PhD Student Paper (AIM Conference, USC Marshall) **2024**
2024 DIG Scholarship (AOM Conference) **2024**
Selected for Best Paper Proceedings (AOM Conference) **2024**
Nomination, Best Conference Paper (AOM Conference) **2024**
Nomination, Best PhD Student Paper (AOM Conference) **2024**
ICSSI Travel Funds (ICSSI Conference) **2024**
Winner, Best Poster Prize (ICSSI Conference) **2023**
Kellogg Graduate Fellowship (Kellogg, Northwestern) **2020-present**
Merit Scholarship (University of Chicago) **2018-2020**
Outstanding Graduate (Sichuan Province, China, Top 1%) **2018**
National Scholarship (China, Top 1%) **2015-2016, 2017-2018**
Top 10 Students in the Class of 2018 (Undergraduate, 10 out of 3751 students) **2015**

Teaching Experience

Teaching Assistant, Northwestern University
Analytical Approach to Uncertainty (Executive MBA), Prof. Alireza Tahbaz-Salehi **2023-2024**
(Evaluation: 5.5/6.0; Response Rate: 62/62)
International Business Strategy (MBA), Prof. Daniel Spulber **2023**
Business Analytics (MBA), Prof. Alireza Tahbaz-Salehi **2021-2023**

Teaching Assistant, The University of Chicago
Microeconomics (MBA), Prof. Richard Hornbeck **2019-2020**
Business in Historical Perspective (MBA), Prof. Richard Hornbeck **2019-2020**
Principles of Microeconomics and Public Policy II (MPP), Prof. Konstantin Sonin **2020**

Research Experience

Research Assistant to Prof. Benjamin Jones, Northwestern University **2024**
Research Assistant to Prof. Daniel Spulber, Northwestern University **2022-2023**
Research Assistant to Prof. Richard Hornbeck, The University of Chicago **2019-2020**
Research Assistant to Prof. Steven Durlauf, The University of Chicago **2019-2020**

Presentations

2025 (incl.scheduled): INFORMS, AOM, DRUID, AI Plus Management Doctoral Consortium (UCL), Duke Strategy PhD Conference, Wharton Innovation Doctoral Symposium

2024: AOM, SMS, Northwestern (Econ), Northwestern (Kellogg), Eastern Economic Association Annual Meeting (Boston), AIM (USC Marshall), International Conference on the Science of Science and Innovation (Washington DC)

2023: Northwestern (Econ), International Industrial Organization Conference (Washington DC), Economics of QIT Conference (USC Marshall), Northwestern (Kellogg), International Conference Science of Science and Innovation (Kellogg), Northwestern (AI@NU)

Application Essay

As a Ph.D. student in the Managerial Economics and Strategy program at the Kellogg School of Management, Northwestern University, I am deeply fascinated by research on the economics of innovation and entrepreneurship. I am applying to the Entrepreneurship Research Boot Camp 2026, which I believe will further enhance my academic training and provide new perspectives on entrepreneurship research. I am confident that this boot camp will be an invaluable opportunity for me to deepen my understanding of key concepts and collaborate with leading scholars in the field.

One of my current research projects are on human capital and firm's innovation direction. This project examines how the loss of personnel impacts the direction of innovation within firms. I introduce three distinct measures to quantify shifts in firms' innovation trajectories. Using a difference-in-differences approach, I then analyze changes in the innovation direction of U.S. public firms following personnel deaths. The results reveal that the death of upper-tail inventors significantly alters a firm's innovation trajectory, while deaths among lower-tail inventors and management personnel do not. Further analysis suggests that a firm's innovation direction is shaped by the aggregation of individual inventors' expertise and the collaborative dynamics within teams. The findings—characterized by reduced invention in the technology fields of upper-tail inventors, a lack of new inventors in affected firms, and declines in firm performance—highlight the hard-to-replace nature of inventive human capital and underscore its role in firms' dynamic capabilities.

Another research project I am working on is how the commercialization of innovation affects patent disclosure. Invention disclosure facilitates knowledge spillovers, supporting future progress but potentially limiting appropriability for the inventor. This project examines invention disclosure behavior by analyzing the readability of patent texts, using both traditional and novel AI-based readability scores. Using two difference-in-difference analyses, the study finds that following the 1980 Bayh-Dole Act and the establishment of Technology Transfer Offices, university-affiliated inventors reduced the readability of patent detailed descriptions. This decrease in readability does not extend to patent summary texts, suggesting that university inventors strategically limit information on how to make and use the invention. The findings reveal strategic disclosure behavior not just in the decision of whether to patent or keep inventions as trade secrets, but also in the degree of patent language clarity. Institutional changes lead inventors to selectively adjust the information disclosed in their patents. The mechanisms behind this influence and its impact on follow-on innovation are further explored.

I also coauthored a project on adaptability and the pivot penalty in science and technology. This project introduces a measurement framework to quantify how far researchers move from their existing research when producing new works. We uncover a pervasive "pivot penalty", where the impact of new research steeply declines the further a researcher moves from their prior work. The pivot penalty applies nearly universally across scientific publishing and patenting and has been growing in magnitude over the past five decades. While creativity frameworks suggest a benefit to exploratory search by researchers and often emphasize outsider advantages in driving breakthroughs, we find little evidence for such an advantage. The pivot penalty is consistent with increasingly narrow specializations of researchers, and when researchers undertake large pivots, a signature of their work is weak engagement with established mixtures of prior knowledge.

I believe this competitive research boot camp taught by outstanding researchers will greatly help me in furthering research in the economics of innovation and entrepreneurship. I will have the opportunity to learn cutting-edge entrepreneurship and innovation research, improve my ability to formulate research questions, develop innovative research ideas, and make significant contributions to the field in the future. I believe that the research skills that I have acquired in my research projects can be used to address questions in innovation and entrepreneurship study.

I am very eager and enthusiastic to join the NBER Entrepreneurship Research Boot Camp. I strongly believe this is an essential opportunity for a young scholar like me to get intensive academic training, build an academic connection with fascinating scholars, and advance my research in the economics of innovation and entrepreneurship. I sincerely hope to be considered for admission to this competitive boot camp.