SEUNG HYEONG LEE
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Dear NBER Innovation Research Boot Camp Team,

I am writing to apply for the NBER Innovation Research Boot Camp 2025. I am a Ph.D. candidate in Economics at Northwestern University with a research focus on finance, macroeconomics, and labor economics. While taking the Innovation Economics and the Science of Science course by professors Ryan Hill and Benjamin Jones, I developed an interest in the topic of innovation. Since then, I have been exploring how firms' innovation and investment in innovation affect their customers and workers. I am excited for the opportunity to learn at the program, as my research interests and experience make me a good fit for the program. During the boot camp, I look forward to developing my current research projects while applying the training I receive to a variety of potential research topics.

Several of my current projects focus on the effects of firm innovation on society. For one, I am analyzing how alternative credit scoring systems using machine learning algorithms and unstructured data can promote loan access for low-income households. I also examine how firms' investment in innovation affects their employees' human capital and their position in the labor market. The topic of innovation has potential intersections with my other research agenda, in the sense that innovation may affect households' economic decisions and that innovation policy can encourage dynamism in business and foster economic growth. Additionally, I am experimenting with innovative methods in economic research to test how they can benefit the academic community. Using Large Language Models, I am working on generating virtual economic agents which can be used to simulate households.

NBER Innovation Research Boot Camp is an ideal opportunity for me to continue building on my research interests. Lectures from outstanding faculty will help me delve more deeply into my current fields of interest and explore a diverse array of related topics. Interacting with fellow attendees, I will also be able to refine my current research projects and build a foundation for future collaborations. I am eager to learn in the boot camp as a student aspiring to become an academic economist, and to contribute to the intellectual community working on the economics of innovation and innovation policy.

Please find enclosed my curriculum vitae, with a list of all current and completed PhD courses, and research essay. Please also note that a letter of recommendation from Scott Baker (s-baker@kellogg.northwestern.edu) has been sent separately to you via his email address. I would be happy to provide any additional details that you need. Thank you for considering my application, and I look forward to hearing from you.

Sincerely,

Seung Hyeong Lee

Lee, Seung Hyeong

Contact Information

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Education

Northwestern University — **Evanston, IL**
Ph.D. in Economics — *September 2022 - Present*

University of Rochester — **Rochester, NY**
B.A. in Economics (with high distinction) and Mathematics — *May 2020*

- Cumulative GPA: 3.96/4.0, *magna cum laude*
- Certificate of Mathematical Modeling in Political Science and Economics
- Citation in Economic Theory and Application

Employment

Federal Reserve Bank of Chicago — **Chicago, IL**
Visiting Scholar — *September 2024 - December 2024*

Department of Economics, Harvard University — **Cambridge, MA**
Pre-Doctoral Fellow for John Beshears, James Choi, and David Laibson — *June 2020 - May 2022*

Research Interests

Finance, Macroeconomics, Labor Economics

Publications

"A Randomized Trial of Behavioral Nudges Delivered Through Text Messages to Increase Influenza Vaccination Among Patients With an Upcoming Primary Care Visit" (with Mitesh Patel, Katherine Milkman, and 43 co-authors), *American Journal of Health Promotion*, 2023, 37(3): 324-332

"Test-Based Accountability and the Effectiveness of School Finance Reforms" (with Christian Buerger and John Singleton), *AEA Papers and Proceedings*, 2021, 111: 455-59

Working Papers

"Giving Up": The Impact of Decreasing Housing Affordability on Consumption, Employment, and Investment (with Younggeun Yoo)

"Disagreement, Subjective Uncertainty, and the Stock Market" (with Jingoo Kwon and Younggeun Yoo)

Work in Progress

"Anticipatory Spending" (with Scott Baker, Michael Gelman, and Lorenz Kueng)

"Intangible Investments and Human Capital Growth" (with Bryan Seegmiller, Yufeng Wu, and Miao Ben Zhang)

"Spatial Inequality and Multi-Plants Firms" (with Hyunseob Kim and Michal Zator)

"Access to and Gains from Selective Education" (with Ying Shi and John Singleton)

"Large Language Model's Out-group Perception" (with Minwoo Kang and Suhong Moon)

Research Experience

Kellogg School of Management, Northwestern University — **Evanston, IL**
Research Assistant for Bryan Seegmiller — *September 2023 - June 2024*
Research Assistant for Scott Baker — *May 2023 - September 2023*

Federal Reserve Bank of Chicago — **Chicago, IL**
Research Assistant for Hyunseob Kim — *July 2023 - December 2023*

Department of Economics, Northwestern University — **Evanston, IL**
Research Assistant for Kirabo Jackson — *June 2023 - December 2023*

Department of Economics, University of Rochester — **Rochester, NY**
Research Assistant for Lisa Kahn — *January 2020 - March 2020*
Research Assistant for Mark Bils — *December 2019 - March 2020*
Research Assistant for John Singleton — *January 2019 - March 2020*

Teaching Experience

Department of Economics, Northwestern University — **Evanston, IL**
Teaching Assistant
- ECON 309 Public Finance — *Winter 2024, Spring 2024, Winter 2025*

Department of Economics, University of Rochester — **Rochester, NY**
Teaching Assistant
- ECO 289 Economic Research and Communication (John Singleton) — *Spring 2020*
- ECO 277 Financial Crisis: Theory & Evidence (Asen Kochov) — *Spring 2020*
- ECO 225 Freakonomics (Lisa Kahn) — *Spring 2020*
- ECO 217 Contract Theory (Mark Bils) — *Fall 2019*
- ECO 211 Money, Credit & Banking (Narayana Kocherlakota) — *Spring 2019*
- ECO 209 Intermediate Macroeconomics (Yan Bai) — *Spring 2018*
- ECO 207 Intermediate Microeconomics (Kuzey Yilmaz) — *Fall 2015*

Military Service

2502nd Digital Liaison Detachment, 8th United States Army — **Daegu, Korea**
Sergeant — *January 2016 - October 2017*

Awards and Honors

Barry Rapoport Prize, University of Rochester — *May 2020*
Research Presentation Award, University of Rochester — *March 2020*
Phi Beta Kappa (Junior Inductee) — *May 2019*
United States Army Commendation Medal — *October 2017*

Scholarships and Fellowships

Institute for Policy Research Graduate Assistantship — *Fall 2023*
Northwestern University Fellowship — *Fall 2022 - Spring 2023*
University of Rochester College Grant (Merit Scholarship) — *Fall 2014 - Spring 2020*
Continuing Student Scholarship for Undergraduates — *Fall 2019 - Spring 2020*
Korea Defense Veterans Association Scholarship — *Fall 2018 - Spring 2019*

Grants

EdChoice Research Grant — *September 2021*

Seminar Presentations	2025: Northwestern University (EconLab, HELP Workshop) 2024: Northwestern University (Applied Micro Lunch Seminar), Federal Reserve Bank of Chicago
Conference Presentations	(* denotes co-author presentation) 2024: Yiran Fan Memorial Conference (Poster)*, Economics Graduate Student Conference* 2021: ASSA* 2020: AEFP*, APPAM*
Other	Computing: Stata, SAS, SQL, LaTeX Clearance: U.S. Census Bureau Special Sworn Status (2023 - Present) Department Service: First Year Mentor (2023 - Present)

References

Scott R. Baker
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Kellogg School of Management
Northwestern University
Phone: 415-244-8274
Email: s-baker@kellogg.northwestern.edu

Bryan Seegmiller
Assistant Professor of Finance
Kellogg School of Management
Northwestern University
Phone: 435-313-6534
Email: bryan.seegmiller@kellogg.northwestern.edu

C. Kirabo Jackson
Professor of Economics
Abraham Harris Professor of Education and Social Policy
Northwestern University
Phone: 847-491-8207
Email: kirabo-jackson@northwestern.edu

Ph.D. Coursework

First Year: Microeconomics I, II, III; Macroeconomics I, II, III; Econometrics I, II, III;

Elective Courses: Innovation Economics and the Science of Science; Corporate Finance I, II; Industrial Organization; Labor Economics; Economics of Organizations; Public Finance; Applied Microeconometrics; Economic Theory and Methods; American Economic History

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I am currently developing three projects on the economics of innovation.

In the first project, I am working with a fintech firm operating in India to analyze how we can use alternative credit scoring systems based on machine learning algorithms to promote loan access for low-income households. This fintech firm uses alternative data sources (information from smartphone devices) to evaluate credit scores and provide loans to those who previously did not have access to loans due to limited credit information. In the project, I have documented how the alternative credit score system has the effect of reducing default rates compared to the traditional credit score. By analyzing the characteristics of users who have benefited from the new system, I show that financially underserved groups are the ones to benefit. I then evaluate how their welfare has been improved by examining how people use the loans and how their economic conditions have changed. Through this project, I hope to shed a new light on using alternative datasets and machine learning in microfinance to help disadvantaged households' real-life economic activities.

In another project with Bryan Seegmiller, Yufeng Wu, and Miao Ben Zhang, we investigate how firm's investment in intangible capital, an important source of innovation, brings an increase in human capital. In examining what firm characteristics influence employees' human capital, we show that firm investments, especially investments in intangible capital, encourage human capital growth in the employees. We also point out that, since workers move between firms, there is an external spillover of human capital and firms may not be able to retain the human capital that they cultivate. However, we also show how firms are still motivated to invest in human capital, as they are able to internalize its benefits through high markup and profitability. Incorporating these ideas, we provide a model to explain the labor market dynamics of firms making hiring and investment decisions, taking into account workers' preference to work for the "human capital incubator" firms.

Thirdly, I am interested in directly applying innovative methods to economic research. In a project with Minwoo Kang and Suhong Moon, we are working on generating virtual economic agents through LLM. As our first step, we created virtual personas through the "Anthology" method (Moon et al., 2024), where we provide open-ended life narratives to create the personas and study in/out-group (mis)perceptions. We show that the method captures humans' in/out-group (mis)perceptions related to politics, gender, and immigrants more accurately than other methods. Through the virtual agents, we are examining how echo-chambering occurs by separately estimating the echo and chamber effects and developing the optimal way to decrease the impacts through information injection. In the long run, we want to use virtual economic agents to study the decision-making process of humans and estimate policy effects before implementing them.

In the boot camp, I hope to receive feedback not only on my existing projects but also on my early-stage research ideas regarding innovation. I am developing two ideas using restricted-usage Census datasets. The first idea examines how proximity to other firms affects a firm's innovation-related tendencies and outcomes. The relationship between proximity and innovation is a potential channel of explaining how the agglomeration of firms in specific areas exacerbates spatial inequality. The second project documents whether patents from small and big companies are becoming similar and how much the phenomenon can explain a slowdown in innovation and business dynamism. Specifically, I plan to see big firms that poach productive innovators from small firms enjoy increased labor market power as a result. Based on my observations, I hope to propose an optimal innovation policy to counteract the phenomenon.

NORTHWESTERN UNIVERSITY
KELLOGG SCHOOL OF MANAGEMENT
DEPARTMENT OF FINANCE
EVANSTON, IL, 60208

SCOTT R. BAKER
ASSOCIATE PROFESSOR OF FINANCE
S-BAKER@KELLOGG.NORTHWESTERN.EDU

January 27, 2025

Recommendation for Seung Hyeong Lee

Dear Summer Institute Selection Committee,

I have known Seung Lee since 2023 when he began working as my Research Assistant. Since then, we have been working together on one project, where he is now a co-author, and have been discussing several potential ideas for a second related project.

In short, he has is a fantastic collaborator and has been indispensable in many different aspects of the research process. He has enabled us to quickly align and integrate several different (very large and complex) databases and has always kept in mind the eventual goals of the research when doing so. He is quick to remind me when a particular strategy will not work or may be less efficient than an alternative that he has devised. Overall, he has been a pleasure to work with and I hope to continue to do so in the future.

Our first project aims to better understand the extent to which households change spending in response to news about future income shocks. Most models of household behavior assume that households are forward looking in most dimensions. That is, households incorporate news about future income into the current levels of spending. However, many previous papers have found that households tend to underreact to news and overreact to the actual occurrence of income changes. This paper leverages household financial transaction data (bank, credit, and debit transactions) across tens of millions of Americans to build a large set

of anticipated income changes (including stimulus checks, tax refunds, state-level rebates, and child tax credits) to seek to define the boundaries of when they do or do not response to such news events, both across households and within a given household over time. Moreover, we can better define the types of individuals and circumstances, across financial characteristics, that tend to respond as models would predict.

Seung is working on several other projects on his own or with co-authors, as well. One project also utilizes the household transaction data with which he has gained experience in our joint project. Preliminary results suggest that persistent negative shocks to real income can sometimes counter-intuitively induce increases in non-durable consumption as households give up on future home purchases and consequently reduce savings towards a down payment.

Beyond his research activities, Seung has done well in his graduate coursework. This includes the traditional first year core sequence as well as second year field coursework in corporate finance, IO, applied microeconomics, public finance, innovation, and economic history.

Overall, Seung has shown great enthusiasm for engaging in excellent topical and impactful projects and is well equipped for a productive career pursuing data-driven research. He has every indication of becoming a great researcher and is an excellent candidate for this workshop.

If I can be of further assistance, please feel free to e-mail or contact me at 415-244-8274.

Sincerely,



Scott R. Baker