Cover Letter

Jieying Zhang
Economics Ph.D. Candidate at Harvard University
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Reference of recommendation letter writer: Prof. Josh Lerner jlerner@hbs.edu

Hi,

Thanks a lot for taking time to read my application! I am a fourth-year PhD student in the Economics program at Harvard. I came from a diverse background of macro, finance, and some trade and IO. These coursework and my RA experiences in international and empirical finance help me accumulate many research tools and skills that I can apply in innovation research, including working with large data sets, using leading machine learning methods and LLMs, doing causal analysis and structural estimation, and modeling dynamic decisions and general equilibrium. Since my third year I have been deeply interested in innovation and been studying and doing research in the field, from initially more on the measurement side (e.g., measuring innovation frontier, separating product vs process innovation) to now more on the economic implications (e.g. how to evaluate the gains and loss of local technology cluster). I would really love to attend the innovation bootcamp because it provides a precious opportunity to deepen my knowledge of innovation, discuss key open questions in innovation research, understand key practical issues to consider for innovation and R&D policies, and learn from other people in the innovation community. I sincerely appreciate your time and consideration of my application, and looking forward to hearing from you!

Best,
Jieying

List of Current and Completed PhD Courses

Econ 2416	Empirical Macro	Fall ’22	A
Econ 2410A	Macro-Finance: Rational and Behavorial	Sp ’23	A
Econ 2530B	International Macro/Finance	Sp ’23	A
Econ 2535	International Trade	Sp ’23	A-
Econ 2723	Asset Pricing	Fall ’22	A
Econ 2725	Corporate Finance and Banking	Fall ’22	A-
Econ 2727	Empirical Methods in Financial Economics	Sp ’23	A
Econ 2412	Time Series Analysis	Fall ’22	A
Stat 236	Network and Text Analysis	Fall ’23	A
Econ 2610	Industrial Organization I	Fall ’24	A-
Econ 2726	Perspectives on Entrepreneurship and Innovation	Sp ’25	Auditing
Econ 2030	Psychology and Economics	Sp ’22	A
Econ 2010B	Microeconomic Theory II	Sp ’22	A-
Econ 2010D	Macroeconomic Theory II	Sp ’22	A
Econ 2140	Econometrics II	Sp ’22	A
Econ 2010A	Microeconomic Theory I	Fall ’21	B+
Econ 2010C	Macroeconomic Theory I	Fall ’21	B+
Econ 2120	Econometrics I	Fall ’21	A-

Jieying Zhang

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Education

2021 – **Harvard University**
Ph.D. Candidate in Economics (Expected graduation date: May 2027)
Fields: Innovation, Macroeconomics, Finance

2017 – 2021 **University of Wisconsin-Madison**
B.S. with triple Majors in Economics (Mathematical Emphasis), Mathematics, and Computer Sciences
- Comprehensive Honors - Honors in Economics and Honors in the Liberal Arts; GPA: 4.0/4.0

Independent Research in Progress

2024 – Diffusion and Adoption of Information Technologies
2024 – Goldrush: Technological innovation and the allocation of talent and entrepreneurial capital (joint with Abhijit Tagade)
2024 – On the Nature of Innovation in Durable Goods
2023 Measuring the Dynamics of Innovation Frontier using ML Topic-Modeling Methods

Research Experience

2023 – 2024 Research Assistant to Professor Jonathan Wallen (Harvard Business School)
2022 Research Assistant to Professor Kenneth Rogoff (Harvard)
2020 – 2021 Undergraduate Senior Thesis in International Macroeconomics (Advised by Professor Charles M. Engel)
2020 Directed Study in Economics Geography (Supervised by Professor Raymond Deneckere)
2019 – 2021 Research Assistant to Simeon D. Alder (UW-Madison, Center for Research on the Wisconsin Economy)

Teaching Experience

Spr 2024 & 25 Second-Year Behavioral Macro-Finance (Harvard PhD)
First-Year Sequence in Macroeconomics, Quarter IV (Harvard PhD)
Teaching Fellow for Professor Xavier Gabaix

Fall 2023 & 24 Econ 1545: International Financial and Macroeconomics Policy (Harvard Undergraduate)
Teaching Fellow for Professor Kenneth Rogoff

Summer 23 Math Camp for Incoming Economics PhD Students (Harvard)
Teaching Fellow for Macroeconomics Section (with Rachel Pomerantz)

Awards and Honors

2020 Juli Plant Grainger Scholarship, *Department of Economics, UW-Madison*
2019 Lennell Goodman Ammerman Scholarship, *Department of Economics, UW-Madison*

Others

Programming: *Advanced:* STATA, Python, Julia, SAS; *Intermediate:* MATLAB, R; *Basic:* Java, C, SQL, GAMS
Others: Git, Jupiter Notebook, LATEX, Microsoft Office Suite
Languages: Mandarin (native), English (fluent)

I am a fourth-year PhD student in the Economics department at Harvard University. My research broadly focuses on the macroeconomic impact of innovation activities and R&D policies, and recently in particular on the diffusion and adoption of information technologies with its implication on firm productivity, inequality, and innovation sustainability.

I originally came from a background of macro and finance, but since my third year in the PhD program, I have been deeply interested in innovation and been exploring a variety of innovation topics. In what follows, I first summarized a few projects and ideas I worked on during my third year:

- My very first innovation project is to measure and understand the evolution of innovation frontier. Treating innovation as problem-solving, there are problems that innovators struggle to solve and other directions that innovators have successfully pushed forward. The difference in the difficulty of science and the amount of scientific progress embedded in patents may not always be reflected in patent counts and citations. Motivated by this, I cleaned the raw text of patents and used a high-dimensional text analysis method, topic modeling, to extract a focal set of problem descriptions that patents in each field have worked on, as well as the distribution of innovation effort in each problem. I showed results in the context of biomarkers and highlighted how the research progress in each extracted problem of cancers and other diseases has evolved over time. (Fall 23)
- My second project focused on separating the amount of product vs process innovation across firms and industries. Assuming that product innovation enters the demand curve – as taste shocks – and process innovation enters the supply curve – as TFP shocks, we proposed and experimented a 2-step strategy to identify product and process innovation by using the variation in product price and quantity data and building on De Loecker et al (2020). We still need to work out identification challenges. (Fall 23 – Spring 24)
- In my third (early-stage) project, I looked into the feedback loop between households-side technology diffusion and firm-side innovation, with the goal of understanding how a newly innovated feature in durable goods diffuse across households of different demographics, and how the consumer composition differences of firms affect their investment and innovation decisions. I am in talk with some private data company to evaluate the feasibility of data purchase on detailed product-level data. (Summer 24 –)

In my fourth year, I have been studying the diffusion and adoption and information technologies. Using US individual work history data, firm fundamentals, and patent data, I constructed a new measure of IT adoption and IT intensity by exploring the capital-skill complementarity. I then applied the IT adoption measures to study (1) how technology adoption is achieved through the lens of human capital, by separating the relative importance of skilled labor mobility versus on-job training in explaining real-world technology adoption patterns, and (2) how the adoption of different information technologies influences the firms and industry productivity across geographic areas via various performance dimensions. While most of my time is devoted to this current project, there are many other connected research areas that I am excited to explore in the future, including how innovation breakthroughs affect the flow and allocative efficiency of private capital, how regional innovation hubs (and technology clusters) influence the local prosperity and human capital availability, how foreign trade policies (e.g., tariffs, restrictions on dual-use goods) may affect the innovation directions, and how global competition in technologies may shape the country productivity and social welfare.

I would really love to attend the innovation boot camp because it offers a valuable opportunity to deepen my knowledge of innovation and to learn more about the key open questions in innovation research as well as the important practical issues when thinking about innovation and R&D policies. I also really appreciate the opportunity to connect with other students and scholars in the innovation community, to learn from each other and hopefully spark new ideas or insights that I might not have arrived at on my own.

HARVARD UNIVERSITY

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

GEORGE F. BAKER FOUNDATION

JOSH LERNER
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February 7, 2025

Ms. Brett Maranjian
Conference Department
National Bureau of Economic Research

Dear Brett:

I am delighted to write a letter of recommendation for Jieying Zhang for the NBER Innovation Research Bootcamp this summer. She is a fourth-year doctoral student at Harvard Economics that I have been advising for the last year-and-a-half alongside Gabe Chodorow-Reich. She has also been a student in my doctoral class, Economics 2726, "Theoretical and Empirical Perspectives on Entrepreneurship and Innovation." I have been quite impressed with Jieyang and would give ***my very strongest recommendation*** that you accept her to this program.

Jieying has produced a series of papers (and proto-papers) looking at issues about innovation that are really intriguing. While a clear job market paper has not emerged yet, a number of these are super-promising. I will briefly discuss two of these.

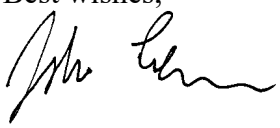
Then first tries to look at innovative progress, but seeking to address not simply observed progress (e.g., patents or papers), but also innovative effort. To do this, she uses textual analysis of patents to discern where the inventors have both devoted effort to and succeeded in. Focusing empirically on the arena of biomarkers, she shows how much researchers differ not just in their efficacy in inventing in a given topic, but in their ability to identify promising questions to pose more generally.

Another interesting line of research has been to look at heterogeneity in the diffusion of information technologies. Many of the influential economics papers on the impact of IT has treated it as an undifferentiated whole, while it seems likely that the extent to which various technologies can be adopted, specialized, and integrated differ substantially. She is looking at how rivals and firms in downstream industries adopt and integrate a wide variety of ITs into their own processes, and how these processes. To do this, she constructs a measure of firm-level adoption using aggregated LinkedIn data, where individual information technological specializations are measures using bigrams *a la* Kalyani *et al.* (2025).

These two projects illustrates the skills that Jieying brings to the table, as well as the creativity of the questions she is posing. She is curious, enthusiastic, and has the potential to be a terrific contributor to the field of economics of innovation. She would benefit tremendously from the Boot Camp, and I very highly recommend her.

I hope these comments are of use. Please do not hesitate to follow up with any additional questions.

Best wishes,



Josh Lerner

Aakash Kalyani, Nicholas Bloom, Marcela Carvalho, Tarek Hassan, Josh Lerner, Ahmed Tahoun, The Diffusion of New Technologies, *The Quarterly Journal of Economics*, 2025, qjaf002.