Cover Letter

Xiaoran Liu
4th year PhD Candidate, Economics
Nanyang Technological University
Singapore

Email: xiaoran.liu@ntu.edu.sg

February 2026

Admissions Committee
NBER Innovation Research Boot Camp 2026
National Bureau of Economic Research

Dear Members of the Admissions Committee,

I am writing to apply for the NBER Innovation Research Boot Camp 2026. I am currently a 4th year PhD Candidate in Economics at Nanyang Technological University, where my research focuses on industrial policy, innovation, and the economic impacts of artificial intelligence.

My research examines how industrial policy instruments—including intellectual property regimes, R&D support, and procurement—shape the direction and quality of innovation. I use large language models (LLMs) both as a measurement tool to extract structured policy and innovation variables from unstructured text, and as an experimental platform to study innovation incentives and mechanisms. Through projects on Taiwanese industrial policy and LLM-based innovation experiments, I aim to provide policy-relevant evidence on how design choices in industrial policy affect innovative growth and diffusion.

I am eager to attend the NBER Innovation Research Boot Camp because it offers unparalleled training in the economics of innovation and direct engagement with scholars working at the frontier of innovation, growth, and AI-related research. I also value the opportunity to exchange ideas with other early-career researchers interested in innovation and industrial policy.

One letter of recommendation will be submitted on my behalf by Professor Xu Jianhuan from Singapore Management University (SMU) or by Professor Tang Yang from Nanyang Technological University (NTU), who are both familiar with my current research projects and academic development. (Professor Tang is currently on leave, and in case she cannot submit on time, I have included both professors here.)

Thank you very much for your time and consideration. I would be grateful for the opportunity to participate in the NBER Innovation Research Boot Camp 2026.

Sincerely,
Xiaoran Liu

Liu Xiaoran (Ryan)

Xiaoran001@e.ntu.edu.sg | +65 81600502

Education

Nanyang Technological University (NTU), Ph.D. in *Economics* Expected graduation time: 2027

Research interests: Industrial Policy; Innovation Economics; Intellectual Property as Policy Instrument; Artificial Intelligence and Growth; Innovation and Labor Markets

Course: Advanced Macroeconomic, Advanced Microeconomic, Advanced Econometrics, Financial Economics, Industrial Organization, Machine learning for Economics, Economic Growth

University of California, Berkeley, *Bachelor of Arts,* Double major in *Economics* and *Applied Mathematics* May 2023

Research Projects

Industrial Policy and Innovation: Evidence from Taiwan

- Uses large language models to parse Taiwanese industrial policy documents (laws, regulations, program guidelines) and construct a high-frequency panel of policy instruments, including IP protection, R&D subsidies, and procurement
- Links text-derived policy measures to firm- and patent-level outcomes to study innovation quality, technological upgrading, and diffusion

Innovation Policy Mechanisms in LLM Agent Experiments

- Designs controlled LLM-agent environments to study how industrial and innovation policy instruments affect exploration, novelty, and diffusion in innovation
- Uses agent behavior to isolate mechanisms difficult to identify in observational data

Research Experience

Research Assistant, Prof. Tang Yang (Nanyang Technological University)

- Contributed to research on industrial policy and innovation using administrative and textual data
- Assisted with data construction, empirical analysis, and robustness checks

Research Assistant, Prof. James Ang (Nanyang Technological University)

- Supported projects on economic growth and innovation
- Conducted data analysis and assisted in interpretation of empirical results

Teaching Experience

Teaching Assistant, Intermediate Microeconomics (Nanyang Technological University) May 2024 – Sep. 2025

Conference Participation

Asia-Pacific Symposium on Economics and Finance, 2025

Skills and Personal

- *Programming languages*: Fluent in R Studio, Stata, Python, Stata, Excel, Matlab, SQL, and Dynare
- *Hobbies*: Weight training, distance running, Live Action Role Playing (LARP) games, all kinds of documentaries

One-page essay

My research agenda studies how industrial policy shapes innovation and long-run growth, with particular emphasis on policy design, appropriability, and the emergence of artificial intelligence as a general-purpose technology. Methodologically, I use large language models (LLMs) to transform unstructured policy and technical text into economic data, and to construct controlled experimental environments for studying innovation incentives. The unifying goal is to open the "black box" of industrial policy by measuring not only *whether* governments intervene, but *how* specific policy instruments redirect innovative activity.

My current research focuses on Taiwan as a laboratory for modern industrial policy. A core limitation in the empirical literature is that industrial policy is usually proxied by coarse expenditure or sector-level indicators, which obscure the underlying policy tools. We address this by using LLMs to parse the full corpus of Taiwanese industrial policy documents, including statutes, administrative regulations, program guidelines, and implementation notices, and classify them into a high-frequency panel of policy instruments. The classification captures economically meaningful dimensions: policy tool (e.g., IP protection, R&D subsidies, procurement, commercialization support), targeted technology, implementation strength, and policy intent. Importantly, intellectual property is treated explicitly as an industrial policy instrument that governs appropriability and the incentives to invest in risky innovation, rather than as a purely legal institution. I link this text-derived policy panel to firm- and patent-level outcomes to study how different industrial policy designs affect innovation quality, technological upgrading, and diffusion, moving beyond patent counts to measure novelty, scope, and downstream spillovers.

My future research extends this agenda in two directions. First, I plan to further decompose industrial policy by measuring design features such as conditionality, selectivity, and dynamic targeting, allowing me to identify which policy structures generate innovative growth rather than rent-seeking or misallocation. Second, I will study how AI alters the innovation–growth relationship by lowering the cost of idea production while changing the role of human labor in research and invention. This work is directly inspired by Chad Jones's research on ideas, growth, and AI, and aims to connect macro-level implications of AI-driven innovation to micro-level policy design and labor-market adjustment.

I seek to attend the NBER Innovation Research Boot Camp because it offers unmatched training in the economics of innovation and industrial policy, and because the faculty's work closely aligns with my research interests. I am particularly eager to learn from scholars working on innovation, growth, and AI, and to refine my projects through discussion with other early-career researchers studying innovation policy. The boot camp would play a central role in shaping my research at a formative stage.

Dear Members of the Selection Committee,

I am pleased to write in strong support of Xiaoran Liu's application to the NBER Innovation Research Boot Camp. I am an Associate Professor of Economics at Singapore Management University, and Xiaoran has worked with me as a research assistant while pursuing his PhD at Nanyang Technological University. During this time, I have been consistently impressed by his research ability, intellectual maturity, and initiative.

Xiaoran's research focuses on industrial policy and innovation, with particular interest in Taiwan's industrial development. He combines strong institutional understanding with modern empirical methods and has recently developed approaches using large language models to systematically analyze policy and administrative documents. Importantly, he treats these tools as part of a rigorous research design rather than as black-box techniques, demonstrating strong judgment in data construction and identification.

As an RA, Xiaoran has shown excellent analytical skills and independence. He moves efficiently from conceptual discussions to implementation and often contributes ideas that improve research design. I view him as a highly promising young researcher with clear potential to produce impactful work in innovation and industrial policy.

The NBER Innovation Research Boot Camp would be an ideal environment for Xiaoran at this stage, and I strongly recommend him without reservation.

Sincerely,
Jianhuan Xu
Associate Professor of Economics
Singapore Management University

School of Humanities and Social Sciences
Division of Economics

48 Nanyang Ave, Singapore 639818
Tel: 65-67906115 Fax: 65-67955797
Email: tangyang@ntu.edu.sg

NANYANG TECHNOLOGICAL UNIVERSITY

Yang Tang PhD
Associate Professor
Division of Economics, School of Humanities and Social Sciences
Nanyang Technological University
48 Nanyang Ave SSS 04-56
Singapore 639818

Singapore, 13h Feb 2026

To whom it may concern,

I am writing a reference to give Mr. Xiaoran Liu my strongest recommendation to your NBER Innovation Research Boot Camp. Xiaoran, with his solid academic background and strong motivation, I am confident that he will excel in your highly selective camp. Xiaoran is a strong candidate in our PhD program. Although I am not his supervisor, we have worked together on a joint research project for more than six months. In our project, we attempted to document the structural changes in industrial policy in Taiwan over the past seven decades. The literature has extensively studied structural change along the process of economic development. Industrial policy is a popular topic to study these days. We combine these two streams of literature, and try to provide insights on the optimal industrial policy. The research requires comprehensive implications of the large language models (LLM). Xiaoran is a great expert in this area. He has helped us identified industrial policy from broadly defined industries among over 1-million policy documents. He is very passionate, committed and also creative in his role. Our project has greatly benefited from his contribution. I am sure your program can be a great complements to his skill set and thus can help improve his knowledge in innovation.

Please do not hesitate to contact me at tangyang@ntu.edu.sg if you have any questions about his qualifications.

Yours Sincerely,
Yang Tang