Feburary 6, 2025

Selection Committee
NBER Innovation Research Boot Camp 2025

Dear Selection Committee,

I am writing to apply for the Innovation Research Boot Camp hosted by the NBER in July 2025. I am currently a second-year PhD candidate in economics at the University of Pennsylvania.

Please find enclosed the requested application materials. My recommendation letter writer is **Joachim Hubmer**, Assistant Professor of Economics at the University of Pennsylvania.

Thank you for reviewing my application. Should you need any further information, please feel free to reach out using the contact details provided below.

Sincerely,

Jack Dunbar
PhD Candidate
Department of Economics
University of Pennsylvania
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(207) 337-1753

Jack Dunbar

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Education

University of Pennsylvania
Ph.D. in Economics — exp. 2028

Carnegie Mellon University
B.S. in Economics and Mathematics — 2021
Honors thesis: *The Codetermined Firm and Automation*

Interests

Macroeconomics, Growth, Technological Change, Family Economics

Employment

Federal Reserve Board of Governors
Research Assistant, Industrial Output section — 2021 - 2023

Working Papers

In the Driver's Seat: Pandemic Fiscal Stimulus and Light Vehicles — 2024
with Christopher Kurz, Geng Li, and Maria D. Tito

Teaching

University of Pennsylvania
Economic Growth (TA to Prof. Hubmer) — 2025
Intermediate Microeconomics (TA to Prof. Vohra) — 2024

Carnegie Mellon University
Intermediate Macroeconomics (TA to Profs. Sleet and Foley-Fisher) — 2020 - 2021

Honors and Fellowships

Benjamin Franklin Fellowship, University of Pennsylvania — 2023 - 2028
Outstanding Teaching Assistant, Carnegie Mellon University — 2021

Programming

R, Matlab, Python, Stata

Citizenship

USA

Economics PhD Courses at UPenn

Current (Spring 2025)

1. *Topics in Advanced Macro: Goods Markets and Market Power* with Professor Lukas Nord
2. *Topics in Quantitative Econ: Heterogeneity, Banking, Family & Labor* with Professor José-Víctor Ríos-Rull
3. *Advanced Topics in Macro: Financial Frictions* with Professor Harold Cole
4. *Economic Growth* with Professor Jeremy Greenwood (begins in March)
5. *Topics in Advanced Quantitative Macroeconomics* with Professor Joachim Hubmer (begins in March)

Completed (Fall 2024)

1. *Introduction to Macroeconomics with Household Heterogeneity* with Professor Dirk Krueger
2. *Computational Methods in Economics* with Professor Jesús Fernández-Villaverde
3. *Search Theory and Applications* with Dr. Benjamin Lester
4. *Topics in Development* with Professor Shresth Garg

Completed (Spring 2024)

1. *Microeconomic Theory II* with Professor George Mailath
2. *Macroeconomic Theory II* with Professors Jeremy Greenwood and José-Víctor Ríos-Rull
3. *Econometrics II: Methods & Models* with Professors Frank Schorfheide and Wayne Gao

Completed (Fall 2023)

1. *Microeconomic Theory I* with Professors Aislinn Bohren and Andrew Postlewaite
2. *Macroeconomic Theory I* with Professors Dirk Krueger and Alessandro Dovis
3. *Econometrics I: Fundamentals* with Professors Wayne Gao and Xu Cheng

Application Essay

I am currently in my second year of the economics PhD program at the University of Pennsylvania. As I transition from coursework to independent research, the NBER Innovation Research Boot Camp would be a valuable experience to help me develop my research agenda. The lectures would provide a foundation in innovation economics, equipping me with a framework to approach research questions, while the conference would expose me to frontier work and enable enriching discussions with like-minded scholars.

The importance of economic growth drove me to pursue a PhD in economics, and it is innovation that generates sustained growth. So far, my coursework has mostly focused on macroeconomic models, particularly those with heterogeneous agents. These courses have given me an appreciation for the role of firm dynamics in innovation and growth. For example, in a course on search theory, I studied the model of technology diffusion in Perla and Tonetti (2014) and extended it to include an innovation choice for productive firms. In the extended model, there are spillovers that lead firms to under-invest in both adoption and innovation as well as rich interplay between these activities. By comparison, I expect the boot camp to be more empirical, which would complement the theoretical tools I have developed. Ultimately, I hope to produce research that innovates on both fronts.

One of my research interests is the pipeline from science to technology to productivity growth. While applying to PhD programs, I wrote a research proposal aimed at quantifying the importance of this channel by connecting technologies to their scientific origins in the spirit of Ahmadpoor and Jones (2017). The idea was to measure the textual similarity of the patents owned by firms to prior scientific publications, and estimate the impact of scientific underpinnings on measures of subsequent firm performance. To identify the causal effect, I proposed the 2008 NIH open access mandate studied by Bryan and Ozcan (2021) as a source of plausibly exogenous variation in the similarity of patents to science. I think a project like this could lay the groundwork for follow-on research into topics such as the role of privately versus publicly funded research.

Last summer, I had the opportunity to work under the supervision of Professor Joachim Hubmer on measuring capital in task-based models of automation. I started by studying the literature on task models and the decline of the labor share. Then, I wrote a literature review documenting how the prior work has approached the problem classifying capital that augments or automates human labor. Combining and building on existing methodologies, I proposed three novel approaches to classifying and measuring capital. This work spurred my thinking on measuring how new technologies, embodied in capital, are deployed in the economy.

Another of my research interests is the economics of fertility and its implications for growth. For advanced economies, research has highlighted the impact of population aging on growth through channels like entrepreneurship and firm dynamics. Comparatively less research has focused on its impact in developing countries. A project I am beginning considers the implications of population aging for the structural transformation of developing countries. It begins with the observation that countries developing today are aging faster than presently developed countries did. There is evidence that structural transformation plays out as the young enter sectors different than their parents. With smaller cohorts due to a rapid decline in fertility, structural transformation and therefore growth may be slowed. Given recent trends and forecasts for population growth, I view an understanding of population aging as crucial for understanding the future of innovation and growth.

I am in the early stages of my research career and developing my agenda. The importance of growth motivated my pursuit of an economics PhD, and it is driven by the innovations of entrepreneurs and firms. I have been interested in this boot camp for a few years, and this summer would be an excellent time for me to participate. I hope to build a foundation in the economics of innovation, as well as learn from and contribute to a community of innovation scholars.

Joachim Hubmer
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February 5, 2025

Subject: Jack Dunbar – Letter of Recommendation

Dear Colleagues,

I am delighted to **recommend Jack Dunbar, a second-year PhD student in Economics at the University of Pennsylvania, for the 2025 Innovation Research Boot Camp**. I have supervised Jack in his coursework and early research endeavors, and he has consistently shown strong insight and intellectual rigor in tackling questions related to economic growth, firm dynamics, and technological change.

Beyond his strong technical skills, Jack demonstrates genuine curiosity and a collaborative spirit, which make him well-suited for the interactive format of the Boot Camp. He combines an impressive command of theory with a growing facility in empirical and quantitative methods. Given his determination to investigate frontier questions about the pipeline from science to innovation and the broader implications for long-run growth, I am confident that Jack would contribute meaningfully to discussions and projects at the Boot Camp.

Sincerely,



Joachim Hubmer