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January 20, 2022

NBER Entrepreneurship Research Boot Camp 2022 Selection Committee

Dear Members of the Selection Committee:

I am writing to apply to the NBER Entrepreneurship Research Boot Camp. Having learned about this opportunity from my advisor, Prof. Daniel Xu, I believe it is a good fit for my research interests. I am a third-year Ph.D. student in economics at Duke University. My research interests lie at the intersection of industrial organization and quantitative macroeconomics. Regarding topics, I am passionate about innovation, firm dynamics, and economic growth, and pay particular attention to the role startups play in these areas.

My goal is to integrate large-scale microdata and dynamic structural models to study innovation and market structure, as well as analyze counterfactual policies. At present, I am working on two ongoing projects that investigate the innovation effects of nascent acquisitions across different industries. For future research, I plan to leverage the extensive confidential microdata from the Census and external data to explore the dynamics of innovation processes in large corporations and its impact on the entry and innovation decisions of startups. For instance, one of the research questions concerns whether the rise of superstar companies affects the direction and quantity of innovation in smaller firms by influencing their choice of acquisitions over IPOs as an exit strategy.

I am excited about the opportunity to attend this Research Boot Camp in which I will be able to learn cutting-edge studies on entrepreneurship and make connections with researchers who have similar research interests and diverse academic backgrounds. By sharing insights from my research and professional experience, I believe that I can also make a valuable contribution to the community.

I have enclosed my CV, list of courses, and research statement. I have asked my advisor to write a letter of recommendation on my behalf:

Daniel Yi Xu daniel.xu@duke.edu

Thank you in advance for your consideration. I look forward to hearing from you.

Sincerely,

Weiting Miao

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Duke University
Durham, NC 27708

Phone: (984) 260-2438
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Education

Ph.D., Economics, Duke University, 2019 –.
M.A., Economics, Duke University, 2017 – 2018.
B.A., Economics, Central University of Finance and Economics (CUFE), 2013 – 2017.

Work In Progress

Two Tales of Innovation and Nascent Acquisitions
Quantify the Innovation Effects of M&A in the US Pharmaceutical Industry

Research Papers

Labor Share Decline in Chinese Industrial Sector (Master's Thesis)
Capital Account Openness and Business Cycle Synchronization (Undergraduate Thesis)

Research Experience

2021 – present	Research Assistant to Daniel Xu and Matthias Kehrig, Duke University
2018 – 2019	Research Assistant to Daniel Xu, Duke University
2017 – 2018	Research Assistant to Attila Ambrus, Duke University
2016 – 2017	Research Assistant to Zhanqiang Zhou, CUFE
2016 – 2017	Research Assistant at Case Center, Cheung Kong Graduate School of Business

Teaching Experience

2020 Fall	TA for Macroeconomic Analysis I – Economics PhD Core, Duke University
2021 Spring	TA for Macroeconomic Analysis II – Economics PhD Core, Duke University

Awards and Fellowships

2020, 2021 Summer	Graduate School Summer Research Fellowship, Duke University
2019-2020	Economics Department Graduate Fellowship, Duke University
2019	Master's Program Award for Academic Excellence, Duke University
2018 Spring, 2018 Fall	M.A. Merit Scholarship, Duke University
2016, 2017	Scholarship of Academic Merit, CUFE
2015, 2016, 2017	Model Student of Academic Records, CUFE

Programming Skills

Stata, MATLAB, R, Python, Mathematica, LaTeX

Security Clearance

U.S. Census Bureau Special Sworn Status

List of Courses

Course Code	Description	Instructor(s)	Grade
	First-Year Core Courses		
ECON 701	Microeconomic Analysis I	Philipp Sadowski & Curtis Taylor	A
ECON 702	Macroeconomic Analysis I	Craig Burnside & Francesco Bianchi	A
ECON 703	Econometrics I	Federico Bugni	A
ECON 705	Microeconomic Analysis II	Curtis Taylor & Todd Sarver	*S**
ECON 706	Macroeconomic Analysis II	Cosmin Ilut & Andrea Lanteri	A
ECON 707	Econometrics II	Matt Masten & Andrew Patton	*S**
	Field Courses		
ECON 881	Innovation, Productivity, and Industry Dynamics	Daniel Xu	A
ECON 882	Empirical Macroeconomics	Matthias Kehrig	A
ECON 882	Expectation & Macroeconomics	Cosmin Ilut	A
ECON 882	Economic Growth	Pietro Peretto	A
ECON 882	Macroeconomics with Heterogeneous Agents	Andrea Lanteri	A+
ECON 882	International Finance	Laura Castillo Martinez	A
ECON 824	International Trade	Daniel Xu & Rafael Dix-Carneiro	A
ECON 825	Industrial Organization	Allan Collard-Wexler & Daniel Xu	A
BA 990	Economics of Innovation	Wesley Cohen & Sharon Belenzon	pending
	Toolbox Courses		
ECON 700	Mathematics for Economists	Craig Fratrik & Aram Grigoryan	A+
ECON 890	Python for Economics	Tyler Moran	A
ECON 890	Stata for Economics	Tiancheng Chen	A
ECON 883	Nonparametric Estimation	Federico Bugni	A
ECON 826	Partial Identification & Industrial Organization	Allan Collard-Wexler & Adam Rosen	A-
STA 602	Bayesian and Modern Statistics	Olanrewaju Akande	A+
STA 663	Statistical Computation	Cliburn Chan	A+
CS 671	Theory & Algorithms for Machine Learning	Cynthia Rudin	A+

** Note: Microeconomic Analysis II and Econometrics II were graded on a satisfactory/unsatisfactory (S/U) basis.*

Research Statement

My research interests mainly focus on innovation, firm dynamics, and growth, with an emphasis on the role startups play in these areas. I am attempting to bring together large-scale microdata and dynamic structural models to address research questions related to innovation and market structure as well as to analyze counterfactual policies.

In my field paper, I analyze the effect of nascent acquisitions on innovation under general equilibrium conditions across industries. It is motivated by the empirical observation that the number of acquisitions in some high-technology industries has risen significantly since the 1980s. A heated debate has taken place on whether mergers and acquisitions (M&A) will harm innovation, especially after Cunningham et al. (2021) made "killer acquisitions" prominent. Despite the rich literature on the treatment effect on firms involved in acquisitions (Sevilir and Tian, 2012; Seru, 2014), papers on the general equilibrium effect are scarce with a few exceptions (Dimopoulos and Sacchetto, 2017; David, 2021; Fons-Rosen et al., 2021), and none of them examine the role of industry characteristics. My project seeks to fill this gap. I construct a model that includes endogenous entry decisions, R&D investment decisions, acquisition decisions, as well as development decisions after acquisition. Furthermore, the model allows for different R&D costs and project success rates between the incumbent and the new entrant. The model provides me with the flexibility to account for multiple aspects of the trade-off: (i) extensive margin: the prospect of being acquired might spur the entry of potential entrants, whereas the acquired projects might be terminated by the acquirers to avoid competition with their own products; (ii) intensive margin: M&A opportunities motivate small firms to innovate in order to be acquired, whereas large firms sit back and consume innovation from small firms; (iii) innovation efficiency: the synergy effect can be captured by the difference in R&D costs and project success rates between the acquirer and the target firm. Based on this model, I identify conditions under which acquisition opportunities can enhance innovation rather than hinder it. A key takeaway is that M&As have heterogeneous effects on innovation across different industries. In industries with high entry barriers, such as the pharmaceutical industry, the attracting entry effect is more pronounced as the entry rate is low without the acquisition option. Even with killer acquisitions, competition will increase in the research stage because startups compete to be acquired. Also, truly promising projects will get implemented anyway because the acquirer also benefits from high-quality products. In contrast, in industries with low entry costs, like the software industry, there is already intense competition among small firms. It is less effective to promote innovation among small firms by attracting entry. By using industry-level M&A data and business dynamics statistics, I find a positive correlation between firm entry volume and lagged M&A volume in the pharmaceutical industry, but no correlation in the software industry, supporting the hypothesis in my model.

The second project I am working on is an extension of my field paper: that is, using the insights gained from my model, I am developing a quantitative model and attempting to quantify the innovation effect of nascent acquisitions in the US pharmaceutical industry. While the pharmaceutical industry is among the most important sectors in society and has both a high level of innovation and an active and growing M&A market, I am unaware of any quantitative studies that have examined the general equilibrium impact of M&A on innovation in this industry. In calibrating the model parameters, I will make use of the extensive micro-data I have access to. Specifically, I will utilize SDC Platinum to identify acquisition transactions, Pharmaproject's drug development data to identify killer acquisitions and innovation outcomes, confidential R&D data (the Survey of Industrial Research and Development (SIRD) and the Business R&D and Innovation Survey (BRDIS)) to calibrate the innovation efficiency, as well as Longitudinal Business Data (LBD) to measure startups' entry into the market. Once the model is calibrated, I can disentangle the effects of the various channels and perform counterfactual experiments that provide policy implications.

In another line of my research plan, I will explore the dynamics of innovation processes in large corporations and their impact on the entry and innovation decisions of startups by leveraging the extensive confidential census data. Currently, I am focused more on data processing and pattern exploration. The finer research questions are still in the brainstorming stage, but I believe there will be many interesting questions that can be answered based on the information gathered from these datasets. Here are several examples: Why are most of the US industries becoming more concentrated in terms of revenues and profits? Are these high-performing companies more innovative and efficient than their counterparts? Are superstar firms distorting the direction and quantity of innovation among smaller companies by influencing their choice of acquisitions over IPOs as an exit strategy?

I view NBER's Entrepreneurship Research Boot Camp as a valuable opportunity to improve my understanding of the field and to make connections with researchers who have similar research interests and diverse academic backgrounds. The lectures presented by leading scholars will help me to expand my understanding of the frontiers of entrepreneurship research. The boot camp also provides me with the opportunity to share my research ideas and views about the field with all participants and hear their opinions. Participants can form a network that generates tremendous positive spillovers. For example, we can discuss the datasets we have access to and how we can best make use of them. Furthermore, we might develop interesting and important research questions and novel approaches to solving them during our discussions. We may even form coauthorships since we have similar research interests.

References

Cunningham, C., Ederer, F., and Ma, S. (2021). Killer acquisitions. *Journal of Political Economy*, 129(3):649–702.

David, J. M. (2021). The aggregate implications of mergers and acquisitions. *The Review of Economic Studies*, 88(4):1796–1830.

Dimopoulos, T. and Sacchetto, S. (2017). Merger activity in industry equilibrium. *Journal of Financial Economics*, 126(1):200–226.

Fons-Rosen, C., Roldan-Blanco, P., and Schmitz, T. (2021). The aggregate effects of acquisitions on innovation and economic growth. *Available at SSRN 3785485*.

Seru, A. (2014). Firm boundaries matter: Evidence from conglomerates and r&d activity. *Journal of Financial Economics*, 111(2):381–405.

Sevilir, M. and Tian, X. (2012). Acquiring innovation. In *AFA 2012 Chicago Meetings Paper*.

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Dear colleagues,

I am pleased to write a letter of recommendation for Weiting Miao to attend the NBER Innovation and/or Entrepreneurship Research Boot Camp. I have known Weiting for more than four years. I came to know her when she was a master's student in my applied econometrics course. I hired her as my RA after the course. She later enrolled in Duke's PhD program, and I have been her primary advisor. Furthermore, we work closely on several projects, with her serving as my research assistant or potential collaborator. My unequivocal support is based on this extensive experience.

As a student, Weiting excels in her academic performance and displays a high level of intelligence. She has taken my advanced courses in both IO and trade and has performed very well in both. These courses include a significant amount of reading, computation, and writing. For example, one of the assignments in the IO course requires students to develop BLP algorithms from scratch and perform a counterfactual merger analysis, and one homework in the trade class is to replicate the trade model in Caliendo and Parro (2015) to calculate the changes in welfare in each country related to trade. Additionally, she has received training in quantitative and empirical macroeconomics. After obtaining rigorous training in multiple fields, Weiting has acquired extensive tools in the development of theoretical models, quantitative tools, and empirical methods to make inferences from large datasets. Moreover, her background in multiple fields enables her to synthesize insights and methodologies from various disciplines to produce novel research studies.

While serving as my research assistant, Weiting has demonstrated superb problem-solving skills and a creative mind through multiple projects focused on firm dynamics and innovation. I have assigned her various research tasks requiring a wide variety of skills, including data collection, empirical analysis, model derivation, and simulation. She has completed all research tasks to a high standard. Currently, we are working on two projects together: one on the dynamics of market structure in the US railroad industry and the other on the impact of structural changes in R&D productivity. We meet regularly to discuss the progress of the projects and to exchange ideas. She has been very creative when it comes to many of the issues we discussed.

Weiting has also given me weekly presentations of her own work, I have seen her progress towards advancing her independent study as a remarkable speed. Motivated by the increasing number of mergers and acquisitions (M&A) that have occurred in some highly innovative industries such as the pharmaceutical and the software industry, she began to pay attention to how these increased transactions would affect firms' behaviors, particularly in terms of innovation. Following a comprehensive literature review, she found that there was limited discussion about how M&A affect innovation in the general equilibrium, and even less discussion concerning the role of industry heterogeneity in this context, so she decided to fill this gap in her field paper. The idea is that acquisition waves might spur innovative ideas by attracting more new entrants, and this channel is particularly important for industries with high entry barriers, such as the pharmaceutical sector. Having discussed the idea a few times, she formalized it by developing a rich model that incorporates endogenous entry decisions, R&D decisions, and acquisition decisions. In parallel, she has been actively seeking empirical evidence to test the hypothesis based on her model. Currently she is working with a large-scale micro-data from multiple sources, including SDC Plantinum, Compustat and Pharmaproject, as well as the confidential Census data.

In addition to her research abilities, her research interests make her an ideal candidate for this research boot camp. Her independent research projects explore the impact of M&A on innovation, with a special emphasis on the channels of attracting more startups to the market. In addition, she has been actively participating in my current project concerning the relationship between R&D, innovation, and productivity. All of these research projects are closely aligned with the objectives of your program.

In summary, Weiting is a creative researcher with solid technical skills and a great passion for innovation and entrepreneurship research. Based on her academic background and research interests, she would be well suited for your research boot camp, as well as able to contribute significantly to the program. I give her my highest recommendation.

Best,

Daniel Yi Xu

Professor of Economics, Duke University and NBER