Charu Gupta
The Wharton School of Business
University of Pennsylvania
Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19104

March 30, 2018

Dear Professor Robinson:

I look forward to the opportunity to participate in the 2018 NBER Entrepreneurship Research Boot Camp. Having discussed the ERBC with past participants Hyo Kang, Kyle Myers, and Andrea Contigiani, I think I could benefit from learning from preeminent scholars and fellow PhD students with similar interests in entrepreneurship. The ERBC will be particularly beneficial at this point in my graduate career, as I am in the early stages of dissertation research. I am submitting the following application materials:

1. CV including list of courses
2. Research statement

My advisor Professor Matthew Grennan, of the Wharton School of Business and an NBER Faculty Research Fellow, will be sending his recommendation letter separately.

Please do not hesitate to contact me via phone (937.671.6099) or email (guptac@wharton.upenn.edu) if I can provide any additional information.

Thank you for your consideration.

Sincerely,

Charu Gupta

PhD Candidate, The Wharton School of Business

Charu Gupta

Curriculum Vitae (March 2018)

Contact Information

The Wharton School of Business
University of Pennsylvania
Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19104

Cell phone: 937.671.6099
Email: charu.n.gupta@gmail.com
Citizenship: United States
Gender: Female

Education

PhD, Managerial Science and Applied Economics, The Wharton School, expected 2020
PhD Visiting Scholar, Haas School of Business, UC Berkeley, 2016 - 2017
MSc, Economics, The London School of Economics and Political Science, 2012
AB, Economics (Honors) and International Relations, *magna cum laude*, Brown University, 2007
Visiting student, Université de Paris I Panthéon-Sorbonne, 2006

Research Fields

Economics of innovation; Entrepreneurship; Technology adoption and diffusion; Health economics

Research Employment

Research Assistant for Professor Matthew Grennan, The Wharton School, 2016
Research Assistant for Professor Robert Town, The Wharton School, 2015 - 2016
Research Economist, Precision Health Economics, Los Angeles, CA, 2012 - 2014
Senior Research Associate, Precision Health Economics, Los Angeles, CA, 2011 - 2012
Senior Research Assistant, Federal Reserve Bank of Boston, 2007 - 2010

Teaching

Teaching Assistant for ECON 39/HCMG 212, Health Economics (undergraduate), Spring 2016
Teaching Assistant for MGMT 612, Managing the Emerging Enterprise (MBA core), Fall 2016
GSI for ECON 100A, Microeconomic Analysis (undergraduate, Berkeley), Summer 2017

Working Papers

"Success across product markets: Estimating spillovers from medical device innovation" with Matthew Grennan and Mara Lederman

Awards and Honors

NBER-IFS Value of Medical Research Pre-Doctoral Fellowship, 2018

Institute of Research on Innovation and Science Dissertation Award, 2018

Mack Institute Research Fellowship, The Wharton School, 2017

Distinction (highest honors) in master's thesis, Economics Department, The London School of Economics and Political Science, 2012

President's Award, Federal Reserve Bank of Boston, 2010

National Science Foundation Graduate Research Fellowship Honorable Mention, 2010

Samuel C. Lamport Prize in International Studies for outstanding senior thesis, Economics Department, Brown University, 2007

Phi Beta Kappa & *magna cum laude* (highest honors), Brown University, 2007

Professional Activities

Leonard Davis Institute of Health Economics, Associate Fellow, 2017 - present

Mack Innovation Doctoral Association; member, 2015 - present; Executive Board, 2017 - present

Wharton Society for the Advancement of Women in Business Academia, member, 2014 - present

Summer Undergraduate Minority Research (SUMR) Program mentor, 2016

PhD Coursework

Economics

Microeconomic Theory
Game Theory and Applications
Microeconomic Theory I
Microeconomic Theory II
Econometrics I
Topics in Applied Microeconomics
Statistical Method in Economics (MIT)
Industrial Organization I (Berkeley)
Industrial Organization II (Berkeley)
Seminar in Industrial Organization (Berkeley)

Business and Public Policy (Berkeley-Haas)

Workshop in Institutional Analysis
Research and Theory in Business
Health Economics II
Contract Theory

Agriculture and Resource Economics (Berkeley)

Applied Econometrics

Finance

Intertemporal Macroeconomics and Finance
Empirical Methods in Corporate Finance

Management

Applied Research Methods for Management
Corporate Strategy
Firm Boundaries and Scope
Economic Foundations of Management

Health Care Management

Models and Methods in Health Economics
Cost-Benefit and Cost-Effectiveness Analysis
The Economics of Health Care and Policy
Industrial Organization of Health Care
Econometrics for Health Economics

Research statement

As a fourth-year PhD student with interests connecting health economics to firm strategy, innovation, and entrepreneurship, I could particularly benefit from attending the NBER Entrepreneurship Research Boot Camp (ERBC). My research relates to several key topics in entrepreneurship such as entrepreneurial strategy (Projects 1 and 3), academic entrepreneurship and financing (Project 2), firm organization (Project 3), and innovation and productivity (Projects 1, 2 and 3). Participating in the ERBC would further my efforts towards creating meaningful entrepreneurship research.

1. "Success across product markets: Estimating spillovers from medical device innovation"

In industries where firms offer products spanning related product lines—from electronics to pharmaceuticals to online search platforms—successful firms may possess firm-specific capabilities enabling them to produce superior products all-around, or they may experience spillovers from one successful product line to others. Understanding whether or not a successful product line generates performance advantages across other related lines is a relevant question across industries and for entrepreneurs attempting to disrupt an existing market with a new product or service.

In a joint project with Professors Matthew Grennan and Mara Lederman, we use detailed hospital-month level data on medical device manufacturer sales and discrete shocks in market share induced by major product innovations to empirically evaluate whether and how success in stents transfers performance advantages to balloon and guidewire devices in the interventional cardiology space. We find that increased stent usage induces hospital-level spillovers onto a manufacturer's balloon sales on the order of 10 to 30 percent and more modest market-level spillovers onto guidewires; these results suggest that those firms innovating in one product line can potentially experience meaningful spillovers in success, especially in complementary product lines. We also analyze how a focal firm's product introductions impact its competitors' performance and find that an innovating firm's market share gains come at the detriment of both large and small competitors.

Our results have important implications for entrepreneurs in the US medical device industry, which consists of a few large players such as Medtronic and Boston Scientific, and numerous smaller startups (Chatterji, 2009; International Trade Administration, 2010). They point to supply-side economies of scope for firms producing multiple device products and demand-side preferences among physicians as key mechanisms behind medical device purchases. These results suggest difficulties for small-scale entry of medical device entrepreneurs into hospitals, as smaller startups will not have the same established relationships with physicians and hospital networks. Indeed, the typical path for innovative medical device startups involves eventual acquisition by one of the large firms in the market (MedPAC, 2017).

2. "Allocation of Funding Resources in the Biomedical Sciences"

My proposed dissertation research evaluates how funding sources influence academic research trajectories and downstream commercial innovation. Given the large and growing role of academic entrepreneurship via patenting, start-up development, and university-industry relationships (Grimaldi et al., 2011; Shane, 2004), understanding how funding sources may impact scientists' incentives is a crucial area for entrepreneurship research, particularly in the biomedical sciences. As government funding through the National Institutes of Health declines, academic biomedical researchers are increasingly seeking to replace expired public grants with grants from private sources (Jahnke, 2015). Yet incentives differ among decision makers at these various private and public organizations and it is unclear the extent to which funding allocation decisions are actually associated with optimal societal outcomes and innovation (Moses et al., 2015; Krimsky, 2004; Butler, 2008).

I exploit changes to government funding from US stem cell funding regulation to study whether public funding of scientific research crowds in or crowds out private funding, not just in terms of dollar amounts but also the rate and direction of research. In particular, I make use of a 2001 Bush administration ruling blocking federal funding for research on new human embryo stem cell lines and a 2009 Obama administration ruling that reversed those restrictions. I combine data from national surveys on university-level R&D funding as well as scrape website data on private grants from foundation financial statements. I link funded projects and scientists to subsequent publications, patents and clinical studies to understand the downstream impacts of changes to funding access.

The research will provide insights into how stakeholder incentives influence resource allocation and the impacts of those allocations. For academic entrepreneurs seeking industry partners or funding sources, the selection of those partners may have notable effects on research direction, advancement of basic science, and technological development. This project is funded through an NBER-IFS Value of Medical Research Pre-Doctoral Fellowship.

3. "Role of Teams in Science Productivity"

A final project looks at the distribution of scientific knowledge among team members and its impacts. Specifically, I ask the following research question: How does the relatedness of scientific knowledge within teams influence overall productivity and innovative output? Teams with a narrow focus may benefit from the ease of knowledge transfer and a comparative advantage arising from specialization, leading them to produce higher innovative output than less specialized ones. Conversely, more diversified teams may experience greater spillovers from their separate knowledge bases, thus improving innovative activity (Garcia-Vega 2006). I propose to evaluate the pharmaceutical industry and track PhD scientists who move across firms and within firms, across teams, using a combination of pharmaceutical pipeline, publication and CrunchBase datasets. For each scientist, I create a measure of knowledge relatedness within their team. Specifically, I follow Azoulay et al. (2011) and develop a Herfindahl index of subject keywords for their dissertations from the ProQuest Thesis and Dissertation database.

The research has important implications for who entrepreneurs should hire and how they should structure their employee teams in order to promote innovation. Prior studies have focused on firm specialization versus diversification and the absorptive capacity organizations to assimilate new knowledge and apply it to innovative ends (Cohen and Levinthal 1990; Garcia-Vega 2006; Lane and Lubatkin 1998). However, these studies have largely focused on technological knowledge, whereas my study focuses specifically on *scientific* knowledge. Also in contrast to much of the extant literature addressing knowledge in the aggregate, I how consider *individual-level* knowledge among team members influences group productivity via a measure of knowledge relatedness. I received a dissertation award from the Institute of Research on Innovation and Science for this project.

Attending the ERBC is especially appealing at this stage of my graduate career, as I am beginning my dissertation research. It would offer the opportunity to discuss the existing literature, to better understand where the research frontier lies, and to learn from top scholars in the field. Meeting and discussing entrepreneurship research with PhD students across schools is another advantage. I am an Executive Board member of the Mack Innovation Doctoral Association (MIDAs), a student-run group focusing on research in the fields of innovation, entrepreneurship and firm strategy; the collaborative setting has been fruitful in realizing my own interests. From discussions with past participants Hyo Kang, Kyle Myers, and Andrea Contigiani, I know the ERBC will help advance my research agenda, and that I can offer a unique contribution to other attendees given my background in health economics. I look forward to the opportunity to be an active participant at the 2018 ERBC.

MATTHEW R. GRENNAN
ASSISTANT PROFESSOR, HEALTHCARE MANAGEMENT
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April 3, 2018

NBER Entrepreneurship Research Bootcamp
Selection Committee

Dear Selection Committee Member:

I am writing to recommend Charu Gupta for the NBER Entrepreneurship Research Boot Camp 2018. Charu is a current PhD student in Health Care Management and Economics at the Wharton School, University of Pennsylvania whose research focuses on innovation and entrepreneurial strategy in the biomedical space. I have known Charu since 2014 when she entered the PhD program, but have come to know her well over the two years while she has worked as a research assistant (and now co-author) on a project on the advantages to established medical device firms (vs. startups) in new product commercialization.

Through my work with her, I can certify that Charu possesses strong fundamental training as an empirical economist, and also a certain careful creativity that is rare for a PhD student. I have been particularly impressed with her care and detail orientation in working with data and developing institutional knowledge, and then using those institutional details to carefully relate research results to the broader scientific literature. Because of her contributions, Mara Lederman and I have asked Charu to be a co-author on our joint project.

In addition to her work with us, Charu has several nascent projects on the direction and productivity of innovation. In one paper, she looks at the 2001 block on US federal funding for research on new human embryo stem cell lines and a 2009 ruling that reversed those restrictions. She combines data from national surveys on university-level R&D funding, scrapes website data on private grants from foundation financial statements, and links the funded projects and scientists to subsequent publications, patents, clinical studies, and product approvals to understand the downstream impacts of changes to funding access. This project has been funded through an NBER-IFS Value of Medical Research Pre-Doctoral Fellowship. This project has clear potential links to entrepreneurial strategy—I think the ERBC could help Charu strengthen these ties and better understand how her research interests interact with the entrepreneurship literature.

More generally, I think Charu will be a positive addition to the ERBC experience for her classmates. She is smart, friendly, and mature. She has spoken to previous attendees such as Kyle Myers (another former student of mine) and Abhishek Nagaraj, and has a clear idea of what she can gain from the boot camp. She will undoubtedly come well-prepared and ready to engage with the ideas and papers of the curriculum.

Sincerely yours,



Matt Grennan, University of Pennsylvania and NBER