Hayley Wabiszewski
Department of Economics, MSC 1208-228-308
Washington University in St. Louis
1 Brookings Dr.
St. Louis, MO 63130-4899
314-330-3836
hwabiszewski@wustl.edu

January 17, 2022

Dear NBER Innovation Research Boot Camp Selection Committee,

My name is Hayley Wabiszewski and I am a PhD candidate in Economics at Washington University in St. Louis. I am writing to apply for the NBER Innovation Research Boot Camp 2022.

My research interest is in empirical industrial organization with a focus on pharmaceutical and healthcare markets. My research seeks to analyze strategic firm interactions in these industries and how they affect innovation, pricing, and overall welfare. For the first chapter of my dissertation, I am working on a paper that examines the impact of biotechnology startup acquisitions by big pharmaceutical firms on innovation, as measured by clinical trial outcomes and patenting. A more complete description of my research is included in the "Research Statement" section enclosed.

My advisor **Prof. Stephen P. Ryan** (stephen.p.ryan@wustl.edu) will be sending a reference letter in support of my application.

Thank you kindly for considering my application for the NBER Innovation Research Boot Camp 2022. I am excited to hear back from you and am happy to provide any further information that may be needed.

Best,

Hayley Wabiszewski

HAYLEY WABISZEWSKI

Department of Economics ⋄ MSC 1208-228-308 ⋄ 1 Brookings Drive ⋄ St. Louis, MO 63130-4899

hwabiszewski@wustl.edu ⋄ www.hayleywabiszewski.com

EDUCATION

Washington University in St. Louis

Ph.D. in Economics — August 2018 - May 2023 (Expected)

Committee: Stephen P. Ryan, George-Levi Gayle, Matthew J. Higgins

M.A. in Economics — August 2018 - May 2020

University of Missouri

B.S. in Economics (*summa cum laude*) — August 2014 - May 2018

B.S. in Mathematics (*summa cum laude*) — August 2014 - May 2018

RESEARCH INTERESTS

Industrial organization, health economics, pharmaceutical markets, innovation, applied microeconomics.

RESEARCH

Refereed Publications

(i) *The Impact of Juvenile Conviction on Human Capital and Labor Market Outcomes* (with Limor Golan and Rong Hai). **Federal Reserve Bank of St. Louis Review.** Forthcoming.

Works in Progress

(i) *The Welfare Effects of Reverse Payment Settlements in Pharmaceuticals.*

(ii) *Big Firms Buying Small: Acquisitions, Innovation, and Pricing in the Pharmaceutical Industry.*

Research Assistantships

Prof. Limor Golan, Washington University in St. Louis — August 2020 - Present

- Current work focuses on exploring the relationship between juvenile conviction and subsequent adult labor market outcomes including employment, hours worked, occupational choice, wages, and recidivism.

Prof. Stephen P. Ryan, Washington University in St. Louis — May 2020 - Present

- Current work focuses on creating a Stata module which implements a novel econometric method that combines machine learning and moment-based estimation techniques to identify when multiple treatment effects are present in a sample based on observables.

Profs. Michael Podgursky and Joe Haslag, University of Missouri — Summer 2018

TEACHING

Teaching Assistant, Washington University in St. Louis

Structural Microeconometrics, ECON 5175 — Spring 2021

Industrial Economics, MEC 470 — Fall 2020

Labor Economics, ECON 480 — Spring 2020
Labor and the Economy, ECON 380 — Spring 2020
Environmental Policy, ECON 451 — Fall 2019

Teaching Assistant, University of Missouri

Principles of Microeconomics, Econ 1014 — Spring 2015 - Spring 2018

PROFESSIONAL ACTIVITIES

Affiliations

Visiting Scholar, University of Utah, Eccles School of Business — 2020 - Present

Presentations

2022: Olin Business School Brown Bag
2021: GSA Breakfast Seminar, Wash U

Workshops

2021: CSWEP Mentoring Workshop, Houston

Department Service, Washington University in St. Louis

President, Economics Graduate Student Association (GSA) — 2021 - Present
Member, Economics Graduate Student Association (GSA) — 2019 - Present
Student Representative, Graduate Professional Council — 2021 - Present
Senator, Graduate Student Senate — 2021 - Present
Organizer, 15th Economics Graduate Student Conference (EGSC) — 2020

Sorority Service, Alpha Phi, University of Missouri

Assistant Director of Academics — 2015 - 2017
Active Member — 2014 - 2018

HONORS, AWARDS, AND FELLOWSHIPS

University Fellowship, Washington University in St. Louis — 2018 - Present
Outstanding Senior in Economics Award, University of Missouri — 2018
David Loschky Scholarship, Economics Department, University of Missouri — 2016 - 2018
Missouri Bright Flight Scholarship — 2014 - 2018

SKILLS

Matlab, Stata, Latex (Proficient); Python, Java, FORTRAN (Novice)

COMPLETED PHD COURSES

- Microeconomics I
- Microeconomics II
- Macroeconomics I
- Macroeconomics II
- Quantitative Methods in Economics I (Real Analysis)
- Applied Econometrics (Econometrics I)
- Quantitative Methods in Economics II (Econometrics II)
- Advanced Microeconometrics (Nonparametrics, reduced-form causal inference)
- Structural Microeconometrics
- Labor Economics I
- Economics of Industrial Organization I (Introduction to and topics in industrial organization)
- Industrial Organization I
- Industrial Organization II

RESEARCH STATEMENT

My research interest is in empirical industrial organization, with a particular focus in healthcare and pharmaceutical markets. I use structural models to analyze strategic firm interactions in these markets in order to understand their effects on innovation, pricing, and overall welfare. Below I will detail my current and future works on these topics.

Big Firms Buying Small: Acquisitions, Innovation, and Pricing in the Pharmaceutical Industry

In March 2021, the Federal Trade Commission (FTC) announced it would create a multilateral working group tasked with building a new approach to evaluating pharmaceutical mergers and acquisitions. Among the objectives of the group was to evaluate the full range of effects of pharmaceutical M&A on innovation, which can be measured through patenting activity, advancement through phases of clinical trials, and new drug approval. An often neglected but empirically important category of M&A activity in this industry is the acquisition of small biotechnology firms –who typically focus on research and early development of innovative drugs and technologies– by large pharmaceutical firms –who are vertically integrated and engage in both research, development, manufacturing, and marketing of innovative drugs. These deals have lower transaction values and are thus less likely to be scrutinized by the FTC. However, when these types of deals are both frequent and numerous, the implications for innovation can be large, complicated, and theoretically ambiguous.

One mechanism through which acquisitions can affect innovation is returns to scale and scope. Cockburn & Henderson (1996) find both returns to scale and scope in research by pharma firms as measured by patent production. In a subsequent study, they also find there are returns to scope in development as measured by the number of new drug approvals by the FDA. This suggests that acquisitions should boost the productivity of acquired firms. On the other hand, Cockburn (2004) reasons that large firms may hinder innovation by distorting the incentives of acquired researchers and through bureaucracy which may cause rigidity, organizational slack, and conservative decision making. Further, even in the presence of returns to scale and scope, productive efficiency may be decreasing if large firms are substituting external for internal R&D. A second mechanism through which acquisitions can effect innovation is competitive considerations in downstream drug markets. Higgins & Rodriguez (2006) and Danzen et al. (2007) find that firms with weaker pipelines and more drugs losing patent exclusivity are more likely to acquire, suggesting they are using acquisitions to boost their innovation pipeline. Additionally, Phillips and Zhdanov (2012) show that small firms may be more likely to enter and innovate if there is a lucrative acquisition market. On the other hand, innovation by small firms may cut into downstream profits in drug markets for large firms. Cunningham, Ederer, & Ma (2021) find that about 5-7% of acquisitions are "killer acquisitions" intended to kill the drug projects of acquired firms and decrease innovation in order to prevent cannibalization. It is therefore an empirical question what the effect of acquisitions are on innovation.

It is the goal of this paper to analyze the affect of acquisitions of small biotech startups by large pharma firms on innovation and sort out the competing mechanisms through which innovation is affected. I will construct a dynamic oligpoly model of the pharmaceutical industry where firms hold a portfolio of drug projects. In each period, firms decide whether to begin, continue, or quit each drug project; the level of investment in that drug project; whether to acquire a small firm and its portfolio of drug projects; and engage in product market competition for approved drugs. An interesting feature of the acquisition stage is that it allows for acquisition

waves, a phenomenon which is supported empirically. This is done by repeating the acquisiiton stage, where firms are chosen at random to propose acquisitions, until all firms have been given an opportunity to propose an acquisition and none occur. Using this model and the estimated primitives, I can perform counterfactual policy analysis to determine the effect of increased regulatory scrutiny on innovation.

The data for this paper comes from several sources. The demand estimation data comes from IMS Health, which has quarterly wholesale volume and sales data for all marketed drugs in the U.S. from 1997 - 2010. This is supplemented with data on select drugs from SSR Health for 2007 - 2018. Data on drug projects and their advancement through the phases of R&D is available from Cortellis. Cortellis compiles information on drug research and development around the world and includes information about the focal firm, the start and end date of each phase of R&D, termination decisions, and a brief development history for most drug projects from 1997 - 2014. This data is supplemented with patent data from the US Patent and Trademark Office (USPTO), which will serve as another measure of innovation. The acquisition data comes from SDC Platinum and SDC Venture Xpert and includes most acquisitions from 1989 - 2019.

In related future work, I want to extend the model to incorporate the role of patent litigation and litigation risk in determining innovation decisions. Firms differ in their ability to write strong patents and litigation risk changes over time due to judicial precedent and regulatory changes to the patent litigation process. In order to identify the effect of litigation on investment in innovation, we can incorporate pharmaceutical patent litigation data into the model. For example, firms whose patents fall more frequently in court will be more likely to discontinue projects earlier because they have lower expected profits from the project. Further, Congress created the US Patent Trial and Appeal Board within the USPTO in 2011 which allowed firms to challenge patents outside of courts through inter partes review. Branded drug companies contend that this process makes pharmaceutical patents easier to challenge and will hinder subsequent innovation. This exogenous policy changed can be leveraged to identify the effect of increased litigation risk on innovation choices.

NBER Innovation Research Boot Camp 2022

Attending the NBER Innovation Research Boot Camp would greatly benefit my research by enabling me to engage with top innovation researchers. In particular, the works of Heidi Williams, Scott Stern, and Rebecca Henderson have been influential in shaping the questions I intend to answer in my job market paper and understanding the mechanisms through which innovation in pharmaceuticals is affected. I am also excited to use this opportunity to expand my interest in and knowledge of the economics of innovation beyond the pharmaceutical and healthcare industries. My job market paper focuses on the innovation implications of startup acquisition by large companies, a phenomenon that is not unique to the pharmaceutical industry but is also a feature of many tech industries and R&D intensive industries more broadly. I believe attending this boot camp will allow me to think seriously about the generalizability of the results of my job market paper and whether it can provide insights into innovation in other industries.

Washington University in St. Louis
OLIN BUSINESS SCHOOL

Stephen P. Ryan
Myron Northrop Professor of Economics
Olin Business School, Washington University in St. Louis

January 2022

To Whom It May Concern:

I am writing today on behalf of Hayley Wabiszewski, a fourth-year graduate student in the economics department here at Washington University in St. Louis. I have known Hayley for several years and I am her primary adviser; as such, I am very familiar with her work and her potential. It is with unreserved enthusiasm that I give her **my strongest possible recommendation** regarding the NBER Innovation Research Boot Camp.

Hayley's in-process dissertation work examines the role that mergers and acquisitions play in fostering or hampering innovation in the pharmaceutical industry. We observe that firms specialize in different niches in the development supply chain, and merger and acquisition activity may have pro-innovative effects via economies of scale and scope. For example, small firms may be extremely good at basic research, but lack the institutional infrastructure to push the drug to market in a way that large, vertically-integrated firms can. In such a situation, a large vertically-integrated producer acquiring a small biotech firm can lead to higher productivity. Dynamically, firms may be more likely to enter this market knowing that there are additional channels to the market should they be successful in innovating on the basic science component of their product. On the other hand, those small firms have relatively high-powered incentives for innovation that may be diminished after acquisition. Furthermore, acquisitions may offset internal innovations that may have to lead to similar but distinct products. Further downstream, firms may have incentives to acquire intellectual property that they foresee competing with their own products in the future; this may lead to so-called "killer acquisitions" ala the recent paper by Cunningham, Ederer, and Ma (2021, *JPE*). Understanding how all of these forces intersect in equilibrium is a very interesting and important research topic, especially given the recent antitrust attention that this industry has received from the Federal Trade Commission.

Hayley is an exceptional graduate student and easily among the best that I have had in the last ten years, including Nick Buchholz, who is now an assistant professor in the Princeton economics department. I anticipate equally great opportunity for Hayley if she is able to execute completely on her proposed work. She would benefit tremendously from this opportunity along a number of dimensions. She is squarely in the field of interest, so there are those direct benefits of seeing innovation-related research. The other dimension that I think she would benefit from is the networking; opportunities for graduate students outside of the very top economics departments to rub elbows with leaders in their fields are few and far in between. This is an opportunity to accelerate her career forward. I am very excited for her that she has a chance to attend the Boot Camp, and I reiterate my enthusiasm for her candidacy.

Please feel free to contact me at my email (Stephen.p.ryan@wustl.edu) or my phone (314-935-8221) if I can be of any further assistance.

Best,



Washington University in St. Louis, John M. Olin Business School • Campus Box 1133
One Brookings Drive, St. Louis, Missouri 63130-4899
Tel (314) 935-8221 • *Fax:* (314) 935-6359 • stephen.p.ryan@wustl.edu

Stephen