Manuel Hermosilla
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March 20th, 2014

Dear members of the selection committee:

This letter is to introduce myself as applicant for 2014 NBER Entrepreneurship Research Boot Camp. My name is **Manuel Hermosilla**. I am a doctoral candidate at Northwestern University's Kellogg School of Management and will soon be joining Johns Hopkins University's Carey School of Business as an Assistant Professor.

During my dissertation I have conducted research on technological innovation, with an emphasis on understanding how commercialization decisions of entrepreneurial firms may be affected by imperfections in technology transfer. In the paper included in this application, I explore these issues in the context of biotech drug candidate licensing. Looking ahead in my carreer, I would like to continue exploring the interface of entrepreneurship and innovation.

Please see attached my application materials, including a recommendation by my advisor, Prof. **Yi Qian**.

Thank you in advance for your consideration. Please do not hesitate to contact me with any questions. I look forward to meeting you in Boston.

Sincerely,

Manuel Hermosilla

Manuel Hermosilla

(March, 2014)

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Academic Employment

Johns Hopkins University, Carey School of Business

Assistant Professor (starting August, 2014)

Universidad de los Andes, Facultad de Ciencias Económicas y Empresariales

Lecturer and Researcher (2006-2008)

Education

Northwestern University, Kellogg School of Management

Ph.D. (Marketing, expected June 2014), M.Sc. (Marketing, 2010)

Pontificia Universidad Católica de Chile, Facultad de Ciencias Económicas y Administrativas

M.A. (Economics, 2006), Ingeniero Comercial (2005), B.A. (Business and Economics, 2004)

Research and teaching interests

Innovation, Entrepreneurship, Empirical Industrial Organization, Quantitative Marketing.

Honors and Awards

- Kauffman Dissertation Fellowship, Ewing Marion Kauffman Foundation (2013)
- ISBM Doctoral Dissertation Competition (Finalist, 2013)
- Marketing Science Doctoral Consortium Fellow (2011,2013)
- Mervin Shalowitz Fellowship in Health Enterprise Research (2011-2012)
- Presidente de la República Doctoral Fellowship (Declined, 2008)
- Kellogg School of Management Doctoral Fellowship (2008-2013)
- TGS Travel Grant (The Graduate School, Northwestern University, 2011,2012)
- Valedictorian (Pontificia Universidad Católica de Chile, 2006)

Research

Working papers:

- The impact of Medicare part D on drug innovation (with D. Dranove and C. Garthwhaite, 2014)
- Development and commercialization strategies for new technologies: an empirical study of pre-market licensing for drug innovation (With Y. Qian, 2013)

Work in progress:

- The impact of Medicare part D on the biotech licensing market
- Equilibrium Contracting in Markets for Technology (with J. Lemus)

Non-refereed published research:

- Renegotiation of Public Work Contracts: Evidence from Chile. *Estudios Públicos* 113 (2009), Centro de Estudios Públicos. (with E. Engel, R. Fisher and A. Galetovic; in spanish)
- The Renegotiation of Public Works Concession Contracts and the new Law. *Puntos de Referencia* 297 (2008), Centro de Estudios Públicos. (with E. Engel, R. Fisher and A. Galetovic; in spanish)

  Featured by the chilean media in the coverage of the reform to the Public Works Procurement System: El Mercurio (04/30/2011), La Tercera (08/24/2008, 10/20/2012), CIPER (12/23/2008).

Invited Presentations

1. Simon Business School, University of Rochester (2013)
2. Carey School of Business, Johns Hopkins University (2013)
3. LeBow College of Business, Drexel University (2013)
4. Leeds School of Business, University of Colorado at Boulder (2013)
5. Escuela de Administración, Pontificia Universidad Católica de Chile (2011)

Conference Presentations

1. PSI - Products and Services Innovation Conference (Park City, UT; 2014)
2. REER - Roundtable for Engineering and Entrepreneurship Research (Atlanta, GA; 2013)
3. Workshop Management Science and Economics (DII Universidad de Chile, Santiago de Chile; 2012)
4. Marketing Science Conference (Boston, MA; 2012)
5. Marketing Science Conference (Houston, TX; 2011)
6. LBS Transatlantic Doctoral Conference (London, UK; 2011)

Refereeing

Management Science, Review of Industrial Organization.

Other

Computer skills: R, Matlab, LaTeX, Stata.
Languages: Spanish (native) and English (advanced). Studies in Latin (Latin I-IV, Pontificia Universidad Católica de Chile), German (*Deutsches Sprachdiplom*, German Culture Ministry) and Finnish (Finnish I-II, University of Helsinki).
Citizenship: Chile, U.S. F-1 visa.
Date of birth: November 1, 1980.

Doctoral course work

Economics
Microeconomics (Eddie Dekel)
Game Theory (Jeff Ely)
Competitive Strategy (Daniel Spulber)
Industrial Organization I (Aviv Nevo/William Rogerson)
Industrial Organization II (Rob Porter)
Industrial Organization III (Igal Hendel/Michael Whinston)
Dynamic Decision Models (Alp Atakan)
Topics in Marketing and IO (Aviv Nevo)

Econometrics and Statistics
Multivariate Statistics (Lakshman Krishnamurthy)
Applied Econometrics I (Yi Qian)
Applied Econometrics II (Scott Stern)
Econometrics (Charles Manski)
Advanced Econometrics (Eli Tamer)
Bayesian Microeconometrics (Peter Rossi)
Bayesian Statistics (Hedibert Lopes)

Networks
Social Network Theories and Methods (Noshir Contractor)

Marketing
Marketing Models: Quantitative Modeling (Eric T. Anderston)
Marketing Models: Analytic Modeling (Anne Coughlan)
Marketing Strategy (Gregory Carpenter)
Advanced Marketing Models (Pradeep Chintagunta)

Statement of Purpose

I am applying to attend the NBER Entrepreneurship Research Boot Camp for two primary reasons: (i) acquiring a deep, critical view of the main topics and angles of research in entrepreneurship, and (ii) identifying research opportunities in the area. I am also looking forward to discussing research, meeting people and becoming part of this community. This is a great and timely opportunity, as I prepare to teach and continue doing research in related topics.

In my research I study the functioning of markets for technology, which have become tremendously important as a vehicle for technological innovation, by articulating partnerships between entrepreneurial and established firms with complementary capabilities. They have thus broadened the mechanisms to reward entrepreneurs and boost the impact of their ventures.

My focus has been on eliciting the impact of imperfect contractibility on start-ups' commercialization decisions, the design of technology licensing contracts, and innovation performance. For this purpose I have collected various types of data from the biotech licensing market, where small biotech start-ups contract with well-established big pharma corporations, which are able to provide the complementary assets that are necessary to complete a drug candidate's development process and distribute it in the market.

Two of my projects were born in an attempt to explain three important empirical facts of this market. These are: (1) there is significant heterogeneity in the propensity of biotech licensing and the time (stage of development) it occurs, (2) licensing contracts strongly emphasize contingent payments and become much more attractive towards later stages of development, and (3), all else constant, technologies are significantly less likely to succeed after they have been licensed.

In a first paper (attached with this application) I rationalize (1) and (3) with an empirical model of forward-looking biotech start-ups. These firms make two decisions: whether/at which stage they will license their technology to a downstream commercializer, and how hard they will work on the project throughout development stages. Imperfect contractibility plays in because these entrepreneurial innovators may have superior information about a technology's intrinsic probability of success (i.e., the probability of advancing past development stages and, ultimately, reach the market) or because their (un-contractible) involvement in the development process can be important to foster the probability of advance past development stages. The model is cast in a dynamic framework which highlights a basic trade-off: waiting to license to a later stage allows start-ups to earn a more attractive licensing contract, but risks seeing their technology fail before achieving any return on their investment. Thus, biotech licensing and effort decisions are assumed to be made considering the likelihood of all future contingencies: reaching successive development stages and the characteristics of licensing contracts negotiable in each circumstance.

I estimate this model on a dataset describing the development and licensing decisions of almost 250 biotech-originated drug candidates, which I complemented with data of

contract design, development performance (clinical trial results), and proxies for the importance of complementary assets (costs of clinical trials and market distribution) and market potential (disease-specific prescription drug expenditure).

My results show that imperfect contractibility is primarily rooted on what biotech entrepreneurs know about their candidate, not about what they do/stop doing. Time-to-license heterogeneity follows from biotech firms licensing early those compounds with relatively poor (privately observed) prospects and holding on longer to those with better chances to make it to the market. These results imply that there is a significant adverse selection problem among candidates licensed early on in the development process. The adverse selection disappears towards more advanced development stages, as compounds that reach this stage not having been licensed are those with relatively good prospects.

In a second paper (in progress), my coauthor and I build on this result to rationalize the observed structure of licensing contracts and its evolution throughout stages. We show that there exists a market equilibrium characterized by (1), (2), and (3) when imperfect contractibility is based only on innovators' superior information about the technology's intrinsic probability of success.

A second strand of my research analyzes the impact of a large demand shock on firms' innovation decisions. In particular, using data of over 250 biotech firms' drug candidates' pipelines, my coauthors and I show that the 2003 enactment of Medicare part D (a large government-sponsored prescription drug insurance program) shifted the patterns of innovation in the industry: biotech firms were significantly more likely to introduce Medicare-oriented compounds to clinical trials after the program begun to operate. Our results are novel because they document that the demand shock was primarily exploited through me-too candidates as opposed to groundbreaking, first-in-class drugs. They inform the entrepreneurship literature by showing that a directional shift of innovation was observed among well-established capital-abundant firms, but not among entrepreneurial resourced-constraint biotech innovators.

I am currently in the early stages of a project whose main goal is to assess empirically the extent to which market power is exercised in the biotech licensing market, as well as clarifying what its main sources are. The research design also exploits the enactment of Medicare part D, which increased the "licensing demand" for candidates targeting diseases highly prominent among Medicare enrollees.

The NBER Entrepreneurship Research Boot Camp stands out as an excellent opportunity to get to know this literature in detail, perfect the framing of my current research and orient that in the future. I look forward to meeting people in this community and, hopefully, become part of it.

Kellogg School of Management

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NORTHWESTERN
UNIVERSITY

March 18, 2014

To Whom It May Concern,

This letter is to recommend **Manuel Hermosilla** for the NBER Entrepreneurship Research Boot Camp. I have known Manuel since he entered the program at Kellogg, first as a student in my Ph.D. class and then as advisee. Throughout this time he has revealed himself a hard and independent worker, a talented and rigorous scholar. He has developed a research agenda in the intersection of innovation and entrepreneurship economics, bringing in a broad skill set and a fresh look at important topics. His work has earned him the Kauffman Dissertation Fellowship and an Assistant Professor position at Johns Hopkins University, where he will teach an entrepreneurship class. For these and other reasons, I think the Boot Camp would be of great value to his career.

His job market paper studies development and commercialization strategies of entrepreneurial biotech firms. These firms generate drug candidates, and have the option to develop them all the way into the market or share development risks by selling the commercialization rights to a downstream big pharma commercializer. He estimates a complex dynamic structural econometric model, which recognizes the possibility of adverse selection and moral hazard in the transfer of technology. The model's estimates allow us to study the effects of various environmental factors on the likelihood that biotech firms will establish a partnership with a downstream commercializer, the stage of the development process at which this will occur, and the subsequent performance of the project. Overall, the paper's results draw a clear picture on how leading sources of imperfect contractibility shapes entrepreneurs' commercialization strategies, as well as their relationship to rate of successful innovation.

Much of the merit of this paper comes from the work he did collecting the data and setting up an analytical framework that is consistent with the main features of decision making. In order to get access to the main data source, Manuel got a large grant from the Health Enterprise Research Center at Kellogg. He then spent several months cleaning and further complementing the dataset with variables from different sources. In terms of the modeling, he was able to come up with a nice identification strategy based on deep institutional knowledge. In my view, this IO-style paper is quite unique within the entrepreneurship literature. Manuel is in good position to continue exploiting this approach in the future.

In the process of writing his dissertation, Manuel has become an expert in the business of drug development and its relationship to the management of intellectual property. In a second chapter of his dissertation he studies the impact of Medicare part D on the direction of biotech innovation. This research highlights a whole different set of issues and primarily targets an audience of health economists. It speaks to a degree of comfort with

interdisciplinary research, which strikes me as particularly very well suited for anyone interested in furthering the knowledge on entrepreneurship.

Manuel is an excellent young researcher, with great potential. I therefore recommend him without reservations. I am sure this will be an important milestone in his career, and that he will be a valuable addition to the Boot Camp's audience and the Entrepreneurship research community. Please feel free to contact me with any questions or concerns.

Sincerely Yours,



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