Jorge Lemus
Department of Economics
Northwestern University
302 Arthur Andersen Hall
2001 Sheridan Road
Evanston, IL 60208-2600

March 28, 2014

Entrepreneurship Working Group
NBER, Cambridge, MA

To Whom It May Concern,

I am a PhD candidate at the Department of Economics at Northwestern University, applying for the 7th Entrepreneurship Research Boot Camp, hosted by the NBER Entrepreneurship Working Group from July 15 to July 18, 2014.

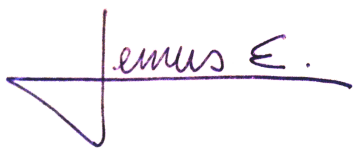
My primary research interest is innovation economics and for my PhD thesis I have been studying theoretically how competition among firms change the direction of innovation. I have also been studying how the so called patent trolls affect R&D incentives to develop products that are protected by multiple patents. My secondary fields are industrial organization and applied microeconomics.

This application packet contains my CV, a list of my PhD courses, and a statement of purpose. A letter of recommendation from my advisor Michael Whinston is being sent separately to Brett Maranjian.

If you have any questions, please feel free to contact me at 920-428-5255 or by email at jlemus@u.northwestern.edu.

Thank you for your consideration.

Sincerely,



Jorge Lemus

Jorge Lemus

PhD Candidate
Department of Economics
Northwestern University

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e-mail: jlemus@u.northwestern.edu
Address: 824 Washington St. Apt 3S
Evanston, IL, 60202.

EDUCATION

2012 PhD candidate (Economics), Northwestern University
Expected graduation date: June 2015.
2011 Master in Arts (Economics), Northwestern University.
2009 M.S., Economics, Universidad de Chile - CEA, Maximum Distinction.
2009 Mathematical Engineering, Universidad de Chile, Maximum Distinction.
(B.S. and M.S. in Applied Mathematics equivalent)

FIELDS OF INTEREST

Economics of Innovation, Industrial Organization, Applied Microeconomics, Microeconomic Theory.

HONORS AND AWARDS

2013 Northwestern University, The Graduate School - Conference Travel Grant.
2011 Distinguished Teaching Assistant Award, Northwestern University.
2009 PhD Fellowship, Northwestern University.
2008 Foreign Travel Fellowship, Universidad de Chile.
2007 CONICYT, Scholarship for Master degree.
2008 CMM - DIM, Outstanding student.
2002 -2007 Outstanding Student, School of Engineering, Universidad de Chile (top 10%)

TEACHING EXPERIENCE

Northwestern University

PhD: Microeconomics, Macroeconomics, Industrial Organization.
MBA: Competitive Strategy and Industrial Structure.
Undergraduate: Intermediate Microeconomics, Introduction to Macroeconomics.

Universidad de Chile

2014 Introduction to Economics of Innovation (mini-course).
2002-2009 Microeconomics, Macroeconomics, Introduction to Economics, Statistics, Optimal Control, Measure Theory, Probability, Multivariate Calculus, Differential Equations, Algebra, Calculus.

RESEARCH ASSISTANT

2011 - 2014 Benjamin Handel, Igal Hendel, and Michael Whinston.

CONFERENCES / PRESENTATIONS

2014 IO Seminar, MIT
2013 Workshop on Games, Contracts, and Organizations, CEA, Universidad de Chile
2013 Taller de Organización Industrial, TOI 6
2013 Trans-Atlantic Doctoral Conference (LBS)
2013 Optimal firm behavior and the game-theoretic modeling of competition (Budapest)
2012 Behavioral Economics Annual Meeting (Yale, School of Management)

WORKING PAPERS

Patent Assertion and the rate of innovation (with Emil Temnyalov)
Direction of Innovation (with Kevin Bryan)
Blame in Teams (with Emil Temnyalov)
Patentees in 1860 (History paper)

WORK IN PROGRESS

Equilibrium Contracting in Markets for Technology (with Manuel Hermosilla)
The Dynamics of Pricing with Frequent Cost Changes (with Fernando Luco)
Dynamic Contest with capital accumulation (with Jorge Catepillan)

LANGUAGES

English (written and oral proficiency), Spanish (native language)

COMPUTER SKILLS

Python, Matlab, Stata, Excel (Macros).

REFERENCES

Michael Whinston
MIT Sloan Applied Economics
MIT Department of Economics
Phone: (617) 258-8408
E-mail: whinston@mit.edu

William Rogerson
Department of Economics
Northwestern University
Phone: (847) 491-8484
E-mail: wrogerson@northwestern.edu

Jeffrey Ely
Department of Economics
Northwestern University
Phone: (847) 491-8208
E-mail: jeffely@northwestern.edu

List of Ph.D. classes - Department of Economics. Northwestern University

Jorge Lemus

Fall (2009-09-22 to 2009-12-11)
ECON 410-1 Microeconomics
ECON 411-1 Macroeconomics
ECON 480-1 Introduction to Econometrics

2010 Winter (2010-01-04 to 2010-03-19)
ECON 410-2 Microeconomics
ECON 411-2 Macroeconomics
ECON 480-2 Econometrics

2010 Spring (2010-03-29 to 2010-06-11)
ECON 410-3 Microeconomics
ECON 411-3 Macroeconomics
ECON 480-3 Introduction to Econometrics

2010 Summer (2010-06-21 to 2010-08-27)
ECON 590-0 Research

2010 Fall (2010-09-21 to 2010-12-10)
ECON 414-2 Economics of Information
ECON 420-1 American Econ History
ECON 450-1 Industrial Organization
MECS 449-1 Competitive Strategy

2011 Winter (2011-01-03 to 2011-03-18)
ECON 414-1 Economics of Information
ECON 415-1 Advanced Microeconomics
ECON 450-2 Industrial Organization

2011 Spring (2011-03-28 to 2011-06-10)
ECON 414-3 Economics of Information
ECON 415-2 Advanced Microeconomics

ECON 450-3 Industrial Organization
ECON 590-0 Research

2011 Summer (2011-06-20 to 2011-08-26)
ECON 590-0 Research

2011 Fall (2011-09-20 to 2011-12-09)
ECON 501-0 Graduate Student Seminar
ECON 590-0 Research

2012 Winter (2012-01-03 to 2012-03-16)
ECON 590-0 Research

2012 Spring (2012-03-26 to 2012-06-08)
ECON 501-0 Graduate Student Seminar
ECON 590-0 Research

2012 Summer (2012-06-18 to 2014-06-13)
TGS 500-0 Advanced Doctoral Study

Other courses (audited):
Innovation Economics - Daniel Spulber
Empirical Studies of Innovation - Shane Greenstein
Economics of Organizations - Niko Matouschek

Reasons to participate in the 7th Entrepreneurship Research Boot Camp

Jorge Lemus

I am currently in my last year of the PhD program at the Department of Economics at Northwestern University. I have focused my research agenda mostly on Innovation Economics, and as a secondary field, Industrial Organization and Applied microeconomics. The close connection between innovation and entrepreneurship was one of the reasons I was attracted to the workshop. Although I have mostly worked on incentives for competing firms to innovate, I am very interested in exploring and working more on the entrepreneurial side of innovation. My goal is to start a research project on entrepreneurship as a result of my participation in this workshop.

One of my projects, "Direction of Innovation (joint with Kevin Bryan)," studies how competing firms direct their research efforts over a network of inventions. The novelty of this paper lies on the development of a tractable model of research allocation. In our setting, each invention has a state dependent payoff and difficulty, and discoveries open oportunities to future inventions. Firms are competing to be the first to discover an invention and get an immediate reward upon discovery. We characterize the firm equilibrium and the social planner solution and we also explore the inefficiencies that arise due to competitive pressures. Our main result is to provide a precise condition that establishes when firms behave inefficiently. Using this condition we explore implications on patent policy and R&D subsidies.

A second project, "Breaking the IP Truce: How Patent Assertion Entities Affect the Incentives for Litigation and Innovation (joint with Emil Temnyalov)," studies the effect of the so called patent trolls on the ex-ante incentives of competing firms to invest in R&D and develop product covered by multiple patents. There is a major concern about companies that do not produce anything but acquire patents to enforce them in court. If the patent system encourages innovation, then enforcing patents should not be seen as a bad practice per-se. Having in mind that "patent trolls" operate mostly on the ITC sector, our model focuses on products that must be covered by multiple components, for example, a smartphone. We find that these non-practicing entities increase the threat of litigation and break the "truce equilibrium" among firms. In this equilibrium, countersuing threats deter firms from suing each other, even when firms have large patent portfolios. A non practicing entity breaks this equilibrium, which is part of the reason why the litigation threat increases. However, we find that, in equilibrium, "breaking the truce" can increase the ex-ante incentives to innovate.

Apart from these projects, during my second year class of American Economic History, I studied the characteristics of patentees in the 1860s. Patents were issued mostly by single inventors, rather than large companies, and anecdotical evidence pointed out that inventors were poor people trying

to succeed. To address this claim, first I looked at a random sample of people who wrote patents in the year 1860 and then I looked at their personal information on the census records. Surprisingly, I found that patentees in the 1860s where much richer than the average citizen. One possible explaination is that rich people could finance their own projects, compared to poor people, and they were willing to invest time patenting their inventions.

Currently, I am also working on a model that tries to characterize the equilibrium contracts between early stage innovators and large firms that commercialize the innovations. In particular, in the market for pharmaceuticals, biotech companies might hold private information regarding the likelihood of reaching the FDA approval stage. Big pharma companies might offer different contracts to try to sort out different types of drugs. Firms looking after the complementarity of their own porfolios and the original inventor have disaligned comercialization incentives. We study how this disalignment of incentives is moderated by competition and how it affects the timing of acquisitions.

Entrepreneurs are essential to our society, because they are the ones who take risks and bring inventions to the market place. I would like to deepen my understanding of why entrepreneurship naturally arises in some places and not others, how and when profit opportunities are capitalized, and how and why entrepreneurs can recognize them. Given that entrepreneurship happens in a context, it would be interesting to know how to design a system that facilitates entrepreneurial activity. In particular, because ideas are dispersed among different people, selecting the "best" ideas efficiently is a challenging economic question.

My home country, Chile, the engine of the economy has traditionally been the exploitation of natural resources. In recent years Chile has been fostering policies to attract more entrepreneurs into the country. Have these policies been effective? In particular, the program "Start-up Chile" sponsored by the Chilean Government, has set its main goal "to attract world-class early stage entrepreneurs to start their businesses in Chile". This program provides capital to entrepreneurs from all over the world to come to Chile and develop their ideas. The reasoning behind this program is that by creating networks of entrepreneurs around the world, along with bringing human capital to the country (at least for some years), the entrepreneurial spirit will rise. It would be very interesting to find a way to measure the effectiveness of this program, and to determine the rate of return of the government spending.

Participating in this workshop would be a great chance for me to learn more about an important topic which is part of my future research agenda and career. Learning and understanding the literature directly from experts who work at the frontier of research on entrepreneurship is an incredible opportunity. With my background and interests, I am sure I will contribute to the discussion of papers and to the generation of new research ideas.

MICHAEL D. WHINSTON
Professor of Economics
Sloan Fellows Professor of Management
Department of Economics and Sloan School of Management
Massachusetts Institute of Technology

Phone: 617-258-8408
Fax: 617-258-6786
Email: whinston@mit.edu

Entrepreneurship Boot Camp Selection Committee
NBER
1050 Massachusetts Ave.
Cambridge, MA 02468

Dear Selection Committee:

I am writing to recommend JORGE LEMUS for participation in the Summer 2014 Entrepreneurship Boot Camp. Jorge is a 5th year Ph.D. student at Northwestern who will be completing his Ph.D. next year. I have known him since early in his doctoral studies, and am now one of his primary thesis advisors.

Jorge is smart, hardworking, and creative. His thesis is examining issues related to R&D and intellectual property protection and he has two very nice papers already.

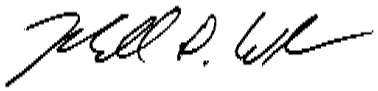
The first examines a elegant model of R&D in which firms choose the direction of their R&D rather than its level, as is assumed in nearly all of the literature. This allows analysis of issues such as "inventing around", etc. The paper shows how firms' incentives are distorted relative to what is socially optimal (e.g., they fail to consider the social value of the research lines they enable). The paper also shows that strong patents encourage forms to innovate in directions that are likely to be quick, rather than in directions that open socially valuable future possibilities.

The second is a very nice paper on patent assertion entities. In it, Jorge constructs a model in which the level of R&D by productive firms is endogenous, PAEs can acquire patents from productive firms, and there is a suit and settlement process. The model elegantly captures two effects that PAEs can have on innovation incentives. On the one hand, because PAEs can capture rents, they reduce the profitability of innovation; on the other hand, the presence of PAEs tends to harm firms with small patent portfolios more than those with large portfolios, which increases innovation incentives. Whether PAEs increase or decrease innovation depends on which of these two effects dominates.

Jorge has a serious interest in the real-world aspects of innovation. I think he would benefit a lot from attending the Boot Camp, which would expand his knowledge and interests into the entrepreneurship area.

I'm happy to answer any further questions you might have about Jorge.

Sincerely,



Michael D. Whinston

Professor of Economics
Sloan Fellows Professor of Management
M.I.T.