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Paris, March 24, 2016

Thomas Hellmann
Professor of Entrepreneurship and Innovation
Academic Director of the Entrepreneurship Centre, Said Business School
Academic Coordinator, the NBER Entrepreneurship Bootcamp

From: Thomas Åstebro

Re: letter of support for Wendy Bradley to the 2016 NBER Entrepreneurship Bootcamp

Dear Thomas,

I write in enthusiastic support of my Ph.D. student Wendy Bradley's application for the 2016 NBER Bootcamp. She is a promising student in her 4th year of Ph.D. studies at HEC Paris. I am supervising her. She is doing well in her studies, with high grades. Her thesis work is focusing on the impact of the creation of patent pool on the direction of technological change in society. As you know, patent pools are formed when there is technology for which there is large group of related patents which needs to licensed in order for products to be brought to the market. An example is the mpeg-2 audio compression algorithm. Various related compression patents were all granted to Sony, Columbia University, Fraunhofer Institute, and a few other inventors. To be able to resolve the difficulty of a lot of bi-party licensing agreements the inventors decided to form a consortium where patents were pooled together and the potential user would simply sign one licensing agreement giving access to all patents in the pool at a very low cost. We are talking about a few cents per device using the technology. However, U.S. regulators have had bad experience with patent pools in the past, where suppliers used them for rent extraction, limiting competition from imports and elevating the price for access to the patents. This was the case for the patent pool on sewing machines in 1856. Patent pools were deemed illegal by the F.T.C. after the 1930s until they reappeared in the 1990s.

What has happened is that with the rise of complex interrelated patents on new technology, U.S. regulators have been starting to allow patent pools again, and there are

now around 100 of them. But although these might resolve patent licensing complexity, and provide technology at a low basic royalty, when suppliers create these consortia there is a creeping incentive to collude to extract monopoly rents. This has taken several forms, such as extending the life of the patent pool way beyond the expiration date of the original patents by including new patents in the pool which have not expired. Wendy is in the process of examining what kind of impact such behaviour have on the progress of technology change. Overall, should we be worried that patent pools reduce the efforts of follow-on inventors because of limitations to competition, or are these effects small in relation to the increase in welfare that are gained by reducing licensing complexity?

Wendy is a very bright Ph.D. student with an excellent future career ahead of her. Her skills in collecting and analysing data for her research are very high and although she is a social scientist, she has a firm grasp of the technologies she is studying. In one of her studies she looks at illegal downloads of movies. This work follows her investigation into a few specific patent pool on compression algorithms and is eagerly cheered on by Scott Stern, whom she has been working with on this project as a visiting student at MIT for the past year. This is how she describes her research:

[Not long ago Time Warner CEO Jeff Bewkes told investors, "Game of Thrones is the most pirated show in the world. *Now that's better than an Emmy*." In a world where piracy has been consistently shown to eat away at industry profits, why would chiefs at Time Warner, the parent company of HBO, be excited about the piracy of their work? After collecting and curating a unique database of 2.5 million illegally-downloaded torrents, which contain 53 million individual files downloaded from 2004 to 2013, and then matching them to the IMDB movie database, I present a rarely comprehensive view of the behavior of internet pirates, the habits and preferences of file sharers, and the codec technologies used to compress the movie files. For any given movie that has been released, there are multiple, and often hundreds of pirated torrents to choose from. The major differences between versions are the quality of the compression (determined by codec and settings), size of the torrent, source of the original media (camcorder, stream, or disc), and availability (number of peers currently sharing). What is unclear, however, is which of these factors matters most in consumer choice. Combined with information about movie-house investment, box office revenue, and DVD sales, this paper is the first to draw a causal picture linking innovation in Internet piracy with legitimate product consumption.]

Her aim is to estimate a system of demand equations of movie theatre consumption, pirated movie consumption downloaded through torrents and DVD sales. The key idea is to examine how movie theatre consumption is affected by increases in the quality of viewing and speed of download through torrents, holding everything else equal. She should be able to estimate the shadow price of internet piracy quality this way, and it will be very interesting to see what she finds. I am quite certain that Jeff Bewkes will not be happy with

the results, as I am expecting that the prediction is a steep drop in movie theater consumption in the future as these torrents improve in quality. But we will see.

Wendy has strong leadership abilities as witnessed by her being selected to join the "Davos for Geeks", held annually through the Future Global Leaders Scholarship. She was selected as one of 22 students from 6,500+ applications. Wendy is a very outgoing and likeable person and has very strong leadership qualities. She helped me to conduct interviews with managers in Quatar. Quatar is not a place which is very hospitable to young western women, but she managed to conduct over 20 interviews predominantly conducting them on her own, and with great success.

To conclude, I recommend Wendy Bradley to the 2016 NBER Entrepreneurship Bootcamp with my considerable support.

Please feel free to contact me if you have further questions.

Sincerely,



Thomas Åstebro

Professor

HEC Paris

WENDY A. BRADLEY

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DOCTORAL STUDIES

Current: Visiting Researcher, Massachusetts Institute of Technology (MIT) since Jan 2015 — Cambridge, MA, USA

Ecole des Hautes Etudes Commerciales (HEC Paris) — Jouy-en-Josas, France
PhD Candidate in Strategy & Business Policy — Expected Jun 2017

- Research interests: Entrepreneurship, IP, Management of innovation, Technology
- Completed courses: Microeconomics, Behavioral Sciences, Research Methods, Statistics 1: Probability Theory, Statistics 2: Regression Models, Statistics 3: Non-linear Estimation Methods, Experimental Methods, Social Networks, Strategy: Organizations & Learning, Strategy: Industry & Competition, Innovation & Technology Strategy, The Economics of Strategy, Sociology of Strategy, Institutional Advantage Seminar, Economics of Innovation

PRIOR EDUCATION

London School of Economics and Political Science — London, UK
MSc International Political Economy — Oct 2008-Nov 2009

L'Institut d'Etudes Politiques de Paris (SciencesPo/ IEP Paris) — Paris, France
MSc Finance & Strategy, specialized in International Business — Oct 2007-Jun 2008

University of Texas at Austin, Liberal Arts Honors Program — Austin, TX, USA
BA Government and French, *Ampla Cum Laude* (GPA 3.7/4.0) — Aug 2001-May 2005

PHD HONORS, AWARDS & DOCTORAL CONFERENCES

Seventh Annual Searle Conference on Internet Commerce and Innovation — Chicago, IL, USA
- Invited discussant alongside economists, legal scholars, and Northwestern faculty to discuss research relevant to Internet search, innovation and antitrust issues — August 2016

Laboratory of Excellence in Economics & Decision Sciences Grant — Paris, France
- Labex Ecodec grant to study the economic and social impediments to innovations in the labor, financial, and product markets, to help alleviate them and enhance welfare — May 2015-present
- Research Area 4: Evaluating the Impact of Public Policies and Firms' Decisions

Future Global Leaders Scholarship - Web Summit 2014 — Dublin, Ireland
- Accepted in the first round of 22 students from 6,500+ applications, 650 interviews of students from 137 different institutions, announced as "22 Students Changing The World" — Nov 2014
- Paid to attend, "the new hot ticket on the tech conference scene." (*Forbes*)
- Dublin Web Summit described as "the Davos for Geeks."

HEC Foundation Scholarship — Paris, France
- Four-year fellowship covering tuition, living expenses, and academic conferences — Oct 2012-Jun 2016
- Worked with HEC faculty in Qatar on a project financed by the Qatar Foundation to produce MBA case studies on Qatari family-run, publicly-held businesses (*publication pending*) — Doha, Qatar Oct 2012-Jun 2014

Strategy Research Initiative - PhD Boot Camp 2014 — New York, NY, USA
- Program taught by experienced scholars (Cornell, Maryland, Wharton, Yale) working at the theoretical and empirical frontiers of strategy research — June 2014

Competition and Innovation Summer School (CISS) — Turunç, Turkey
- Conference lectures on current topics of innovation, the economics of science and IP rights, empirical competition analysis, and issues in theories of industrial organization — May 2013

OTHER AWARDS

St. Gallen Wings of Excellence Award — St. Gallen, Switzerland
- 100 of over 1,000 applicants selected from article submission — May 2009
- Award to attend symposium on the "Revival of Political & Economic Boundaries"

Distinction (Highest Honors) for LSE MSc Dissertation — London, UK
- Paper titled "American and British Government Policy Preference for Mortgage Moratoria During the Inter-War Period" — Oct 2010

Dedman Distinguished Scholarship — Austin, TX, USA
- 5 to 8 scholars chosen out 700+ applicants; and full, four-year academic scholarship for merit and leadership 2001-2005 — Aug 2001-May 2005

PROFESSIONAL EXPERIENCE

Self-employed — Mar 2011-present
The Center for Competitive Management — New York, NY, USA
Writer, lawfirmsuccess.wordpress.com (freelance)
- Contributed articles daily examining legal cases, trends, and personalities of interest to the business and law community;
- Kept up-to-date on U.S. federal and district court dockets to investigate and analyze legal developments

Kaiser Associates, International Strategy Consulting Firm — London, UK
Researcher, Analyst (freelance) — Nov 2011-Feb 2012
- Conducted market research surrounding strategies to enter the multi-million dollar U.S. durable medical equipment market

The Small Business Authority — New York, NY, USA
Writer, thesba.com (freelance) — Aug 2011-Aug 2013
- Contributed 10 articles per month regarding best business practices for small businesses to serve over 100,000 business accounts in 50 states; the SBA provides real-time, state of the art content, and business services.

Bickel & Brewer, Litigation Law Firm — Dallas, TX, USA
Consultant (salaried) — Jan 2010-Mar 2011
- Developed case-specific financial models, including damages models and loan schedules, for a variety of complex commercial litigation suits involving patents, trade secrets, securities, tax, oil and gas, and contracts;
- Managed the analysis of the financial background of cases, such as the conditions, structure and costs of debt financing; for example, calculated the capital carry contributions on a $200 million hotel project; and
- Researched and drafted financial and analytical memoranda for various stages of trial proceedings.

Constella Futures, Government Contractor to USAID — Washington, DC, USA
Technical Editor (salaried) — Jul 2005-Aug 2007
- Proofread, edited, designed and circulated wide-range of technical documents from economists and demographers for publishing, such as the quarterly series *Policy Issues in Planning & Finance*; and
- Coordinated the writing, assisted in the editing, and helped to produce the final draft of a $325 million project proposal, which was successfully awarded to Constella Futures by USAID in September 2005.

OTHER

Volunteering
- Cambridge Women's Center volunteer since January 2015

Athletics: Nationally ranked & sponsored rock climber
- Invited to French National Bouldering Competition (March 2014); Ranked 6th (2014) in French Ile-de-France regional competition for bouldering; Ranked 19th (2014) in French Ile-de-France regional competition for sport climbing, Fédération française de la montagne et de l'escalade (FFME)

Travel & Languages
- Visited 25+ countries
- English (native), French (fluent), Arabic (intermediate)

Wendy Bradley
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Strategy & Management Policy
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Somerville, MA 02143
+1 972 207 1617
Advisor & Recommender: Dr. Thomas Åstebro

March 23, 2016

To the NBER Entrepreneurship Working Group:

As a fourth-year PhD Candidate at HEC Paris in the Strategy & Management Policy department, I am applying with the support of my HEC Paris advisor, Dr. Thomas Åstebro, for this year's NBER Entrepreneurship Research Boot Camp (ERBC).

My letter of recommendation will be sent separately by Dr. Thomas Åstebro, Associate Professor of Strategy and Entrepreneurship at HEC Paris; Academic Director of the HEC Leadership Center; and co-Director of the Entrepreneurship and Innovation Track of the MBA Program. If you have additional questions, you may contact him at: astebro@hec.fr.

My current research surrounds entrepreneurship economics and the economics of innovation, with a focus on how uncertainty in the market for technology drives IP strategy and how this IP strategy affects the direction of future industry innovation and competition among technical standards. I am interested in how decisions surrounding the protection of innovation, particularly patent pools in high-tech industries, differ from decision-making in traditional economic activity, and the consequences of those differences for strategy and policy.

I invite you to read my motivation letter and CV, attached, for further information regarding my academic and professional background and research interests.

Thank you for considering this application.

Kind Regards,



Wendy Bradley
PhD Candidate, HEC Paris
wendy.bradley@hec.edu

I am writing to apply to the 2016 National Bureau of Economic Research (NBER) Entrepreneurship Research Boot Camp (ERBC). As a PhD Candidate in Strategy and Business Policy at HEC Paris, I have completed my second-year doctoral-level courses and passed my qualifying exams. Currently, I am a Visiting Student at the Massachusetts Institute of Technology (MIT) conducting academic research in the Technological Innovation, Entrepreneurship, and Strategic Management (TIES) group at Sloan, under the supervision of Scott Stern. If accepted to the NBER Boot Camp, I aim to hone my current capabilities as a researcher through your multi-disciplinary lectures on theory development and empirical design and methods. I also look forward to the opportunity to discuss my research with premier strategy scholars, including Philippe Aghion, Nick Bloom, John Haltiwanger, Thomas Hellmann, Erik Hurst, Josh Lerner, Antoinette Schoar, and Scott Stern.

My current research surrounds entrepreneurship economics and the economics of innovation, with a focus on how uncertainty in the market for technology drives IP strategy and how this IP strategy affects the direction of future industry innovation and competition among technical standards. I am interested in how decisions surrounding innovation, particularly in high-tech industries, differ from decision-making in traditional economic activity, and the consequences of these differences for strategy and policy. Using U.S. and European patent data, I will investigate the impact of the introduction of new patents in established patent pools on industry competition—fluctuations in entry and exit to a market—in addition to the impact of the introduction of patents in patent pools on innovation rates—in both quantity, quality, and direction of invention—through the mechanisms of lower litigation risk, lower cost to pool technology, and signals of lower uncertainty in the market for technology.

My research interests were profoundly influenced by my professional background as a litigation consultant and legal researcher in the U.S. and in France. Once part of a high-stakes IP lawsuit in the U.S., I made a habit of continually tracking IP-related legal news. So, on June 30, 2011, I took note when Nortel announced it sold a portfolio of 6,000 smartphone-related patents to a pool of six companies that included Apple, EMC, Ericsson, Microsoft, Sony, and Research In Motion for a hefty $4.5 billion. The “Nortel Six” patent holders were incentivized to enter a patent pool to control standards set on future 4G wireless technologies. As members of the patent pool, each firm could coordinate and control the prices and quantities of the products using those patents. No other competitor can use 4G wireless technologies without a license, and those who try face threats of litigation. More importantly, the hefty price tag sends a powerful message that patents—and specifically patent pools—

are, in fact, of important strategic value to a firm and thus to the market for technology as a whole. The Nortel Six auction is hardly unique. Patents within pools are actively traded. Research demonstrates that as much as 13.5 percent of granted patents are sold (Figueroa and Serrano, 2013). In addition, patents are added to patent pools after the pool is formed. This could be because Standard Essential Patents (SEPs) are complex, covering a number of different technical fields, so there is a coordination problem where inefficient standard dynamics create heterogeneous timing in adoption decisions (Farrell & Saloner, 1985; Weitzel et al., 2006; Nakaoka, 2009). In addition, coordination problems may occur if an individual firm prefers a different royalty scheme, which results in a holdup of negotiation to enter the pool (Aoki and Nagaoka, 2004; Aoki and Nagaoka, 2005). Also, as firms invest differently in R&D over time, technology related to the standard may be discovered at a later date, and their respective patents filed post-pool formation. This leads to changes in the ownership and royalty-share composition of a patent pool as outsiders or incumbent firms add new patents to the pool. As a result of changes, it is possible that firms then strategically introduce patents to a pool in order to extend the lifespan of the pool and the owners' monopoly over a particular technical standard.

It is evident that once patent pools are formed, their composition of ownership and royalty distribution is not static. So, with each of these dynamics in mind, my current research uses a novel dataset of 7 patent pools to investigate the following question: (1) As the structure and ownership composition of a patent pool changes over time through the introduction of patents by incumbent and outsider firms, what is the effect on the direction of innovation for this technology and related technologies?

Becoming a leading academic in entrepreneurship will enable me to research key challenges faced by twenty-first century innovators, to answer key questions that lay at the heart of strategy problems, to revolutionize how organizations function in today's economy, and to publish important findings that affect global business practices in the U.S., Europe, and beyond. With the help of the ERBC and the group of esteemed academics assembled to teach at the boot camp this summer, I hope to learn how to develop theory that is unambiguous, rigorously derived, and consistent; and I aim to propel my research efforts forward by learning how to test extant theory using empirical designs and methods that are transparent, that engage directly with the endogenous selection processes, and that generate valid inferences, as is promoted by your research organization.

Thank you for considering my application.