KELLEY SCHOOL OF BUSINESS

INDIANA UNIVERSITY

Yifei Mao
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Professor Thomas Hellmann
University of British Columbia
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2053 Main Mall, Vancouver, BC,
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March 31, 2014

Dear Professor Hellmann,

I am Yifei Mao, a fourth year finance Ph.D. student from Kelley School of Business, Indiana University Bloomington. I would like to apply for the 7th NBER Entrepreneurship Research Boot Camp to be held from July 15th to July 18th. My research interest is on empirical entrepreneurial finance and corporate finance. My advisor, Professor Xuan Tian, will write a letter of recommendation supporting for my application.

If you need further information, please contact me at (215) 882-2290 or via email yifmao@indiana.edu.

Sincerely,
Yifei Mao

YIFEI MAO

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EDUCATION

- Ph.D. in Finance, Indiana University, 2015 (expected)
  - Dissertation: "Three Essays in Entrepreneurial Finance and Innovation"
  - Committee: Xuan Tian (Co-Chair), Matthew Billett (Co-Chair), Craig Holden, and Xiaoyun Yu
- M.A. in Economics, University of Pennsylvania, 2010
- B.A. in Economics, Tsinghua University, China, 2008

PUBLICATIONS

- "Does Banking Competition Affect Innovation?" (with Jess Cornaggia, Brian Wolfe, and Xuan Tian), ***Journal of Financial Economics***, forthcoming.
  - On the 2013 Western Finance Association (WFA) program
  - On the 2014 Association of Financial Economics (AFE) program

WORKING PAPERS

- "How Do Financing Constraints Affect Innovation? The Role of Collateral,"
  - Job Market Paper
- "Unleashing Innovation," with Xuan Tian and Xiaoyun Yu
  - On the 2013 CEPR Workshop on Entrepreneurship Economics program
  - On the 2013 Indiana Finance Symposium program
- "Price Discovery in the Stock and Corporate Bond Markets,"
  - On the 2013 Financial Management Association (FMA) program
  - On the 2013 Midwest Finance Association (MFA) program

RESEARCH IN PROGRESS

- Innovation and Cost of Capital

INVITED CONFERENCE PRESENTATIONS

- Presentations (* indicates presentations by co-author)
  - 2014 Association of Financial Economics (AFE) Annual Meetings
  - 2013 Western Finance Association (WFA) Annual Meetings*
  - 2013 CEPR Workshop on Entrepreneurship Economics program*
  - 2013 Financial Management Association (FMA) Annual Meetings
  - 2013 Indiana Finance Symposium program*

- 2013 Midwest Finance Association (MFA) Annual Meetings

- Discussions
  - 2014 Financial Intermediation Research Society (FIRS) Annual Meetings (scheduled)
  - 2013 Financial Management Association (FMA) Annual Meetings
  - 2013 China International Conference in Finance (CICF) Annual Meetings (3 papers)
  - 2013 Midwest Finance Association (MFA) Annual Meetings

RESEARCH AND TEACHING EXPERIENCE

- Instructor
  - Intermediate Corporate Finance (Undergraduate), Indiana University, Summer 2013
  - Intermediate Investments (Undergraduate), Indiana University, Summer 2013
- Research Assistant, Indiana University, 2010-2012
- Research Assistant, Dr. Marshall Blume and Dr. Donald Keim, Wharton School, 2009-2010

REFEREE SERVICES

- Asia-Pacific Journal of Financial Studies

HONORS AND AWARDS

- AFA Student Travel Grant, 2013
- Graduate Student Fellowship, Department of Finance, Indiana University, 2010-present
- Research Assistantship, Rodney White Center for Financial Research, University of Pennsylvania, 2009-2010
- University Scholarship, Tsinghua University, 2007
- Asia Institute for Political Economy Scholarship, The Fund for American Studies, 2007

INDUSTRY EXPERIENCE

- Internship at Bank of China International, Hong Kong, China, August 2007
- Internship at ING Bank N.V., Beijing, China, January-February 2007

OTHER INTERESTS

- Writing, Swimming, and Dancing

GRADUATE COURSEWORK

At Indiana University

- F600 Asset Pricing Theory
- F605 Corporate Finance Theory
- F625 Empirical Asset Pricing
- F635 Market Microstructure

- F644-I Empirical Corporate Finance
- F644-II Mutual Fund Studies
- F798 Research Seminar in Finance
- E520 Optimization Theory
- E521 Theory of Prices and Markets
- E522 Macro Economics
- E671 Econometrics - Nonlinear and Simultaneous Equation Models
- E672 Econometrics – Time Series
- G751 Game Theory
- G752 Information Economics
- G753 Agency Theory
- G754 Structural Econometrics
- **At University of Pennsylvania**
- ECON701Microeconomics I –General Equilibrium and Mechanism Design
- ECON 702MacroeconomicsI—Micro Foundations and Numerical Methods
- ECON 703Microeconomics II-Game Theory
- ECON 704 Macroeconomics II-Incomplete Markets, Search Models and OLG Models
- ECON 705 Econometrics I – Panel Data
- ECON 706 Econometrics II – Time Series
- FNCE 912: Financial Institutions
- FNCE 926: Empirical Methods in Corporate Finance

PAPER ABSTRACTS

How Do Financing Constraints Affect Innovation? The Role of Collateral

This paper shows that financial constraints impede innovation. My contribution to the literature is identifying a causal impact of financial constraints on innovation. Specifically, I exploit plausibly exogenous shifts in financing capacity of an innovative firm to expose how firms adapt their innovation strategies in the presence of varying levels of ex-ante financial constraints. My empirical strategy exploits plausibly exogenous variation in local house prices as shocks to the value of real estate collateral owned by a firm. I find that an average innovative firm generates 4.8% more patents one year following a one-standard deviation increase in real estate value over the 1993-2006 period. To enhance innovation, firms increase their innovation spending on internal research and development (R&D), corporate venture capital investment (CVC), and acquisitions of innovative targets. Furthermore, I show that real estate shocks affect innovation output across different time horizons through its effect on innovation spending. In particular, acquisitions immediately increase innovation output (1 year post acquisition), in-house R&D influences innovation output during a medium time horizon (2 or 3 years post R&D), and CVC investment tends to affect innovation output in a longer time horizon (4 or 5 years post CVC investment). Finally, I show that enhanced innovation output due to relaxed financial constraints increases firm value.

Does Banking Competition Affect Innovation?

We exploit the deregulation of interstate bank branching laws to test whether banking competition affects innovation. We find robust evidence that banking competition reduces state-level innovation by public corporations headquartered within deregulating states. Innovation increases among private firms that are dependent on external finance and that have limited access to credit from local banks. We argue that banking competition enables small, innovative firms to secure financing instead of being acquired by public corporations. Therefore, banking competition reduces the supply of innovative targets, which reduces the portion of state-level innovation attributable to public corporations. Overall, these results shed light on the real effects of banking competition and the determinants of innovation.

Unleashing Innovation

Using a sample of venture capital (VC)-backed initial public offering (IPO) firms, we study the impact of financial intermediaries' tight leash on entrepreneurs' innovation productivity. We find IPO firms are significantly less innovative when VCs keep a tighter leash on them by interfering with their development more frequently—as measured by a larger number of VC financing rounds. To establish causality, we exploit the plausibly exogenous variation in the frequency of direct flights between VC domiciles and IPO firm headquarters that are due to airline restructuring. Our identification tests suggest a negative, causal effect of VC staging on firm innovation. We further show that staging is more detrimental to firm innovation when innovation is more difficult to achieve, when IPO firms operate in more competitive product markets, and when VCs are less experienced with the industry to which their entrepreneurial firms belong. Our findings suggest that excessive interference by financial intermediaries impedes innovation, and shed light on a previously under-recognized adverse consequence of VC stage financing.

Price Discovery in the Stock and Corporate Bond Markets

This paper uses intraday U.S. bond transaction and stock quote data to investigate whether corporate bonds lead stocks in price discovery of underlying firm value. I use Hasbrouck's (1995) "information share" approach to determine the relative contribution of corporate bonds to price discovery. Based on a sample of 214 firms, I find that corporate bond markets contribute 12.6% on average to price discovery from 2009 to 2011. Corporate bond market price discovery increases with the riskiness of the underlying firm value, and is related to contemporaneous market conditions. The findings are consistent with the informed trading theory and Merton (1973) model.

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I am a fourth year Ph.D. student in finance from Kelley School of Business, Indiana University Bloomington. I am looking forward to participating in the NBER Entrepreneurship Research Boot Camp since I believe it would substantially benefit my research in entrepreneurial finance and economics. The papers listed in the previous programs of the NBER Boot Camp have covered an extensive collection of cutting-edge research topics and provided insights into issues on entrepreneurial finance. Furthermore, having leading scholars discussing these papers would be inspiring and could greatly advance my understanding in these areas. Meanwhile, exchanging thoughts with cohorts in the boot camp would be a very pleasant and precious experience in my career. I believe it would result in exciting research sparks and may even lead to lifetime collaborations.

My research focuses on innovation and entrepreneurial finance. I have been working on a broad range of topics including the relation between the organizational forms of research and development (R&D) and patenting activities, banking competition and firm innovation, and venture capital (VC) staging. Attending the boot camp provides me with an extraordinary opportunity to deepen my understanding in the current area by intensive interactions with others, and to venture my research into new territories. Excited about the wonderful chance, I also hope that my attendance in the boot camp would contribute to the group by adding fresh angles into discussions.

Specifically, I am currently working on my job market paper titled “How Do Financial Constraints Affect Innovation? The Role of Collateral,” that examines the effect of financial constraints on firm innovation. Since financial constraints and innovation are naturally correlated in equilibrium, it is hard to disentangle the causal impact of financial constraints on innovation. In this paper, I exploit plausibly exogenous shocks to the collateral value of an innovative firm to expose how firms adapt their innovation strategies in the presence of varying levels of ex-ante financial constraints. Specifically, I examine how a firm transforms its financial capacity into patenting outcome by conducting in-house innovation (Research and Development (R&D)), hybrid innovation (corporate venture capital (CVC)), and external innovation (acquisitions of innovative targets).

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My findings exhibit several layers. I find that as a response to collateral value increase, firms increase their innovation spending on R&D, CVC, and acquisitions of innovative targets, and generate more patents as a result. Furthermore, I show that collateral shocks affect innovation output across different time horizons through its effect on innovation spending. In particular, acquisitions immediately affect innovation output (1 year), in-house R&D influences innovation output during a medium time horizon (2 or 3 years), and CVC investment tends to affect innovation output in a longer time horizon (4 or 5 years). Finally, I show that enhanced innovation output due to relaxed financial constraints increases firm value.

While my job market paper examines the organization of innovation and documents its response to increased funding availability, I have also worked on a paper that documents the differential effect of credit financing on entrepreneurial and mature firms. The paper is titled "Does Banking Competition Affect Innovation?" (coauthored with Jess Cornaggia, Brian Wolfe, and Xuan Tian) and is forthcoming in the Journal of Financial Economics. In this paper, we construct tests using U.S. bank branching deregulatory events as plausibly exogenous shocks to banking competition. We find evidence that banking competition enables small, innovative firms to secure financing instead of being acquired by public corporations. Therefore, the supply of innovative targets declines, which reduces the portion of state-level innovation attributable to public corporations.

In addition to examine financial constraints faced by innovative firms and credit financing for innovation, I also investigate a special type of financing -venture capital staging - in a paper titled "Unleashing Innovation" co-authored with Xuan Tian and Xiaoyun Yu. Using a sample of venture capital (VC)-backed initial public offering (IPO) firms, we study the impact of financial intermediaries' tight leash on entrepreneurs' innovation productivity. We find IPO firms are significantly less innovative when VCs keep a tighter leash on them by interfering with their development more frequently—as measured by a larger number of VC financing rounds.

In future, I plan to investigate whether bank financing and venture financing are substitutes or complements, how innovation affects a firm's cost of equity and cost of debt, patent laws and innovation strategy, and other topics in entrepreneurial finance and innovation. I find there are so many fascinating topics in the area to study, and the NBER boot camp would be a great chance for exploring and growing ideas.

KELLEY SCHOOL OF BUSINESS

INDIANA UNIVERSITY

Xuan Tian
Assistant Professor of Finance
Mary Jane Geyer Cain Faculty Fellow
Kelley School of Business
Indiana University, Bloomington

March 31, 2014

Professor Thomas F. Hellmann
Sauder School of Business
University of British Columbia
203 Main Mall
Vancouver, BC V6T 1Z2

Dear Thomas:

It is my pleasure to recommend Yifei Mao, a fourth year Ph.D. student here at the Finance Department, Kelley School of Business at Indiana University, for the NBER Entrepreneurship Research Boot Camp. Yifei has finished all required Ph.D. courses and did an excellent job passing the finance comprehensive exam. She is currently at the dissertation research stage.

Yifei's single-authored paper "How Do Financing Constraints Affect Innovation? The Role of Collateral" is tackling an important research question: how do financial constraints causally affect firm innovation? Exploiting plausibly exogenous variation in financial capacity caused by shocks to collateral value, she shows that a firm that are financially constrained ex-ante enhances innovation by conducting R&D (internal channel), investing in corporate venture capital (hybrid channel), and acquiring innovative targets (external channel). Furthermore, she finds that acquiring innovative targets contributes to innovation output immediately in the following year, R&D affects innovation output in an intermediate time horizon (2-3 years), and CVC influences innovation output in a longer time horizon (4-5 years). Finally, she addresses the

"bottom–line" question about firm value and finds that enhanced innovation output due to relaxed financial constraints increases firm value.

While Yifei is only a 4th year doctoral student, she already has a paper that is forthcoming at the *Journal of Financial Economics*: "Does Banking Competition Affect Innovation?" (joint with Jess Cornaggia, Brian Wolfe, and myself). In this paper, using decades of deregulatory efforts to identify causality, we show that banking competition enhances small businesses' innovation by increasing access to credit, allowing them to operating independently rather than potentially being acquired by public companies. When small firms are not acquired by corporations, corporations are no longer innovative, leading to a decline in the aggregate level of innovation in the economy.

As a student coauthor of the above paper, one may be tempted to believe that Yifei is merely a "research assistant". However, this was not the case in our cooperation: Yifei not only led the empirical analyses, but also contributed significantly to both idea development and test design. I was extremely impressed with some of her very critical suggestions, which I believe largely enhanced our paper's quality and contribution and was crucial to our final acceptance by the *JFE*.

I have been working very closely with Yifei in the past two years. I am very impressed with her excellent empirical skills and hard-working nature. Yifei has developed a deep understanding about the existing entrepreneurial finance and innovation literature, about important unresolved research questions, and about the databases in this area. She is a very bright student and has shown every sign of becoming a top quality researcher in entrepreneurial finance and innovation.

Overall, Yifei is an ideal candidate to benefit from the NBER Entrepreneurship Boot Camp Program. I therefore recommend her strongly to you. Please feel free to call me at (812) 855-3420, or e-mail me (tianx@indiana.edu), if you require any further information about her.

Sincerely,



Xuan Tian

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