

# Andy Wu

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## EDUCATION

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**The Wharton School of the University of Pennsylvania** Philadelphia, PA

### **Business Economics and Public Policy Department**

- Candidate for *Doctor of Philosophy (Ph.D.) in Applied Economics* Aug '11—May '16 (expected)
- Dissertation: *Organizational Resource Assembly in Technology Ventures*
- Committee: David H. Hsu (Chair), Joseph E. Harrington, Jr. (Supervisor), Harbir Singh, Vikas A. Aggarwal, Laura Huang
- *Master of Science (M.S.) in Applied Economics & Managerial Science* Aug '11 —Dec '13

### **Massachusetts Institute of Technology (M.I.T.)**

- *Bachelor of Science (S.B.) in Economics and in Mathematics* Cambridge, MA Sep '08—Jun '11
- GPA: 4.8/5.0, SAT: 2400/2400
- Thesis: *State Alcohol Excise Taxes: Effects on Consumption and Traffic Fatalities*, MIT Undergraduate Economics Journal

## RESEARCH AND TEACHING INTERESTS

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Entrepreneurship, Technological Innovation, Strategic Management, Organizational Economics, and Corporate Finance

## HONORS, FELLOWSHIPS, AND GRANTS

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Strategic Management Society Best Conference Paper Finalist (2015)  
Social Enterprise @ Goizueta Research Colloquium Best Paper (2015)  
Wharton Risk Center Russell Ackoff Fellowship (2015)  
INSEAD-Wharton Center for Global Research and Education Grant (2015)  
Penn Prize for Excellence in Graduate Teaching (2014)  
Certificate in College and University Teaching (2014)  
President Gutmann Leadership Award (2014)  
Wharton Doctoral Travel Grant (2014)  
Mack Institute for Innovation Management Research Grant (2014)  
Mack Center for Technological Innovation Research Grant (2013)  
Mack Center for Technological Innovation Research Grant (2012)  
NSF Graduate Research Fellowship Honorable Mention (2011)  
Wharton Doctoral Fellowship (2011)  
MIT Burchard Scholar (2010)

**RESEARCH PROJECTS** *Working papers available for all projects upon request.*

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**Organizational Decision-Making and Information: Angel Investments by Venture Capital Partners**

We study the role of information in organizational decision-making for the financing of entrepreneurial ventures. We formally model a committee of agents who vote to allocate resources to a project with unknown outcome. The agents are endowed with costless explicit information, and they can each acquire costly tacit information to improve their decision quality. Equilibrium outcomes suggest a theoretical tension for group decision-making between the benefits of information aggregation and a cost from the participation of uninformed agents, and this tension presents a boundary condition for when a group decision is superior to an individual decision.

We test our predictions in the setting of a particular phenomenon in venture capital: private angel investments by the partners outside of their employer, which represent investments passed on by the employer. Venture capital partners, acting independently with their personal funds, make investments into younger firms with less educated and younger founding teams than their employing VC firms, but these investments perform financially similarly or better on some metrics even when controlling for investment size, stage, and industry. Geographic distance and technological inexperience by the VC increase the probability the investment is taken up by a partner and not the VC. This work contributes to an emerging stream of literature on information aggregation in organizations and the established literatures on resource allocation and incumbent spin-outs.

Link: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2656896](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2656896)

**R&D Production Team Organization and Firm-Level Innovation** (Under Review)

*with David H. Hsu (The Wharton School, Dept. of Management) & Vikas A. Aggarwal (INSEAD, Dept. of Entrepreneurship and Family Enterprise)*

How should a firm organize the diversity of technological experience contained within its base of inventors when firm-level innovation output is a key performance consideration? We investigate the innovation implications of alternate firm-level approaches to organizing such diversity. Building on the knowledge-based view and organization design literatures, we examine the effects of across-team and within-team technical experience diversity on firm-level innovation output. Our framework suggests these alternate managerial choices involve trading off knowledge recombination benefits and coordination costs. Using a panel dataset of biotechnology start-ups observed from their founding date onwards, we find that across-team diversity results in greater firm-level innovation benefits as compared to within-team diversity. We also find evidence that collaborative experience and combinatorial novelty moderate this effect, further supporting our proposed framework.

Link: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2553265](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2553265)

**Skilled Immigration and Firm-Level Innovation: Evidence from H-1B Lottery**

We evaluate the impact of skilled immigration on U.S. innovation by exploiting a random lottery in the H-1B visa program. Proponents of skilled immigration argue that it allows firms to access necessary technical skills and promote innovation, while opponents argue that the program enables firms to substitute domestic labor for cheaper but equally or less skilled foreign labor. Using risk sets, we compare firms who applied for the same number of lottery-subject applicants but won different numbers of immigrants because of the lottery. The results suggest that winning an H-1B immigrant does not significantly increase patent applications or grants at the firm-level; our results suggest the existing literature showing a positive correlation between the spatial distribution of H-1B immigrants and patents is misinterpreted. We argue that our results should be expected given the pervasive use of the program in industries where patenting is not the main value appropriation strategy.

### **The Structure of Board Committees**

*with Kevin Chen (University of Pennsylvania, Dept. of Economics)*

Committees represent a prevalent organizational structure within the board of directors, and they serve as the locus of most board activity. We document and explain the role of this integral internal structure. Utilizing a novel dataset containing full committee membership, including that of non-required committees, for over 5000 public firms from 2001 to 2013, we examine the nature of committee formation and the allocation of directors to these committees. Committees allow directors to specialize on certain board-related issues and gain firm-specific knowledge useful for advising and monitoring. In addition, committees can lead to better measurement of a director's contribution, reducing agency costs. These benefits, however, may be accompanied by the coordination costs that arise when committees increase information dispersion. Our findings from analyzing the data are broadly consistent with the view that boards structure committees to balance these benefits and costs of decentralizing decision-making to committees. In particular, we highlight the role of multi-committee directors in facilitating this balance.

Link: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2646016](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2646016)

### **Do Incumbent Firms Have A Midas Touch for Startups? A Two-Sided Matching Model of Incumbent-Entrepreneur Alliances in the Biotechnology Industry**

We explore the formation and impact of relationships between incumbent pharmaceutical firms and biotechnology startups. To what extent are incumbents creating value in their startup partners and increasing their likelihood of a successful exit event, and to what extent are they merely skilled in matching with successful startups with commercially viable technology? We find that sorting accounts for nearly all the differential impact of incumbents on entrepreneurs in biotechnology. Experienced incumbents match with more successful startups. In addition, incumbents and startups sort and match observable characteristics like technology, access to capital, and geography. We examine both reduced form evidence and construct and estimate a two-sided matching model from Sorensen (2007) using biotechnology alliance data from 1973 to 2007.

### **Innovative Investing through Networks: A Non-Bayesian Learning Model of Venture Capital**

*with Qiwei "David" Sun (University of Pennsylvania, Dept. of Electrical and Systems Engineering)*

Investors and managers learn about new technologies through interorganizational networks to stay competitive in rapidly evolving markets. We develop a novel non-Bayesian social learning model where agents apply a learning rule to incorporate the knowledge of neighbors: agents update their knowledge based on a convex combination of the Bayesian posterior belief conditioned on private knowledge and the observed opinions of its neighbors, with heterogeneous weighting of neighborhood knowledge and a budget constraint. We evaluate and estimate our model in the context of syndication networks in the life sciences venture capital industry. Using the universe of venture capital investments in life sciences startups from 1985 to 2010, we find robust evidence that venture capitalists are learning about new technologies through their syndication networks. Venture capitalists connected through stronger ties are more likely to be influenced by others, and those with great connectivity and size are more likely to influence their peers.

## **CONFERENCE PRESENTATIONS AND INVITED TALKS**

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### **Organizational Decision-Making and Information: Angel Investments by Venture Capital Partners**

- Strategic Management Society Annual International Conference (SMS Best Conference Paper Prize Finalist) (Denver, CO) (2015)
- INFORMS Annual Meeting (Philadelphia, PA) (2015)
- Academy of Management Annual Meeting ENT Division (Vancouver, BC) (2015)
- Social Enterprise @ Goizueta Research Colloquium (Best Paper) (Atlanta, GA) (2015)
- London Business School TADC (London, UK) (2015)

### **Skilled Immigration and Firm-Level Innovation: Evidence from H-1B Lottery**

- Strategic Management Society Annual International Conference (Denver, CO) (2015)
- Academy of Management Annual Meeting TIM Division (Vancouver, BC) (2015)

### **R&D Production Team Composition and Firm-Level Innovation**

with *David H. Hsu (The Wharton School, Dept. of Management)* & *Vikas A. Aggarwal (INSEAD, Dept. of Entrepreneurship and Family Enterprise)*

- West Coast Research Symposium on Tech. Entrepreneurship (Seattle, WA) (2015)
- DRUID15 Conference Rome on the Relevance of Innovation (Rome, IT) (2015)
- Strategic Management Society Annual International Conference (Madrid, ES) (2014)
- Academy of Management Annual Meeting TIM Division (Philadelphia, PA) (2014)
- London Business School TADC (London, UK) (2014)

### **Do Incumbent Firms Have A Midas Touch for Startups? A Two-Sided Matching Model of Incumbent-Entrepreneur Alliances in the Biotechnology Industry**

- Academy of Management Annual Meeting ENT Division (Philadelphia, PA) (2014)

## **CONSORTIA**

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### **West Coast Research Symposium on Technology Entrepreneurship Doctoral Student Workshop** (Seattle, WA) (2015)

**AOM BPS Dissertation Consortium** (Vancouver, BC) (2015)

**Atlanta Competitive Advantage Conference RDW** (Atlanta, GA) (2015)

### **West Coast Research Symposium on Technology Entrepreneurship Doctoral Student Workshop** (Seattle, WA) (2014)

**Strategy Research Initiative PhD Boot Camp** (New York, NY) (2014)

**Smith Entrepreneurship Research Conference Doctoral Consortium** (College Park, MD) (2014)

**NBER Entrepreneurship Research Boot Camp** (Cambridge, MA) (2013)

## **PROFESSIONAL AFFILIATIONS**

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Academy of Management, Strategic Management Society, American Economic Association, Institute for Operations Research and the Management Sciences

## **REFEREE DUTIES *Ad Hoc***

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Management Science, Academy of Management (ENT, TIM)

## **TEACHING EXPERIENCE**

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### **ENTREPRENEURSHIP & STRATEGY**

**MGMT 801 Entrepreneurship** (EMBA, MBA), *Teaching Assistant* Summer 2012—  
Summer 2015

- Emphasis on applying and synthesizing concepts and techniques from strategy, finance, accounting, managerial economics, marketing, operations, and org. behavior in the context of new venture development
- Served 19 times with Prof. David Hsu (EMBA: Summer 2012, Fall 2012, Summer 2013, Summer 2015 for 2 sections) (MBA: Fall 2013 for 2 sections) and Prof. Laura Huang (MBA: Spring 2014 for 6 sections, Spring 2015 for 6 sections)

**MGMT 612 Management of Emerging Enterprise** (MBA), *Teaching Assistant* Spring 2015

**MGMT 806 Formation and Implementation of Entrepreneurial Ventures** (EMBA), *Teaching Assistant* Fall 2014

**Knowledge @ Wharton Introduction to Entrepreneurship** (HS), *Instructor* Summer 2015

**LBW Introduction to Management** (HS), *Instructor* Summer 2015

### **HEALTHCARE ENTREPRENEURSHIP**

**HCMG 858 Healthcare Marketing** (MBA), *Teaching Assistant* Fall 2014

**HCMG 391 Healthcare Entrepreneurship** (UG), *Teaching Assistant* Fall 2014

**VBMA Veterinary Entrepreneurship** (VMD), *Instructor* Fall 2013—

**VBMA Veterinary Economics** (VMD), *Instructor* Spring 2015

- Designed and taught custom courses for Penn School of Veterinary Medicine Business Certificate program

### **ECONOMICS & FINANCE**

**BEPP 250 Managerial Economics** (UG), *Instructor* Spring 2014

- Received university prize for recognition of teaching impact
- Intermediate microeconomics; focus on applications to managerial decision-making

**BEPP 305 Risk Management** (UG, MBA, Law), *Teaching Assistant* Fall 2012

- Undergraduate & MBA economics concepts and techniques to manage org. risks

**14.A03 The Economics of Mutual Funds**, *Teaching Assistant* Fall 2009

### **OTHER**

**MAS.A19 Designing Consumer Electronics**, *Teaching Assistant* Fall 2010

## **TEACHING MATERIALS**

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**Pressed Juicery: Managing Growth**, Wharton Case 2015  
with David H. Hsu (*The Wharton School, Dept. of Management*)

**Cotopaxi: Social Enterprise**, Wharton Case (in progress) 2015  
with Laura Huang (*The Wharton School, Dept. of Management*)

## RESEARCH EXPERIENCE

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- The Wharton School, Dept. of Management, *Research Assistant*** Philadelphia, PA  
**Prof. David Hsu, Entrepreneurship & Innovation** Sep '11—Present
- Various projects on intersection of entrepreneurship and innovation, including a study of commercialization strategy in speech recognition (Marx, Hsu 2015)
  - Supervised team of undergraduate researchers working on background research
- University of Michigan Dept. of Economics, *Research Assistant*** Ann Arbor, MI  
**Prof. Jeremy T. Fox, Industrial Organization & Matching Games** Nov '13—Dec '14
- Empirical work on unobserved heterogeneity in venture capital matching games (Fox, Hsu, and Yang 2015)
- INSEAD Dept. of Entrepreneurship and Family Enterprise, *Research Assistant*** Fontainebleau, FR  
**Prof. Vikas A. Aggarwal, Strategy & Entrepreneurship** Sep '11—Jul '13
- Provided data collection, construction, and analytics on *Entrepreneurial Exits and Innovation*; find short-run positive IPO effect on innovation, reversing over a longer time window (Aggarwal and Hsu 2013)
- MIT Department of Economics, *Research Assistant*** Cambridge, MA  
**Prof. Jonathan Gruber, Public Finance & Public Policy** May '09—Jun '10
- Analyzed data and reviewed literature on Medicare Part D, unemployment insurance, TARP executive bonuses, and stimulus bill
  - Researched empirical and anecdotal evidence demonstrating the liquidity of personal income, in support of work on health care reform and the “Cadillac tax”
  - Updated data and wrote for leading public finance textbook, *Public Finance and Public Policy* (2010), 3rd Edition, Worth Publishers
- Prof. David H. Autor, Labor and Real Estate Economics** Jan '11—Mar '11
- Rent control spillovers in a natural experiment (Autor, Palmer, and Pathak 2014)
- Prof. Peter Temin, Economic History & Labor** Sep '08—Dec '08
- Study of early 20<sup>th</sup> century labor relations
- MIT Department of Economics, *Independent Research*** Cambridge, MA  
**State Alcohol Excise Taxes: Effects on Consumption and Traffic Fatalities** Sep '10—Jun '11  
(MIT Undergraduate Economics Journal)
- Advised by Prof. Stephen P. Ryan (University of Texas at Austin)
  - Studied the effect of state-level alcohol excise tax laws on alcohol sales, alcohol consumption, and alcohol-related traffic fatalities, using a fixed effects panel regression on data from the 50 states and D.C. over the time period from 2000-2007
  - Found small but significant negative price elasticity on alcohol sales, as well as effects from taxes and consumption level on the frequency of alcohol fatalities

## WORK EXPERIENCE

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- IDENTIFIED Technologies Corporation, *Founding Director*** Pittsburgh, PA  
May '13—Present
- Advise CEO on strategy, financing, legal (IP), and sales issues
- MassChallenge, Inc., *Business Development*** Boston, MA  
May '11—Aug '11
- Advised CEO and Director on business development strategy, sourcing potential sponsors, designing discussion materials, and building financial projections
  - Observed over 40 pitches, assisting investors, lawyers, and entrepreneurs with judging process
- The Peter J. Solomon Company, *Analyst*** New York, NY  
Jun '10—Aug '10
- Worked with a team of five bankers on a live sell-side deal representing a leading women's fashion retailer; conducted due diligence, developed offering memorandum and board book, and maintained buyer's contacts
  - Prepared pitch books for industries including aerospace, health care, and retail
  - Assisted managing director with technical presentation on valuation techniques
- Office of Governor Deval Patrick, *Staffer*** Boston, MA  
Jun '09—Aug '09
- Prepared executive summaries under tight deadline for Governor's daily briefing
  - Developed and launched new civic engagement strategies with a team of four interns, including a new website and new grassroots outreach methods
  - Advised on young veteran engagement for MA Department of Veteran Services
- Consortium for Energy Efficiency, *Database Analyst*** Boston, MA  
Jan '09
- Examined utility and appliance industry and related trade groups
  - Designed and implemented database to integrate various data streams as part of next generation IT project
- MIT Information Center, *Tour Guide*** Cambridge, MA  
Sep '08—Jun '11
- Led weekly campus tours and answer questions about MIT
- Vivox Inc., *Consumer Strategy*** Framingham, MA  
Jul '08—Aug '08
- Evaluated Voice over IP (VoIP), telecommunications, and gaming industries
  - Planned and led engineering of Facebook application to integrate VoIP application
  - Initiated research on a white paper on latency
- State Rep. Jay R. Kaufman/MA Joint Comm. on Public Service, *Staffer*** Boston, MA  
Jun '07—Dec '07
- Represented and corresponded with constituents in bureaucratic disputes
  - Developed policy position regarding Chapter 40B zoning issues
  - Documented official testimony for committee

## INSTITUTIONAL SERVICE

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- Trustees of the University of Pennsylvania, *Representative*** Sep '13—Present
- Represent constituents to Board with governance and fiduciary duties
  - Advise on academic policy and facilities/campus planning
- Graduate Council of the Faculties, *Representative*** Sep '15—Present
- Advise Penn Vice Provost for Education on university-wide PhD program evaluation and certification of all PhD degrees

- Penn Graduate and Professional Student Assembly, Wharton Representative** Sep '11—Present
- Serve on Research Student Council and Finance Committee
  - Sat on Presidents Award Grant Committee & led G12 Synergy Fund Committee
- Veterinary Innovation Challenge, Senior Advisor** Sep '13—Sep '14
- Advised leadership team on judging and competition structure
- MIT Undergraduate Economics Association, President & former Treasurer** Sep '08—Jun '11
- Represented undergraduate economics majors and students interested in economics, and work with economics faculty and administrators to improve the undergraduate experience; hosted career events and guest speakers, etc.
- MIT Everett Moore Baker House Dormitory, President** Sep '08—Jun '11
- Tackled various policy and infrastructure issues, including risk management and reform of \$40,000 annual budget
- MIT Dormitory Council, Risk Manager & Member** Jul '10—Jun '11
- Represented dormitory to the Council—association of dormitory presidents
  - Contributed to writing of campus-wide risk management policy
- MIT Associate Advising Program, Associate Advisor** Jun '09—Jun '11
- Worked with Professor Nancy Rose to advise freshmen interested in economics and finance on their course selection, extracurricular activities, etc.

## PATENTS

Methods and Apparatus for UAV Localization Using Ultrasound <i>with Richard Y. Zhang, Brian J. Dougherty &amp; Anna W. Yang</i>	Forthcoming	2015
Structure and Manufacturing Process for Unmanned Aerial Vehicle <i>with Bennett L. M. Welker, Richard Y. Zhang &amp; Anna W. Yang</i>	Patent Pending: 62/069,977	2014
Methods and Apparatus for Persistent Deployment of Aerial Vehicles <i>with Richard Y. Zhang</i>	Patent Pending: 14/193,110	2014
Single-Action Three-Dimensional Model Printing Methods	Patent Pending: 14/332,616	2014
Single-Action Three-Dimensional Model Printing Methods	Patent Pending: 14/332,578	2014
Single-Action Three-Dimensional Model Printing Methods	Patent Pending: 14/332,555	2014
Single-Action Three-Dimensional Model Printing Methods	Patent Pending: 14/332,544	2014
Ground Survey and Obstacle Detection System <i>with Richard Y. Zhang &amp; Kelsey D. Duncombe-Smith</i>	Patent Pending: 13/832,540	2013
Single-Action Three-Dimensional Model Printing Methods	Issued: 8,817,332 B2	2013
On-Site Ordering System for Mobile Devices	Patent Pending: 13/762,838	2013
Methods and Apparatus for URL Handling	Patent Pending: 13/524,198	2012
Single-Action Three-Dimensional Model Printing Methods	Issued: 8,579,620 B2	2011

## SKILLS

*Stata* and *R* statistical software and *MATLAB*  
Familiar with *JAVA*, *Python*, *Fortran*, *VBA*, *C++*, *SQL*, *HTML (HTML, XHTML & CSS)*, *PHP*

## PERSONAL INTERESTS

DJing, Golf, Biking, Skiing, Crew, Lacrosse, Football,  
New England Patriots, Real Madrid, Chennai Super Kings