

RSM3091 ECONOMICS OF INNOVATION

University of Toronto Rotman School PhD Seminar | Spring 2021

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Friday 9am-12pm Eastern Time, Online

Zoom: <https://utoronto.zoom.us/j/8818130864> (Passcode: 528425)

First class Jan 8, Final class Apr 9 | No class on Feb 19 and Apr 2

OVERVIEW

This course is intended to prepare PhD students to write novel research on topics related to innovation. Innovation is a multidisciplinary field: there is interesting work being done in economics, management, sociology, law and history, among others. We will cover the most important theoretical and empirical questions, learn fundamental background knowledge from the related social sciences, and discuss the appropriateness of various methodologies for tackling open questions in the field. The only technical prerequisite is knowledge of basic game theory and the mathematics necessary to solve those types of models.

READINGS

Required readings are denoted in bold in the syllabus. These are chosen less for their importance relative to the reading list and more for the methodological discussions we will have using them. All required reading is made up of articles available via the University of Toronto's subscriptions, except that you need to purchase Bruno Latour's "Laboratory Life".

ASSIGNMENTS

Each class, I will begin with a 30 minute lecture and occasional forays into data sources of interest, before we discuss the day's reading in earnest.

You are obligated to do all of the assigned reading. If you are taking this class for credit, a term paper is also required. For each assigned article, I will designate a student to prepare a 5 minute discussion about what you see as the important contribution of the paper, your thoughts on why the paper has become influential, and your insight as to flaws or shortcomings which can be modified in follow-up work. This discussion ought help structure the broader class discussion.

The term paper should essentially contain the germ of a legitimate research paper on an open question in innovation; as you are graduate students, it is not worth your time to work on projects which do not contribute to graduating on time. I therefore assign term papers which might conceivably become part of your dissertation rather than assigning exams. Grading will be based entirely on the term paper and your contribution to a good classroom environment by properly preparing for each class.

SUMMARY OF THE LITERATURE

- 2020 **K. Bryan and H. Williams, Markets for Innovation...**, in **Handbook of IO**
Survey of state of current knowledge and open questions in innovation
- EARLY CLASSICS ON ECONOMICS OF INNOVATION AS A FIELD
- 1926 R. Epstein, Industrial Invention: Heroic or Systematic?, QJE
Early study on whether profit motive matters for invention
- 1942 J. Schumpeter, Capitalism Socialism and Democracy, Chapter 7
Chapter 7 is the Late Schumpeter on his "creative destruction"
- 1945 V. Bush, Science: The Endless Frontier
Postwar government report justifying active innovation policy
- 1962 R. Nelson, The Link Between Science..., in Rate and Direction of Inventive Activity
Classic case study of the mutual feedback between science and invention
- 1962 **K. Arrow, Economic Welfare and the Allocation...**, in **Rate and Direction**
Arrow's brilliant summary of the fundamental sources of inefficiency in innovation
- GROWTH THEORY
- 1957 **R. Solow, Technical Change and the Aggregate Production Function, RESTAT**
The famous Solow decomposition, building on his 1956 model
- 1990 P. Romer, Endogenous Technological Change, JPE
Knowledge affects growth like Romer 1986 but also created as an equilibrium choice
- 1991 G. Grossman and E. Helpman, Quality Ladders..., RESTUD
Expands differentiated products models to allow quality-improving innovation
- 1992 P. Aghion and P. Howitt, A Model of Growth Through Creative Destruction, Ecta
The classic model of Schumpeterian Growth
- 1999 C. Jones, Growth: With or Without Scale Effects, AER
Endogenous growth involves tricky modeling choices to get realistic growth paths
- 1997 S. Kortum, Research, Patenting and Technological Change, Ecta
Why is research output not growing even as we have many more scientists?
- 2014 P. Aghion et al, What Do We Learn From Schumpeterian Growth Theory?, in The
Handbook of Economic Growth
What have we learned from creative destruction models a la Aghion-Howitt?

*There will also be a handout summarizing the major theories of how invention links to economic growth.

THE INDUSTRIAL REVOLUTION

- 1997 **P. Temin, Two Views of the British Industrial Revolution, JEH**
Was the IR broad or simply driven by a few small industries?
- 1999 **J. Mokyr, Editor's Introduction: The New Economic History and the Industrial Revolution**
A lengthy summary of how science and technology drove the IR in Mokyr's View
- 2002 J. Mokyr, The Gifts of Athena (in particular pp 1-77)
Diffusion of useful knowledge, not its creation, was essential in modern growth
- 2009 R. Allen, The Industrial Revolution in Miniature: The Spinning Jenny..., JEH
The IR did not happen in Britain simply because Britain had better inventions
- 1993 M. Kremer, Population Growth and Technological Change..., QJE
Can Romer-style endogenous growth explain the long long long run of history?
- 2000 O. Galor and D. Weil, Population, Technology and Growth..., AER
Famous Unified Growth Model of Malthusian and Post-Malthusian eras
- 1960 A. E. Musson and E. Robinson, Science and Industry in the Late 18th Century, EHR
What did the technological world look like at the dawn of the IR?
- 1994 J. De Vries, The Industrial Revolution and the Industrious Revolution, JEH
Increase in labor supply and market production preceded Industrial Revolution
- 2004 N. Crafts, Steam as a General Purpose Technology..., EJ
Empirics show steam power can only explain tiny portion of TFP growth during IR

THE SECOND INDUSTRIAL REVOLUTION AND EARLY MODERN INVENTION

- 1990 **P. David, The Dynamo and the Computer, AER P&P**
Electricity took long time from invention to impact; similar story for the computer?
- 1987 G. Clark, Why Isn't the Whole World Developed? Lessons from the Cotton..., JEH
Is culture important for the early modern income differences?
- 1990 G. Wright, The Origins of American Industrial Success, 1879-1940, AER
Exploitation of natural resources helps explain the rise of America
- 1993 B. Z. Khan and K. Sokoloff, 'Schemes of Practical Utility'..., JEH
Great inventors in early modern era actively pursued market opportunities
- 2006 N. Lamoreaux et al, Mobilizing Venture Capital., Capitalism and Society
Something looking very much like venture capital existed in the late 1800s
- 2013 **N. Lamoreaux, K. Sokoloff and D. Sutthiphisal, Patent Alchemy..., BHR**
Active sales markets for patents are not a new phenomenon
- 2011 R. Richter and J. Streb, Catching Up and Falling Behind..., JEH
How does "stealing machines" in a country today affect innovation tomorrow?
- 2018 B. Z. Khan, Knowledge, Human Capital and Economic Dev..., Cliometrica
Great inventors in early modern era were generally not trained scientists

COLLECTIVE INVENTION

- 1983 **R. Allen, Collective Invention, JEBO**
In new industries collective sharing of knowledge has long been common
- 2013 A. Nuvolari and J. Sumner, Inventors, Patents and Inventive Activities..., BHR
Invention of Porter beer is a great example of collective invention

GEOGRAPHIC AND TECHNOLOGICAL SPILLOVERS

- 1992 **Z. Griliches, The Search for R&D Spillovers**, *Scan. J. Econ.*
Identifying R&D Spillovers has traditionally been incredibly difficult
- 1986 A. Jaffe, *Technological Opportunity and Spillovers of R&D*, AER
Origin of technological spillover literature using newly-digitized patent data
- 1993 **A. Jaffe et al, Geographic Localization of Knowledge...**, QJE
Backward patent citations provide evidence for spillovers
- 1996 D. Audretsch and Feldman, M, *R&D Spillovers and the Geography...*, AER
Innovation is much more concentrated geographically than production
- 2010 G. Ellison et al, *What Causes Industry Agglomeration?...*, AER
Input-output analysis can help identify why industries agglomerate
- 2010 P. Azoulay, J. Graff Zivin and J. Wang, *Superstar Extinction*, QJE
The premature death of scientific superstars can help measure the effect of local spillovers
- 2013 **N. Bloom et al., Identifying Technology Spillovers...**, Ecta
Technology spillovers dominate socially-inefficient market stealing
- 2014 S. Kantor and A. Whalley, *Knowledge Spillovers...*, RESTAT
University research instrumented using endowment shocks spills over to industry
- WP E. Berkes and R. Gaetani, *The Geography of Unconventional Innovation*
Atypical innovation is concentrated in high-density urban areas

DIFFUSION

- 1957 **Z. Griliches, Hybrid Corn...**, Ecta
Examines the rationality of the lagged diffusion of hybrid corn in a classic study
- 1957 J. Coleman et al, *The Diffusion of an Innovation Among Physicians*, Sociometry
The classic diffusion paper, among doctors in Chicagoland
- 2003 B. Hall, *Innovation and Diffusion*, in Handbook of Innovation
Handbook chapter summarizing economics of diffusion
- 2010 D. Comin and B. Hobijn, *An Exploration of Technology Diffusion*, AER
Why does technology take so long to diffuse across countries?
- 2010 **T. Conley and C. Udry, Learning about a New Technology...**, AER
Social network data to examine how a new pineapple technology spreads in Ghana
- 2018 D. Gross, *Scale versus Scope in the Diffusion of New Technology*, RAND
Products diffuse partially via changes in the scope of tasks they perform
- 1995 E. Rogers, *Diffusion of Innovations*
Legendary pseudotextbook covering diffusion literature from many different fields
- 1995 G. Saloner and A. Shephard, *Adoption of Technologies with Network Effects*, RAND
Empirical investigation of the diffusion of a network good
- 2010 J. Evans, *Industry Induces Academic Science to Know Less about More*, AJS
Industry collaboration causes academics to work less deeply and more broadly
- 2019 **M. Giorcelli, The Long-Term Effects of Management and Technology...**, AER
Technology transfer policies following WW2 cause long-run productivity gains

RECOMBINATION

- 1998 **M. Weitzman, Recombinant Growth, QJE**
Limit to growth is finding new combinations from huge set of existing knowledge
- 2001 L. Fleming, Recombinant Uncertainty in Technological Search Management, MS
Recombinant knowledge across fields is valuable
- 2013 **B. Uzzi et al, Atypical Combinations and Scientific Impact, Science**
Optimally your work should be weird but not too weird
- 2015 A. Galasso and M. Schankerman, Patents and Cumulative Innovation..., QJE
Patents limit subsequent use in complex fields where many users are small
- 2014 S. Kaplan and K. Valiki, The Double Edged Sword of Recombination..., SMJ
Uses topic modeling to show recombinant inventions are not breakthroughs

GENERAL PURPOSE TECHNOLOGIES

- 1979 N. Rosenberg, Technological Interdependence..., T&C
Why is it so hard to find evidence that certain technologies matter for growth?
- 1995 **T. Bresnahan and M. Trajtenberg, General Purpose Technologies..., J. Econom.**
Introduces idea of key "general purpose technologies" in history of innovation
- 2004 N. Rosenberg and M. Trajtenberg, A General Purpose Technology at Work..., JEH
Empirical case of how a GPT leads to growth-inducing reallocation
- 2005 B. Jovanovic and P. Rousseau, General Purpose Technologies, in The Handbook of Economic Growth
How did the economy react to the introduction of electricity and IT?
- 2021 E. Basker and T. Simcoe, Upstream, Downstream: Diffusion and Impacts..., JPE
The diffusion of UPC codes lead to more product variety and growth of retail chains
- 1997 D. Stokes, Pasteur's Quadrant
Science that is both basic and applied is widespread

THE DIRECTION OF INNOVATION

- 1996 **W. Baumol, Entrepreneurship: Productive, Unproductive, and Destructive, JPE**
Innovators can be socially useful or rent-seekers, and have been both historically
- 2002 D. Acemoglu, Directed Technical Change, RESTUD
How do changes in factor prices affect the incentive to innovate?
- 2016 **D. Acemoglu et al, Transition to Clean Technology, JPE**
How can directed technical change theories guide policies to limit climate change?
- 2017 K. Bryan and J. Lemus, The Direction of Innovation, JET
Innovation direction distorted toward quick or short-run technology

WEEK 5, FEB 5 | INTELLECTUAL PROPERTY: THEORY

WHY SHOULD WE USE PATENTS, AND HOW?

- 1972 F. Scherer, Nordhaus' Theory of Optimal Patent Life..., AER
Short article clarifying the basis monopoly vs. incentives tradeoff of patents
- 1979 **G. Loury, Market Structure and Innovation, QJE**
The classic "patent race" model and why firms might innovate too much
- 1980 T. Lee and L. Wilde, Market Structure and Innovation: A Reformulation, QJE
A minor but important caveat to Loury's patent race
- 1982 J. Reinganum, A Dynamic Game of R and D..., Ect
How do patent races change when we allow non-static strategies?
- 1992 N. Gallini, Patent Policy and Costly Imitation, RAND
Too-long patents incentivize imitation, making them de facto less protective
- 1995 J. Green and S. Scotchmer, On the Division of Profit in Sequential Invention, RAND
Basic model of sequential invention
- 2009 **J. Bessen and E. Maskin, Sequential Innovation, Patents, and Imitation, RAND**
Patents can discourage innovation in cumulative industries like software
- 2006 H. Hopenhayn, H. Llobet and M. Mitchell, Rewarding Sequential Innovators..., JPE
Forcing innovators to set a buyout price optimally rewards sequential innovators

PATENTS AS A SCREENING MECHANISM

- 2012 G. Weyl and J. Tirole, Market Power Screens Willingness-to-Pay, QJE
Benefit of patents versus prizes depends on slope of demand curve
- 1998 **M. Kremer, Patent Buyouts: A Mechanism for Encouraging Innovation, QJE**
Governments should buy patents to reduce deadweight loss, use auction to do it
- 2005 **M. Lemley and C. Shapiro, Probabilistic Patents, JEP**
Patents are not that strong in practice

SECRECY AND DISCLOSURE

- 2011 C. Ponce and E. Henry, Waiting to Imitate: On the Dynamic Pricing..., JPE
Inventors earn rents by threatening to give away their tech to rivals if no one pays
- 2008 M. Lemley, The Surprising Virtues of Treating Trade Secrets as IP Rights, Stan. LR
Trade Secrets actually are a tool for disclosure if policy is optimal
- 1994 J. Anton and D. Yao, Expropriation and Inventions: Appropriable Rents..., AER
Inventors without patents can earn rents by threatening to make invention public
- 2012 **L. Ouellette, Do Patents Disclose Useful Information?, Harv. Law & Tech Rev**
Does the fact that inventors have to disclose methods matter?

WEEK 6, FEB 12 | INTELLECTUAL PROPERTY: EMPIRICS

DO PATENTS AND PRIZES LEAD TO MORE INVENTION?

- 1950 **F. Machlup and E. Penrose, The Patent Controversy in the 19th Century**, JEH
Arguments about whether we need patents are very old
- 2012 L. Brunt et al, Inducement Prizes and Innovation, JIE
Examines a series of royal society prizes for innovation in the 1800s
- 2013 **H. Williams, Intellectual Property Rights...Human Genome**, JPE
Formal IP causes innovations to be used less frequently by downstream users
- 2019 B. Sampat and H. Williams, How Do Patents Affect Follow-on Innovation?..., AER
Formal IP less harmful if easy to license and IP holders have incentive to do so

PATENT CITATIONS AND THEIR MEANING

- 1990 A. Trajtenberg, A Penny for your Quotes..., RAND
Patent citations are a useful proxy for the (otherwise highly skew) value of patents
- 2018 A. Arora et al, Reversed Citations and the Localization of Knowledge..., JEG
Though it's not totally clear what these citations are measuring
- 2020 **K. Bryan et al, In-Text Patent Citations: A User's Guide**, RP
Text analysis can find lots of useful info in patents, such as in-text science references

PATENT RACING AND STRATEGIC INTERACTION

- 1997 J. Lerner, An Empirical Exploration of a Technology Race, RAND
Reinganum-style patent races do seem to occur in the disk drive industry
- 2011 **R. Goettler and B. Gordon, Did AMD Spur Intel to Innovate More?**, JPE
Structural examination of how competition spurs innovation along a quality ladder
- WP J. Furman et al, Disclosure and Subsequent Innovation...
Patent info in libraries suggests that disclosure may matter after all
- WP V. Bhattacharya, An Empirical Model of R&D Procurement Contests...
How should a government procure innovation: sometimes limit competitors

HOW DO FIRMS USE PATENTS?

- 2000 W. Cohen et al, Protecting Their Intellectual Assets..., NBER Working Paper
Results of Carnegie Mellon survey of R&D managers: patents not that important!
- 2001 B. Hall and R. Ziedonis, The Patent Paradox Revisited..., RAND
Why do firms in some industries say patents don't matter but then use them a ton?
- 2005 **P. Moser, How Do Patents Laws Influence Imitation?...**, AER
Inventions from World's Fairs in the pre-Paris Convention era identify role of patents
- 2012 P. Moser, Innovation Without Patents: Evidence from World's Fairs, JLAWE
Almost all important innovations in 1800s Britain were not patented
- 2010 C. Serrano, The Dynamics of the Transfer and Renewal of Patents, RAND
Empirically, when are patents transferred and why is this hard to observe?
- 2018 D. Hegde and H. Luo, Patent Publication and the Market for Ideas
Making patent applications public smooths licensing frictions

BIG MARKETS AND BIG FIRMS DO R&D: CLASSICS

- 2004 **D. Acemoglu and J. Linn, Market Size and Competition...**, QJE
Exogenous increase in market size for medical treatment increases innovation
- 2015 M. Kremer and C. Snyder, Preventives versus Treatments, QJE
Shape of ex-ante and ex-post demand curves means vaccines are underinvented
- 1990 W. Cohen and D. Levinthal, Absorptive Capacity: A New Perspective..., ASQ
Scientists within the firm help you find opportunities outside the firm
- 1986 D. Teece, Profiting from Technological Innovation, RP
You need "complementary assets" if you want to make money from inventions
- 1996 **W. Cohen and S. Klepper, A Reprise of Size & R&D**, EJ
Larger firms can spread fixed costs of R&D out over more units, hence do more
- DOES INNOVATION REQUIRE OLIGOPOLIES?
- 2005 P. Aghion et al, Competition and Innovation: An Inverted U Relationship, QJE
Moderate levels of competition maximize innovation, theoretically and empirically
- WP H. Kang, How Does Competition Affect Innovation?...
- 2006 **R. Gilbert, Looking for Mr. Schumpeter...**, IPE
The Arrow v Schumpeter debate on competition may not be a contrast after all
- SHOULD WE LIMIT STARTUP ACQUISITIONS?
- 2021 C. Cunningham et al, Killer Acquisitions, JPE
Large firms in pharma sometimes acquire competing drugs just to kill competition
- 2020 **K. Bryan and E. Hovenkamp, Antitrust Limits on Startup Acquisitions**, RIO
Laissez faire acquisition policy distorts inventor effort and direction
- WP S. Kamepalli et al, Kill Zone
With network effects, no one uses small firm networks if they expect tech to be killed
- 2019 T. Wollmann, Stealth Consolidation: Evidence from an Amendment..., AER: I
Acquisitions of small firms largely unconstrained and in aggregate important

DOES TAX POLICY INCREASE INNOVATION?

- 2017 E. Moretti and D. Wilson, The Effect of State Taxes on the Geographical..., AER
Higher state taxes drive inventors away
- 2016 U. Akcigit et al, Taxation and the International Mobility of Inventors, AER
And low taxes especially useful for attracting superstar foreign inventors
- WP A. Dechezlepretre et al, Do Tax Incentives for Research Increase...
Elasticity of reported R&D and outputs of small firms very sensitive to tax incentives
- 2009 D. Wilson, Beggar Thy Neighbor..., RESTAT
Some of the tax response is just stealing inventors or research away from other states
- WP Z. Chen et al, Notching R&D Investment with Corporate Income Tax Cuts in China
And some of it is just relabeling spending to get the tax credit
- 2017 S. Howell, Financing Innovation: Evidence from R&D Grants, AER
Public R&D support is not just crowd-out: it funds useful prototyping
- WP J. Pless, Are Complementary Policies Substitutes?...
But this R&D support does appear to crowd out large firm spending

WHO GETS THE RETURNS FROM INNOVATION?

- 2019 P. Kline et al, Who Profits from Patents? Rent-Sharing at Innovative Firms, QJE
Economic rents from a valuable patent largely captured by senior existing employees
- WP B. Jones and L. Summers, A Calculation of the Social Returns to Innovation
Brave attempt to measure full social return of invention; most not captured by firm
- 2019 X. Jaravel, The Unequal Gains from Product Innovations..., QJE
Scanner data: inequality leads to more products for the rich leads to more inequality

DO SOCIAL INEQUITIES HARM INNOVATION?

- 2019 A. Bell et al, Who Becomes an Inventor in America?..., QJE
Rich kids in cities with many inventors will invent, others left behind
- WP P. Aghion et al, The Social Origins and IQ of Inventors
But IQ especially important as mediator of parental income for inventors
- 2019 C. T. Hsieh et al, The Allocation of Talent and U.S. Economic Growth, Ecta
Wasting talent in high-productivity fields is enormously costly for the economy
- WP C. Hebert, Mind the Gap: Gender Stereotypes and Entrepreneur Financing
French data: less funds for male (female)-led firms in female (male)-typed spaces
- 2019 J. Guzman and A. Kapcperczyk, Gender Gap in Entrepreneurship, RP
But most diff in VC due to very small population of growth-focused female firms

BASIC RESEARCH AS AN INPUT

- 1959 **R. Nelson, The Simple Economics of Basic Scientific Research**
Classic article on why markets underprovide basic research
- 2018 **A. Arora et al, The Decline of Science in Corporate R&D**
Corporate R&D still relies on science, but big firms do less of it now
- 2021 J. Furman and F. Teodoridis, Automation, Research Technology..., OS
Outside technology like motion sensors lead to widespread innovation
- 2021 A. Nagaraj, The Private Impact of Public Data..., MS
Public data in the form of maps permits private-sector exploration
- 2021 K. Bryan and Y. Ozcan, The Impact of Open Access Mandates..., RESTAT
Gated academic research harms industrial invention, not academic followup
- 2016 F. Murray et al, Of Mice and Academics..., AEJ: Policy
Cheaper access to “oncomice” increases researcher entry and research diversity

The Sociology of Science

- 1979 **B. Latour and P. Woolgar, Laboratory Life (required pp 105-183)**
Science involves choices by scientists about how evidence is interpreted
- 1996 S. Schaeffer, Making up Discovery, in Dimensions of Creativity
Credit for discoveries, or idea of how the discovery came about, are made up ex post
- 2010 U. Shwed and P. Bearman, The Temporal Structure of Scientific Consensus..., ASR
Can we use automated methods to figure out when scientific consensus exists?
- 2019 P. Azoulay et al, Does Science Advance One Funeral at a Time?, AER
Scientists avoid areas where famous old researchers dominate the field
- 2020 K. Myers, The Elasticity of Science, AEJ: Applied
It is very hard to get scientists to work on what you want them to do
- 2008 P. Aghion et al, Academic Freedom, Private-Sector Focus..., RAND
But you still want to give scientists freedom because they will work for less money
- 1957 **R. K. Merton, Priorities in Scientific Discovery... AJS**
Priority disputes are widespread
- 2020 M. Bikard, Idea Twins: Simultaneous Discoveries as a Research Tool, SMJ
And it is possible to measure priority races
- WP R. Hill and C. Stein, Scooped! Estimating Rewards for Priority in Science
But losing priority races isn't that bad
- 2001 A. Hargadon and Y. Douglas, When Innovations Meet Institutions..., ASQ
Design helps the acceptance of radical innovations

THE BURDEN OF KNOWLEDGE

- 2009 B. Jones, The Burden of Knowledge and the Death..., RESTUD
Team size and age of scientists are both growing over time
- 2016 A. Agrawal et al, Understanding the Changing Structure..., AEJ: Applied
Shock of Soviet mathematicians led to increase in team size where frontier expanded
- 2020 **N. Bloom et al, Are Ideas Getting Harder to Find?, AER**
Extensive evidence that breakthroughs are getting more challenging everywhere

DIVISION OF INNOVATIVE LABOR AND TECHNOLOGY MARKETS

- 1951 **G. Stigler, The Division of Labor is Limited by the Extent of the Market**, JPE
Smithian (following Young 1928) rather than Coasean theory of firm scope
- 2010 **A. Arora and A. Gambardella, The Market for Technology**, in the **Handbook of the Economics of Innovation**
Handbook chapter covering modern literature of sale and purchase of technology
- 1994 E. von Hippel, **Sticky Information and the Locus of Problem Solving...**, MS
Users innovate because their knowledge of what is needed is hard to transfer
- 1986 M. Katz and C. Shapiro, **How to License Intangible Property**, QJE
What goes wrong when firms try to sell to product market competitors?

NON-COMPETE AGREEMENTS

- 2009 **M. Marx et al, Mobility, Skills, and the Michigan Non-Compete Experiment**, MS
Noncompete agreements limit mobility of technically skilled employees
- 2011 O. Sorenson and S. Samila, **Non-compete Covenants?...**, MS
Noncompete agreements are bad for entrepreneurship
- 2011 J. Singh, and A. Agrawal, **Recruiting for Ideas...**, MS
Not much evidence that you buy another firm's knowledge when you buy a researcher

MOTIVATING INVENTORS WITHIN THE FIRM

- 1994 P. Bolton and M. Dewatripont, **The Firm as a Communication Network**, QJE
How do you organize a firm to get the right information to the right people?
- 2011 **G. Manso, Motivating Innovation**, Journal of Finance
Optimal labor schemes for scientists are lenient about failure
- 1994 J. Lerner and U. Malmendier, **Contractibility and the Design of Research...**, QJE
How to get the research firm you contract with to actually do the research you want?
- 1994 **P. Aghion and J. Tirole, The Management of Innovation**, QJE
Incomplete contracts as an explanation for why R&D is sometimes internal
- 1989 B. Holmstrom, **Agency Costs and Innovation**, JEBO
Exploration of how mech. design can explain strange-looking R&D contracts
- 2008 P. Aghion, M. Dewatripont and J. Stein, **Academic Freedom...**, RAND
Give academics autonomy in basic research because it's cheaper
- 1990 N. Rosenberg, **Why Do Firms Do Basic Research (with their own money?)**, RP
By accident, because of agency problems, because they are big or like risk
- 1994 B. Holmstrom and P. Milgrom, **The Firm as an Incentive System**, AER
Performance incentives need bundle with additional organizational features
- 2017 M. Halac et al, **Contracts for Experimentation**, JPE
How to run an optimal prize for inventive effort

PATH DEPENDENCE

- 1985 **P. David, Clio and the Economics of QWERTY, AER P&P**
Path dependence can explain QWERTY, though see Liebowitz and Margolis
- 1990 R. Cowan, Nuclear Power Reactors: A Study in Technological Lock-in, JEH
Path dependence based on a minor factor led to dominance of light water reactors
- 1994 **S. Liebowitz and S. Margolis, Network Externality: An Uncommon Tragedy, JEP**
Socially inefficient path dependence is not what happened to the QWERTY keyboard
- 2006 S. Page, Path Dependence, Quarterly Journal of Political Science
Great typology of different ways that "path dependence" can be thought of formally

THE PRODUCT LIFE CYCLE

- 1996 **S. Klepper, Entry, Exit, Growth, & Innovation over the Product Life Cycle, AER**
Some industries follow very clear "product life cycle" for predictable reasons
- 2002 R. Nelson and S. Winter, Evolutionary Theorizing in Economics
Summary of Nelson and Winter's selection-based model of industry dynamics
- WP S. Alder et al, Competitive Pressure and the Decline of the Rust Belt...
Rust belt declines because of labor-management relations limit tech adoption

DEMAND- AND SUPPLY-SIDE DISRUPTION

- 1993 C. Christensen, The Rigid Disk Drive Industry: A History..., BHR
Article-length historical investigation of disruption in the disk drive industry
- WP T. Nicholas, How History Shaped the Innovator's Dilemma
The accuracies and inaccuracies in the famous Christensen disk drive example
- 2002 **J. Gans et al, When Does Start-Up Innovation Spur the Gale..., RAND**
Why don't incumbents with complementary assets just buy promising startups?
- 2014 M. Marx, J. Gans and D. Hsu, Dynamic Commercialization Strategies, MS
Rather than shift technologies or sit tight, firms can wait to see what tech does
- 1990 R. Henderson and K. Clark, Architectural Innovation: The Reconfiguration..., ASQ
The classic introduction of architectural disruption
- 2014 **S. Helper and R. Henderson, Management Practices, Relational Contracts..., JEP**
Relational contracts means shifting technology can be difficult for incumbents

WHAT ENTREPRENEURS DO

- 2014 **R. Kerr et al, Entrepreneurship as Experimentation, JEP**
Entrepreneurship is fundamentally about option value from experimentation
- 1989 D. Evans and B. Jovanovic, An Estimated Model of Entrepreneurial Choice..., JPE
The classic structural model of entrepreneurship
- 2001 B. Hamilton, Does Entrepreneurship Pay: An Empirical Analysis..., JPE
Entrepreneurs make much less money even without adjusting for the additional risk
- 2014 **T. Astebro et al, Seeking the Roots of Entrepreneurship..., JEP**
Risk aversion and overconfidence do not drive entrepreneurship
- 2010 W. Kerr and W. Lincoln, The Supply Side of Innovation...
Higher skilled immigration leads to more innovation, with no evidence of crowd out
- WP B. Glennon, How Do Restrictions on High-Skilled Immigration Affect Offshoring?
Restricting skilled immigration leads firms to hire those people abroad instead
- 2017 S. Bernstein et al, Attracting Early-stage Investors..., JF
RCT that angel investors respond to information about founding teams

SPINOUTS

- 2007 T. Hellmann, When Do Employees Become Entrepreneurs, MS
Why employees create ideas, and why they spinout
- 1995 J. Anton and D. Yao, Startups, Spinoffs and Internal Projects, JLEO
What keeps researchers at a firm who have a good idea from leaving?
- 2005 **P. Gompers et al, Entrepreneurial Spawning, JF**
Entrepreneurs learn from well-suited "spawning" firms

WHY ENTREPRENEURS MATTER

- 2013 J. Haltiwanger et al, Who Creates Jobs? Small vs. Large vs. Young, RESTAT
Young firms, not small firms, are engines of job growth
- 2020 **J. Guzman and S. Stern, The State of American Entrepreneurship..., AEJ: Policy**
Business registry panel data on quality-adjusted entrepreneurship
- 2021 U. Akcigit and S. Ates, Ten Facts of Declining Business Dynamism..., AEJ: Macro
Business dynamism is falling, in part because laggard tech gap is growing

*We will reserve time to present your term papers as well