Advanced Seminar in Economics & Policy (WIV05001): Economics of Innovation

Winter term 2021/22, Thursdays, 9:45-11:15

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This course provides an introduction to the Economics of Innovation. The lecture will start with four lectures on the history of innovation, creative destruction, the incentives for innovation, recombinant innovation, general-purpose technologies and models of experimentation. Students will then work in groups of two or three on one of the following topical areas: peer effects, team production, science to technology, corporate science, patents/theory, patents/empirical studies, competition and innovation, entrepreneurial strategy, cumulative innovation, open innovation, economics of digitization and artificial intelligence. The group work aims at 1) understanding the topic in depth and 2) presenting the most important insights from their topic to classmates. Finally, they will submit a written seminar paper on a subject in their topical area.

The final grade will be based on the written seminar paper, the group presentation and on a short problem set, which is assigned after the initial four lectures.

Requirements:

- Group presentation incl. slides (45% of grade)
- Problem set (assigned after the first four lectures, due on **25.11.2021**), may be completed in groups or alone (10% of grade)
- Seminar paper, may be completed in groups or alone (45% of grade)

Administration:

- All lectures, group presentations and preparation sessions take place via Zoom
- All materials, incl. my lecture slides, and the links to the Zoom sessions will be provided via Moodle
- If you have questions or suggestions, please send me an email

Additional information:

- **Allocation of topical areas for group presentation and seminar paper:**
    - Opens on **30.10. 10 am** and closes on **31.10. 10 am**. Each student has one vote. The allocation operates on a “first come, first serve” basis. However, mutually agreed upon swaps of topics between students are still allowed after this point (as long as I am notified).

- **Group presentations:**
  - I have posted multiple articles per topic (see below). Read the abstracts and decide which ones suit your interests and skills. The group presentation should be based on no fewer than two different articles.
  - The primary goal of the group presentation is to convey (some of) the most important lessons from the literature on a particular topic to the rest of the class in a didactical manner.
  - Each group should schedule 2 or 3 preparation sessions with me, where we will discuss articles, your slides etc.
  - You may suggest other (alternative) articles or sources for your presentation during your preparation sessions.
  - Group presentations are scheduled to take 45 minutes, including discussion. You should aim to speak for around 30 minutes.
  - At least 2 group members should present.

- **Seminar Paper:**
  - Approx. 2500 words per group member
  - Structure: Table of contents, List of tables/figures, Introduction, Main Part, Conclusion/Discussion, Bibliography, Declaration of authorship
  - Coverpage: Title of the seminar, semester, topic title, name and matriculation numbers of the authors, submission data, supervisor, word count
  - Due **10.2.2022**
  - More instructions to follow

Schedule at a glance:

- 21.10. Class 1: Lecture Welcome, Organization, Introduction
- 28.10. Class 2: Lecture Introduction (continued)
- 30.10. Assignment of topics for group presentations via Moodle
- 4.11. Class 3: Lecture Engines of Growth
- 11.11 Class 4: Lecture Exploration/Exploitation
- 18.11. Class 5: Q&A for problem set
- 25.11. Problem set due
- 9.12. Class 6: Group presentations Teams
- 16.12. Class 7: Group presentations Science
- 23.12. Class 8: Group presentations Patents
- 13.1. Class 9: Group presentations Firms
- 20.1. Class 10: Group presentations Cumulative and Open Innovation
- 27.1. Class 11: Group presentations Digital Technologies
- 10.2. Seminar paper due

List of all articles and books

1. Introduction (21.10. und 28.10.)

a. The history of innovation

Mokyr, J. (2002): The Gifts of Athena. *Princeton University Press, New Jersey*

Ahmadpour M. & Jones, B.F. (2017): The dual frontier: Patented inventions and prior scientific advance. *Science, 357, p. 583-587*

Jones, B.F. (2009): The Burden of Knowledge and the "Death of the Renaissance Man": Is Innovation Getting Harder? *Review of Economic Studies, 76, p. 283-317*

b. Innovation and the market economy

Schumpeter, J.A. (1942): Capitalism, socialism and democracy. *Harper, New York*

Arrow, K. (1962): Economic Welfare and the Allocation of Resources for Invention. *In: The Rate and Direction of Inventive Activity: Economic and Social Factors. Princeton University Press, New Jersey*

Gilbert, R. & Newberry, D.M. (1982): Preemptive Patenting and the Persistence of Monopoly. *American Economic Review, 72, p. 514-526*

2. Engines of Growth (4.11.)

a. Recombination

Uzzi, B., Mukherjee, S., Stringer, M. & Jones B.F. (2013): Atypical Combinations and Scientific Impact. *Science, 432, p. 468-471*

b. General Purpose Technologies

Jovanovic, B. & Rousseau, P.L. (2005): General Purpose Technologies. *In: Handbook of Economic Growth, Elsevier, p. 1181-1224*

Hall, B.H. & Trajtenberg, M. (2004): Uncovering GPTS with Patent Data. *NBER Working Paper 10901*

Moser, P. & Nicholas, T. (2004): Was Electricity a General Purpose Technology? Evidence from Historical Patent Citations. *American Economic Review, 94, p. 388-394*

Bresnahan, T.F. & Trajtenberg, M. (1995): General purpose technologies: `Engines of Growth'? *Journal of Econometrics, 65, p. 83-108*

Cowan, R. (1990): Nuclear Power Reactors: A Study in Technological Lock-in. *The Journal of Economic History, 50, p. 541-567.*

3. Exploration/Exploitation (11.11.)

a. Models of Experimentation

Weitzman, M.L. (1979): Optimal search for the best alternative. *Econometrica, 47. P. 641-654*

Gittins, J.C. (1979): Bandit Processes and Dynamic Allocation Indices. *Journal of the Royal Statistical Society. Series B (Methodological), 41, p. 148-177*

b. Motivating Exploration in Organizations

March, J.G. (1991): Exploration and Exploitation in Organizational Learning. *Organization Science, 2, p. 71-87*

Manso, G. (2011): Motivating Innovation. *The Journal of Finance, 66, p. 1823-1860*

Azoulay, P., Graff Zivin, J.S. & Manso, G. (2011): Incentives and creativity: evidence from the academic life sciences. *RAND Journal of Economics, 42, p. 527-554*

Tian, X. & Wang, T.Y. (2014): Tolerance for Failure and Corporate Innovation. *The Review of Financial Studies, 27, p. 211-255*

4. Teams (9.12.)

a. Peer Effects

Azoulay, P., Graff Zivin, J.S. & Wang, J.(2010): Superstar extinction. *Quarterly Journal of Economics, 125(2), p. 549-589*

Catalini, C. (2021): Microgeography and the Direction of Inventive Activity. *Management Science,64(9), p. 4348-4364*

Jaravel, X., Petkova, N. & Bell, A. (2018): Team-specific capital and innovation. *American Economic Review, 108(5), p. 1034-1077*

Mohnen, M. (2021): Stars and Brokers: Knowledge Spillovers Among Medical Scientists. *Management Science (forthcoming)*

Waldinger, F. (2012): Peer Effects in Science: Evidence from the Dismissal of Scientists in Nazi Germany. *Review of Economic Studies, 79, p. 838-861*

Oettl, A. (2012): Reconceptualizing Stars: Scientist Helpfulness and Peer Performance. *Management Science, 58(6), p. 1122-1140*

b. Team Production (and Formation)

Wuchty, S., Jones, B.F. & Uzzi, B. (2007): The Increasing Dominance of Teams in Production of Knowledge. *Science, 316(5827), p. 1036-1039*

Wu, L., Wang, D. & Evans, J.A. (2019): Large Teams develop and small teams disrupt science and technology. *Nature, 566, p. 378-383*

Catalini, C., Fons-Rosen, C. & Gaule, P. (2019): How do Travel Costs Shape Collaboration? *Working paper*

Ahmadpour, M. & Jones, B.F. (2019): Decoding team and individual impact in science and invention. *PNAS, 116(28), p. 13885-13890*

Jin, G.Z, Jones, B.F., Lu, S.F. & Uzzi, B. (2019): The Reverse Matthew Effect: Consequences of Retraction in Scientific Teams. *The Review of Economics and Statistics, 101(3), p. 492-506*

Boudreau, K.J., Brady, T., Ganguli, I., Gaule, P., Guinan, E., Hollenberg, A. & Lakhani, K.R. (2017): A Field Experiment on Search Costs and the Formation of Scientific Collaborations. *The Review of Economics and Statistics, 99(4), 565-576*

Battiston, D., Blanes i Vidal, J. & Kirchmaier, T. (2017): Is Distance Dead? Face-to-Face Communication and Productivity in Teams. *CEPR Discussion Paper 1473*

5. Science (16.12.)

a. Science to Technology

Poege, F., Harhoff, D., Gaessler, F., Baruffaldi, S. (2019): Science quality and the value of inventions. *Science Advances, 5(7323)*

Watzinger, M., Krieger, J.L. & Schnitzer, M. (2021): Standing on the Shoulders of Science. *Working Paper*

Bryan, K.A. & Ozcan, Y. (2021): The Impact of Open Access Mandates on Invention. *The Review of Economics and Statistics (forthcoming)*

Kantor, S. & Whalley, A. (2014): Knowledge Spillovers from Research Universities: Evidence form Endowment Value Shocks. *The Review of Economics and Statistics, 96(1), p. 171-188*

Czarnitzki, D., Doherr, T., Hussinger, K., Schliessler, P. & Toole, A. (2016): Knowledge Creates Markets: The influence of entrepreneurial support and patent rights on academic entrepreneurship. *European Economic Review, 86, p. 131-146*

Hvide, H.K. & Jones, B.F. (2018): University Innovation and the Professor's Privilege*. American Economic Review, 108(7), 1860-1898*

Astebro, T., Braguinsky, S., Baunerhjelm, P. & Brostroem, A. (2021): Academic Entrepreneurship: Bayh-Dole versus the `Professor's Privilege'. *Working paper*

b. Corporate Science (in the US)

Cohen, W.M., & Levinthal, D.A. (1989): Innovation and Learning: The Two Faces of R&D. *The Economic Journal, 99, p. 569-596*

Cockburn, I. M. & Henderson, R. (1998): Absorptive Capacity, Coauthoring Behavior, and the Organization of Research in Drug Discovery. *The Journal of Industrial Economics, 46(2), p. 157-182*

Arora, A., Belenzon, S. & Sheer, L. (2021): Knowledge spillovers and corporate investment in scientific research. *American Economic Review, 111(3), p. 871-898*

Arora, A., Belenzon, S. & Patacconi, A. (2017): The decline of science in corporate R&D. *Strategic Management Journal, 39, p. 3-32*

Arora, A., Belenzon, S., Patacconi, A. & Suh, J. (2020): The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth. *In: Innovation Policy and the Economy, Vol. 20*

Stern, S. (2004): Do Scientists Pay to Be Scientists? *Management Science, 50(6), p. 835-853*

6. Patents (23.12.)

a. Theory

Gallini, N. & Scotchmer, S. (2002): Intellectual Property: When is it the best Incentive System*? In: Innovation Policy and the Economy, Vol. 2, p. 51-77*

Wright, B.D. (1983): The Economics of Invention Incentives: Patents, Prizes, and Research Contracts. *American Economic Review, 73(4), p. 691-707*

Kremer, M. (1998): Patent Buyouts: A Mechanism for Encouraging Innovation. *The Quarterly Journal of Economics, 113(4), 1137-1167*

Weyl, E.G. & Tirole, J. (2012): Market Power Screens Willingness-To-Pay. *The Quarterly Journal of Economics, 127(4), p. 1971-2003*

b. Empirical Studies

Moscona, J. (2021): Flowers of Invention: Patent Protection and Productivity Growth in US Agriculture. *Working paper*

Williams, H. (2017): How Do Patents Affect Research Investments? *Annual Review of Economics, 9, p. 441-469*

Budish, E., Roin, B. & Williams, H. (2015): Do Firms Underinvest in Long-Term Research? Evidence from Cancer Clinical Trials. *American Economic Reviews, 105(7), p. 2044-2085*

Lerner, J. (2009): The empirical impact of intellectual property rights on innovation: puzzles and clues. *American Economic Review: Paper & Proceedings, 99(2), 434-348*

Moser, P. (2005): How Do Patent Laws Influence Innovation? Evidence from Nineteenth-Century World's Fairs. *American Economic Review, 95(4), p. 1214-1236*

Cohen, W.M., Nelson, R.R & Walsh, J.P. (2000): Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not). *NBER Working paper*

7. Firms (13.1.)

a. Competition

Loury, G.C. (1979): Market Structure and Innovation. *The Quarterly Journal of Economics, 93(3), p. 395-410*

Reinganum, J.F. (1982): A Dynamic Game of R&D: Patent Protection and Competitive Behavior. *Econometrica, 50(3), p. 671-688*

Lerner, J. (1997): An Empirical Exploration of a Technology Race. *RAND Journal of Economics, 28(2), 228-247*

Aghion, P., Bloom, N., Blundell, R., Griffith, R. & Howitt, P. (2005): Competition and Innovation: An Inverted-U Relationship. *The Quarterly Journal of Economics, 120(2), p. 701-728*

Cunningham, C., Ederer, F. & Ma, S. (2021): Killer Acquisitions. *Journal of Political Economy, 129(3), p. 649-702*

Henderson, R. (1993): Underinvestment and Incompetence as responses to radical innovation: evidence from the photolithographic alignment equipment industry. *RAND Journal of Economics, 24(2), p. 248-270*

b. Entrepreneurial Strategy

Teece, D. (1986): Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy, 15, p. 285-305*

Gans, J.S. Hsu, D.H. & Stern, S. (2002): When Does Start-up Innovation Spur the Gale of Creative Destruction. *RAND Journal of Economics, 33(4), p. 571-586*

Marx, M. Gans, J.S. & Hsu, D.H. (2014): Dynamic Commercialization Strategies for Disruptive Technologies: Evidence from the Speech Recognition Industry. *Management Science, 60(12), p. 3103-3123*

Gans, J.S. & Stern, S. (2003): The product market and the market for "ideas": commercialization strategies for technology entrepreneurs. *Research Policy, 32, p. 333-350*

Anton, J.J. & Yao, D.A. (1994): Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights. *American Economic Review, 84(1), p. 190-209*

Arora, A., Fosfuri, A. & Gambardella, A. (2001): Markets for Technology and their Implications for Corporate Strategy. *Industrial and Corporate Change, 102(2), p. 419-451*

8. Cumulative and Open Innovation (20.1.)

a. Cumulative Innovation and Spillovers

Galasso, A. & Schankerman, M. (2015): Patents and Cumulative Innovation: Causal Evidence from the Courts.*The Quarterly Journal of Economics, 130(1), p.317-369*

Sampat, B. & Wiliams, H. (2019): How do Patents Affect Follow-On Innovation? Evidence from the Human Genome. *American Economic Review, 109(1), p. 203-236*

Scotchmer, S. (1991): Standing on the Shoulders of Giants: Cumulative Research and the Patent Law. *Journal of Economic Perspectives, 5(1), p. 29-41*

Hopenhayn, H., Llobet, G. & Mitchell, M. (2006): Rewarding Sequential Innovators: Prizes, Patents, and Buyouts. *Journal of Political Economy, 114(6), p. 1041-1068*

Furman, J.L., Nagler, M. & Watzinger, M. (2021): Disclosure and Subsequent Innovation: Evidence from the Patent Depository Library Program. *American Economic Journal: Applied Economics (forthcoming)*

Furman, J.L. & Stern, S. (2011): Climbing atop the Shoulders of Giants: The Impact of Institutions on Cumulative Research. *American Economic Review, 101(5), p. 1933-1963*

Jaffe, A., Trajtenberg, M. & Henderson, R. (1993): Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations. *The Quarterly Journal of Economics, 108(3), p. 577-598*

b. Open Innovation and the Crowd

Von Hippel, E. (2010): Open User Innovation. *Handbook of Economics of Innovation, Elsevier, p. 411-427*

Lerner, J. & Tirole, J. (2002): Some Simple Economics of Open Source. *The Journal of Industrial Economics, 50(2), p. 197-234*

O'Mahony, S. (2003): Guarding the commons: how community managed software projects protect their work. *Research Policy, 32, p. 1179-1198*

Xu, L., Nian, T. & Cabral, L. (2020): What Makes Geeks Tick? A Study of Stack Overflow Careers. *Management Science, 66(2), 587-604*

Franzoni, C. & Sauermann, H. (2014): Crowd science. The organization of scientific research in open collaborative projects. *Research Policy, 43, p. 1-20*

Sauermann, H. & Cohen, W.M. (2010): What Makes Them Tick? Employee Motives and Firm Innovation. *Management Science, 56(12), p. 2134-2153*

Chandler, D. & Kapelner, A. (2013): Breaking monotony with meaning: Motivation in crowdsourcing markets. *Journal of Economic Behavior & Organization, 90, p. 123-133*

Piezunka, H. & Dahlander, L. (2019): Idea rejected, tie formed: Organizations' feedback on crowdsourced ideas. *Academy of Management Journal, 62(2), p. 503-530*

9. Digital Technologies (27.1.)

a. Economics of Digitization

Rosen, S. (1981): The Economics of Superstars. *American Economic Review, 71(5), p. 845-858*

Tucker, C. & Goldfarb, A. (2019): Digital Economics. *Journal of Economic Literature, 57(1), p. 3-43*

Goldmanis, M., Hortacsu, A., Syverson, C. & Emre, O. (2009): E-Commerce and the market structure of retail industries. *The Economic Journal, 120, p. 651-682*

Baker, G.P. & Hubbard, T.N. (2004): Contractibility and Asset Ownership: On-Board Computers and Governance in U.S. Trucking. *The Quarterly Journal of Economics, 119(4), p. 1443-1479*

Fleder, D. & Hosanagar, K. (2009): Blockbuster Culture's Next Rise or Fall: The Impact of Recommender Systems on Sales Diversity. *Management Science, 55(5), p. 697-712*

Gentzkow, M. & Shapiro, J.M. (2011): Ideological Segregation Online and Offline. *The Quarterly Journal of Economics, 126, p. 1799-1839*

Bar-Isaac, H., Caruana, G. & Cunat, V. (2012): Search, Design and Market Structure. *American Economic Review, 102(2), p. 1140-1160*

b. Artificial Intelligence

The Economics of Artificial Intelligence: An Agenda (ed. Agrawal, A., Gans, J. & Goldfarb, A.). *University of Chicago Press, 2019*

Esteva, A., Kuprel, B., Novoa, R.A, Ko, J., Swetter, S.M., Blau, H.M. & Thrun, S. (2017): Dermatologist-level classification of skin cancer with deep neural networks. *Nature, 542, p. 115-118*