

ESMT

**Management Science II:
Innovation, Intellectual Property Rights and the Market for Technology**

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Course overview

Innovation is central to economic growth. Economists and managers are acutely interested in understanding when and how innovation leads to competitive advantage on the firm level and economic growth on the aggregate level. The complex processes leading to innovation have been analyzed extensively in both microeconomics as well as macroeconomics. While briefly looking at macroeconomic growth models accounting for innovation, this course focuses on theoretical and predominantly empirical analyses taking a micro perspective.

“Intellectual property” has been identified as crucial surrounding the incentives to innovate. Intellectual property refers to the rights which are attached to the creation of the mind and which take the form of a property. Though intangible in nature, intellectual property has become the driving force of many companies in a wide range of industries today, encompassing creative and technology-driven industries alike. While the course gives a short introduction to the spectrum of available intellectual property rights, we will predominantly focus on intellectual property rights that protect technical inventions, i.e., *patent rights*.

The course is designed to impart profound understanding of the economic principles and managerial practices on a range of topics pertaining to the protection of intellectual property in the realm of technical inventions. It will include an economic analysis of the incentives created for firms to engage in costly and risky R&D endeavors that (i) result from the design of the underlying IP regime itself as well as from (ii) strategic interaction of firms within this system. Moreover, we will scrutinize how firms can use intellectual property rights to appropriate the value created from their innovative activities by either exploiting them themselves or by using it for contracting with other firms in the market for technology.

The course encompasses both an overview of microeconomic analyses of the design of IP regimes and its effect on firm strategies as well as empirical studies thereof. Participants interested in theoretical work will get an overview of models applied in the study of IP systems. Participants interested in empirical work will get both an overview on available data-sources as well as a hands-on experience in analyzing patent data as I offer to

replicate the results of selected empirical papers using appropriate datasets if participants are interested.

Disclaimer: First, this is not an engineering course, and so we will cover the technical details of particular industries, only if such knowledge is necessary to understand underlying economics. Second, this is not a law course. While we are looking at basic legal principles underlying intellectual property rights, we will do this maintaining an economic perspective.

Course format

We will meet once a week for three hours. In each meeting I will give a brief introduction to the session's topic. You are expected to have prepared the assigned readings for each session as we will discuss them in detail. While reading the papers it may be useful to first identify the research question, major concepts used to formulate the research problem, the methodology used, key findings and its major shortcomings or weaknesses. You should then be able to suggest research ideas on how to address the weak or problematic aspects of the article.

Each participant will be assigned to present at least one or more paper in class during the course depending on the number of participants. The student assigned the paper being discussed is not only expected to introduce the paper and lead the class discussion. The presentation assignments will be communicated after the first session.

Moreover, in selected sessions of the course participants have the choice to replicate the results of empirical papers based appropriate datasets using the software package STATA. We will discuss whether there is demand for those exercises during the first meeting.

Prerequisites

Participants should be familiar with basic microeconomic tools as well as have a basic understanding of multivariate regression analysis. Some exercises might be carried out using STATA (www.stata.com). While knowledge of STATA is not a prerequisite for the course familiarity with the software package is helpful.

Course evaluation

Performance evaluation will be based on three building blocks

Class participation/Paper presentations this part (25%) - second part (Özlem's course) (25%) - The course will be highly interactive and you are expected to advance discussions in the class-room by your participation. Note that the evaluation of your class participation will be based on quality not quantity. Additionally, you are expected to present at least one paper during the course (see above).

Term paper/referee report (50%) -Grading of the written contribution is based on one individual assignment for which each student is expected to write one referee report on a recent research paper. The instructors will provide a list of research papers on the topics of each part of the course from which students could choose one paper to prepare a referee report. The list of research papers will be provided during the course. Alternatively, students can opt to write a term paper in the form of a research proposal.

Readings

Readings will be assigned for each of the sessions (see below). These typically are scholarly papers published in leading economic and management journals.

Moreover, Scotchmer (2004)'s book on intellectual property rights provides an excellent background reading for much of the course.

Scotchmer, Suzanne (2004): Innovation and Incentives. MIT Press, Cambridge MA.

To get a first overview on the theoretical literature on the economics of IP (and patents, in particular) I suggest reading the brief but excellent summary in

Pollock, R. (2008): The economics of knowledge: A review of the theoretical literature. Working Paper, Cambridge University.

(http://rufuspollock.org/economics/papers/economics_of_knowledge_review.pdf)

A summary of the more recent work (also putting more emphasis on empirical studies) can be found in

Hall, B. and Harhoff, D. (2012): Recent Research on the Economics of Patents, NBER Working Papers 17773, National Bureau of Economic Research NBER.

(http://elsa.berkeley.edu/~bhhall/papers/HallHarhoff12_NBER_w17773.pdf)

Participants interested in a comprehensive textbook covering all aspects of innovation, intellectual property rights and economic growth are referred to an optional reading

Greenhalgh, C. and Rogers, M. (2010): Innovation, Intellectual Property, and Economic Growth. Princeton University Press, Princeton and Oxford.

Venue

The course takes place in Seminar Room 3 in the Learning Center (Main Building) of ESMT at Schlossplatz every Thursday from 9:00am to 12:00noon (please see separate schedule for further details).

Course Sessions

Session 1 Thursday, April 20, 2017 9:00-12:00

Session topic **The nature and importance of innovation**

We begin by defining what economists and management scholars mean by *innovation* and outlining the whole supply chain of innovations: from its basis in such activities as scientific invention and information gathering activities through the widespread diffusion of new knowledge embodied in new processes and products within the economy. In this context, we discuss the role of National Innovation Systems for the conduct of R&D. Finally, we will discuss the incentives for profit maximizing agents to engage in innovative activities and scrutinize to what extent market based mechanisms can lead to an optimal level of innovative activities in an economy.

Required reading: Arrow, K. (1962): Economic welfare and the allocation of resources for invention. In R. Nelson (Ed): *The Rate and Direction of Inventive Activity*, 1962, Princeton University Press, Princeton.

Branstetter, L. and Sakakibara, M. (2002): When do research consortia work well and why? Evidence from Japanese panel data. *American Economic Review* 91, 143-159.

Freeman, C. (1995): The national system of innovation in historical perspective. *Cambridge Journal of Economics* 19, 5-24.

Solow, R. (1956): A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70, 65-94.

Teece, D. (1986): Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy* 15, 285-205.

Optional reading: Nordhaus, W. (1969): *Inventions, Growths and Welfare: A theoretical treatment of Technological Change*. M.I.T Press, Cambridge MA.

Romer, P. (1990): Endogenous Technological Change. *The Journal of Political Economy* 98(5), 71-102.

Session 2 Thursday, April 27, 2017 9:00-12:00

Session topic **A primer on intellectual property rights**

During this session we will introduce a set of legal tools establishing

incentives to innovate as they allow capturing the value of innovations by excluding third parties from using them: copyrights, trademarks, trade secrets and patents. The first part of the session helps to understand the power and limitations of these tools. During the second part, we will focus on the protection of technical know-how using patent rights. This includes a discussion of empirical papers analyzing the effect of patent rights on innovative activities.

- Required reading: Budish, E., Roin, B. and Williams, H. (2015): Do fixed patent terms distort innovation? Evidence from cancer clinical trials. *American Economic Review*, Vol. 105 (7), 2044-2085
- Landes, W. M. and Posner, R. A. (1987): Trademark law: an economic perspective. *Journal of Law and Economics* 30(2): 265-309.
- Moser, P. (2005): How Do Patent Laws Influence Innovation? Evidence from Nineteenth Century World's Fairs. *American Economic Review*, 95(4): 1214-36.
- Optional reading: Wright, B. (1983): The economics of invention incentives: Patents, Prizes, and Research Contracts. *The American Economic Review* 73(4), 691-707.
- Scotchmer, S. (2004) - 3rd Chapter: A primer for nonlawyers on intellectual property.
- Cohen, W., R. Nelson, and J. Walsh (2000). Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not). NBER Working Paper, no. 7552. Cambridge, MA.

Session 3
Thursday, May 4, 2017
9:00-12:00

Session topic **Cumulative innovation and licensing**

Innovation often is cumulative in its nature in the sense that there is technological dependency between different innovations over time and innovators often build on existing technologies. This has implications for the design of patent regimes and mechanism that enable a “market for technology”, such as licensing agreements. We will review theoretical and empirical work focusing on these issues.

- Required reading: Arora, A. and Ceccagnoli, M. (2006): Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing. *Management Science* 52(2), 293-308.
- Gallini, N. and Wright, B. (1990): Technology Transfer under Asymmetric Information. *The RAND Journal of Economics* 21(1), 147-160.

Gans, J. and Hsu, D. and Stern, S. (2008): The impact of uncertain intellectual property rights on the market for ideas: Evidence from patent grant delays. *Management Science* 54(5), 982-997.

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

Optional reading: Merges, R. and Nelson, R. (1990): On the Complex Economics of Patent Scope. *Columbia Law Review* 90(5), 839-916.

Scotchmer, S. (2004): 5th Chapter: Standing on the shoulders of Giants: Protecting cumulative innovators.

Scotchmer, S. (2004): 6th Chapter: Licensing, Joint Ventures and Competition Policy.

Session 4
Thursday, May 11, 2017
9:00-12:00

Session topic	<p>An introduction to available data-sources - an empirical perspective on the patent system</p> <p>Having spent discussed important (micro)economic tools for the analysis of IP related questions we now turn our attention to empirical work. In this session we will discuss the content and the availability of patent data.</p> <p>The second part of the session that will be devoted to hands-on STATA exercises. First, I will introduce the concept of survival models that are usually not covered in standard econometrics courses. Second, we take the models to data and replicate the findings of Harhoff/Wagner (2009).</p>
Required reading:	<p>Harhoff, D. and Wagner, S. (2009): The Duration of Patent Examination. <i>Management Science</i> 55(12), 1969-1984.</p> <p>Kiefer, N. (1988): Economic Duration Data and Hazard Functions, <i>Journal of Economic Literature</i>, Vol. 26(2), 646-679.</p> <p>Stephen Jenkins provides excellent free material on survival analysis covering both theoretical treatment as well as its implementation in STATA. If you are interested in this topic your recommended to have a look at https://www.iser.essex.ac.uk/resources/survival-analysis-with-stata.</p>
Optional reading:	<p>Griliches, Z. (1990): Patent Statistics as Economic Indicators: A survey. <i>Journal of Economic Literature</i> 28(4), 1661-1707.</p> <p>Hall, B. and Jaffe, A. and Trajtenberg, M. (2001): The NBER Patent Citation Data File: Lessons, Insights and Methodological Tools. NBER</p>

Working Paper 8498, NBER, Cambridge MA.

Session 5
Thursday, May 11, 2017
15:00-18:00

Session topic	<p>Patent thickets, patent trolls and other frictions in the market for technology - is the patent system broken?</p> <p>Most patent offices have seen an explosion of patent filings over the last two decades. We will discuss what is behind this surge in patent filing rates and analyze resulting problems for innovating firms - most notably the emergence of hold-up situations in complex high-technology industries (mobile phones).</p> <p>Data work optional.</p>
Required reading:	<p>Cockburn, I. and MacGarvie, M. (2011): Entry and Patenting in the Software Industry. <i>Management Science</i> 57(5): 915-933.</p> <p>Hall, B. and Ziedonis, R. (2001): The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry 1976-1995. <i>RAND Journal of Economics</i> 32(1), 101-128.</p> <p>Harhoff, D., von Graevenitz, G. and Wagner, S. (2016): Conflict resolution, public goods and patent thickets. <i>Management Science</i>, Vol. 62(3): 704-721.</p> <p>Kortum, S. and Lerner, J. (1998): What is behind the Recent Surge in Patenting? <i>Research Policy</i> 28(1), 1-22.</p>
Optional reading:	<p>Bessen, J./ Meurer, M. (2009): <i>Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk</i>. Princeton University Press.</p> <p>Scotchmer, S. (2004): 7th Chapter: Litigation and Enforcement.</p> <p>Shapiro, C. (2001): Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting. In: <i>Innovation Policy and the Economy</i>, Vol. 1, 119-150, M.I.T. Press, Cambridge MA.</p> <p>Von Graenitz, G. and Wagner, S. and Harhoff, D. (2011): How to Measure Patent Thickets - A Novel Approach. <i>Economics Letters</i> 111(1), 6-9.</p>

Additional Multimedia to watch/listen to before or after the session (**highly recommended!**):

Patent Absurdity: how software patents broke the system (Video, 30 mins), available at <http://patentabsurdity.com/>

When Patents Attack (Audio report, 60 mins), available at <http://www.thisamericanlife.org/radio-archives/episode/441/when-patents-attack>

Session 6
Thursday, May 18, 2017
9:00-12:00

Session topic	<p>Measuring knowledge flows using patent data</p> <p>Despite the existence of IP regimes excludability of third parties from ideas usually is incomplete and knowledge flows between firms. In this session we will review empirical studies that focus on the measurement of knowledge flows and the underlying mechanisms.</p>
Required reading:	<p>Almeida, P. and Kogut, B. (1999): The Localization of Knowledge and the Mobility of Engineers in Regional Networks. <i>Management Science</i> 45(7), 905-917.</p> <p>Correida, R. and Rosenkopf, L. (2010): Should Auld Acquaintance be Forgot? The Reverse Transfer of Knowledge through Mobility Ties. <i>Strategic Management Journal</i> 31, 159-181.</p> <p>Jaffe, A. and Trajtenberg, M. and Henderson, R. (1993): Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations. <i>The Quarterly Journal of Economics</i> 108(3), 577-598.</p> <p>Singh, J. (2005): Collaborative Networks as Determinants of Knowledge Diffusion Patterns. <i>Management Science</i> 51(5), 756-770.</p>
Optional reading:	<p>Michel, J. and Bettels, M. (2001): Patent citation analysis - A closer look at the basic input data from patent search reports. <i>Scientometrics</i> 51(1), 185-201.</p> <p>Wagner, S., Hoisl, K. and Thoma, G. (2013): Overcoming localization of knowledge: The role of professional service firms. Forthcoming in: <i>Strategic Management Journal</i>, available at http://dx.doi.org/10.1002/smj.2174</p>