Economics 414: Economic Models of New Technology

Yale University

Department of Economics

Fall 2018
Monday & Wednesday, 1:00 - 2:15 pm
Office hours: Monday, 2:30 - 3:30 pm
& Tuesday, 3:30 - 4:30 pm
(or by appointment)

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Course Description

This course intends to provide students with a solid understanding of theoretical models of the effects of market power on the intensity of innovative activity as well as alternative incentive mechanisms such as prizes, patents, copyrights and trade secrecy. Topics include economics of the intellectual property (IP) protection system; IP licensing and research joint ventures; enforcement and litigation; strategic choices in innovation & competition; the value of innovation & patent races; process and product innovation; the diffusion of knowledge; venture capital; network effects; and current policy issues regarding the conflicts between IP rights and antitrust regulation.

This course will often motivate the analysis of economic concepts using case studies and empirical facts. It will also consider simple economic models to explain individual behavior. The primary tool for understanding firm, consumer or government choices is the maximization paradigm which assumes individuals behave as if they maximize an objective function; such functions may represent the level of profits, happiness or social welfare. Thus, much of the course will be devoted to applying that paradigm to various settings. The academic objective of this course is to elaborate students' skills in using theoretical tools to formulate and solve economic problems. The goal is for the students gain a deep understanding of the economic aspects of innovative activity and IP protection system.

Course website

This course uses **Yale Canvas** as the course website. Students registered for the course may log in at http://canvas.yale.edu/. This website will be used to post announcements, copies of all lecture notes, class handouts, problem sets, answer keys, and most readings. A sample of (next day's) lecture notes will also be available on Canvas before each class.

Prerequisite

Basic and intermediate-level microeconomics (ECON 115 or equivalent; ECON 121) are the prerequisites for this class. You should also be familiar with basic calculus such as derivatives as well as with optimization problems such as profits and utility maximization. Prior knowledge of basic game theory - Nash equilibrium, subgame perfect Nash equilibrium, backward induction - is strongly recommended.

Readings

The lecture notes will be posted over the course on the homepage to reflect the current lectures.

Main textbooks:

- *Scotchmer, S., 2004, Innovation and Incentives, MIT Press*

- *Church, Jeffrey and Roger Ware, 2000, Industrial Organization: A Strategic Approach, Irwin McGraw-Hill.* Available in PDF format at http://works.bepress.com/jeffrey_church/23

Selected readings from recent research and case studies will also be assigned.

Supplementary books:

- *Boldrin, M. and D. K. Levine, 2008, Against Intellectual Monopoly, Cambridge University Press.* Available in PDF format at http://www.dklevine.com/general/intellectual/againstnew.htm

- *Hall, B. and N. Rosenberg, 2010, Handbook of the economics of innovation, Elsevier*

- *Leveque and Meniere, 2004, The Economics of Patents and Copyright, Berkeley Electronic Press.* Available in PDF format at http://www.bepress.com/leveque

Problem Sets

Problem sets will be assigned. They are a critical component of the course. Working through the problem sets (solving or at least trying to solve them) is the key to understanding the course material (and preparing for the midterm and final exam). Some exercises will also be discussed in class. We will not be granting extensions to problem sets, unless you have a letter from your college Dean. However, if no problem sets are missed, the lowest grade will be dropped.

Team work is encouraged in homework assignments. However, problem set solutions should be written up individually. To receive credit, you must clearly write your name as well as the names of the students you worked with. Identical write-ups will not be counted. You also need to show how you arrived at the mathematical solution and explain your steps.

Attendance policy

Attendance to class is mandatory. It will help in mastering the course material and getting prepared for the exams, since presentation slides will be used as a text, problems will be solved and case studies will be discussed. An attendance sheet will be circulated in every class.

Grading

There will be a midterm exam and a final exam. Details about the exams will be announced in class as well as on Canvas. The course grade will be the weighted average of the following:

Midterm exam (Wednesday, October 3, 2018): 30%

Problem sets: 20%

Case study: 10%

Attendance/participation: 10%

Final exam: 30%

- You (with your team) will present a case study on a topic related to the course (e.g., product innovation, knowledge spillovers, patent races, venture capital etc). This case study will be a descriptive study.

- All exams will be based on lectures, class discussions, problem sets and readings assigned during the course. The final exam will be cumulative.

- You are required to inform me of any known conflict as soon as possible but no later than two weeks before the date of examination.

- If you need to miss an exam or assignment, please obtain a "Dean's excuse" and email me before the assignment is due or the exam date. Otherwise, the missed assignment or exam will result in a failing grade.

Remarks

- Lectures are not self-contained. It is not expected that you will be able to follow a lecture if you have gaps in your knowledge from prior lectures.

- It is not expected that understanding the lecture notes will prepare you to perform well in the exams. Successfully completing the problem sets *and* reading the covered sections of the textbooks are necessary components for such preparation.

- Academic Integrity: Violations of academic integrity as given in "Undergraduate Regulations" will be taken seriously. See http://yalecollege.yale.edu/campus-life/undergraduate-regulations.

Students assistance

If you receive services through the Resource Office on Disabilities and require accommodations for this class (note taking assistance, extended time for tests, etc.), please, make an appointment with me as soon as possible to discuss your approved accommodation needs. I will hold any information you share with me in the strictest confidence.

If you need help with your writing skills, you can contact the Yale College Writing Center. See http://writing.yalecollege.yale.edu/writing-yale.

Lectures

The lectures are the core elements of the course. Following is a sketch of topics we are likely to cover (some modifications are likely along the way).

⇒ The required readings for each class will be listed in the last slide of the lecture notes.

Required readings: ***, Recommended: **, Optional: *

Introduction, Technological advance

- Case studies: IKEA; Videogames industry: Microsoft (Xbox), Nintendo (Wii), Sony (Playstation); Online movie rental market: Netflix, Walmart, Blockbuster

Institutions

- An excursion through history: inventors' reward systems; patents, prizes, patrons; inventions by laboratories, industry, universities; the growth of government funding

* Scotchmer: CH 1

Innovation & market power

- Knowledge as a public good; deadweight loss; ideas & innovation; choosing among ideas; targeted & blue-sky prizes; contests; auctions

*** Scotchmer: CH 2, 8.4

*** Church and Ware, CH 2.4

* Arrow, K. (1962), "Economic Welfare & the Allocation of Resources for Invention", In R. Nelson, ed., The Rate & Direction of Economic Activities: Economic and Social Factors, pp. 609-626.

Innovation & market structure

- Drastic & non-drastic innovation; social incentives to innovate; persistence of monopoly & leapfrogging; competition & innovation: an inverted U relationship

*** Church and Ware, CH 18.1 - 18.2.1

* Dosi, G. (1988), "Sources, procedures and microeconomic effects of innovation", Journal of Economic Literature 26 (3), pp. 1120-1171.

* Fagerberg, J. (2004), "Innovation: a guide to the literature", working paper

* Gilbert, R. and D. Newbery (1982), "Preemptive patenting and the persistence of monopoly", American Economic Review 72 (3), pp. 514-526.

Intellectual property

- Patents (basic requirements); copyrights; open source; trade secrets, trademarks

*** Scotchmer: CH 3, 4.6

* Besen, S. and L. Raskind (1991), "An Introduction to the Law and Economics of Intellectual Property", The Journal of Economic Perspectives 5(1), pp. 3-27.

* Gallini, N. and S. Scotchmer (2002), "Intellectual Property: When is it the Best Incentive Mechanism?", in: Jaffe, A., J. Lerner and S. Stern (Eds), Innovation Policy and the Economy (2), MIT Press, pp. 51-78.

* Gilbert, R. and C. Shapiro (1990), "Optimal patent length and breadth", RAND Journal of Economics 21 (1), pp. 106-112.

* Maurer, S. M. and S. Scotchmer (2006), "Open source software: the new intellectual property paradigm", NBER Working Paper 12148.

Strategic investment in R&D

- Process innovation; R&D investment & product market competition; R&D strategies

*** Church and Ware, CH 15 (*CH 8)

* Afuah, A. (2009), "Strategic innovation: New game strategies for competitive advantage", Routledge, Part V, Cases 3, 9, 11, 12

Value of innovation & patent races

- Characteristics of the market of knowledge; stochastic patent races; dimensions of patent protection; optimal length & breadth of patent protection

*** Church and Ware: CH 18.2.2 - 18.3

*** Scotchmer: CH 4

Cumulative innovations

- Types of cumulativeness; basic & applied research; research tools; quality ladders

*** Scotchmer: CH 5

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

Licensing & joint ventures

- Royalties & distribution of profits; patent pools & blocking patents; collective rights management organizations & compulsory licensing

*** Scotchmer: CH 6

Knowledge Spillovers

- The appropriability problem; input & output spillovers

* Almeida, P. and B. Kogut (1999), "Localization of Knowledge and the Mobility of Engineers in Regional Networks", Management Science 45(7), pp. 905-917.

*** Chalioti, E. (2015), "R&D spillovers & the regenerative feedback mechanism", working paper

** Cohen, W. M. and D.A. Levinthal (1990), "Absorptive Capacity: A New Perspective on Learning and Innovation", Administrative Science Quarterly (35), Special Issue: Technology, Organizations, and Innovation, pp. 128-152.

* Cassiman, B. and R. Veugelers (2002), "R&D Cooperation and Spillovers: Some Empirical Evidence from Belgium", American Economic Review 92 (4), pp. 1169-1184.

* Jaffe, A. (1986), "Technological Opportunity and Spillovers of R&D: Evidence from Firm's Patents, Profits, and Market Value", American Economic Review 76 (5), pp. 984-1001.

** Qiu, L. (1997), "On the Dynamic Efficiency of Bertrand and Cournot Equilibria", Journal of Economic Theory 75 (1), pp. 213-229.

* Saxenian, A. (1994), "Regional Advantage: Culture and Competition in Silicon Valley and Route 128", Harvard University Press.

Litigation & enforcement

- Remedies for infringement; enforcement of copyrights; technical protection measures; legal protection & the cost of circumvention; contributory infringement; limited sharing of copyrighted works

*** Scotchmer: CH 7

* Bresnahan, T.F. (2002), "The Economics of the Microsoft Case", working paper

Venture capital & contracts

- Venture capitalists; Researchers' contracts

* Lerner, J. and S. Kortum (2000), "Assessing the Contribution of Venture Capital to Innovation", RAND Journal of Economics 31 (4), pp. 674-692.

Networks & network effects

- Direct & indirect network effects; open standards & networks; case studies: the Microsoft, cell phones, internet, the economics of QWERTY

*** Scotchmer: CH 10

** Katz, M. and C. Shapiro (1985), "Systems competition and network effects", Journal of Economic Perspectives 8 (2), pp. 93-116.

*** David, P., 1985, "Clio and the Economics of QWERTY", American Economic Review papers and proceedings 75 (2), pp. 332-337.

* Liebowitz, S. J. and S.E. Margolis (1994), "Network externality: an uncommon tragedy", Journal of Economic Perspectives 8 (2), pp. 133-150.