



Scuola Superiore
Sant'Anna



International PhD in Management

Course: Economics and management of innovation

Lecturer:

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Course description:

The objective of this course is to introduce students to current research on relevant aspects of the economics of innovation, and to help students refine their own ability to promote independent research. The topics covered by the course are relevant to a variety of fields, ranging from innovation policy to firms' internationalization strategies.

Specifically, the course focuses on the following topics:

- 1) Technological change;
- 2) The economics of science and knowledge production;
- 3) National, regional and sectoral systems of innovation.

Classes are typically organized with an initial and broad introduction of the topic to be analyzed, and a further in-depth discussion of one (or a few) paper(s) related to the topic. The latter discussion may also be led by students (in this case, students are expected to prepare a 45-minutes presentation on a research paper).

A particular emphasis is devoted to the methodological aspects that have been used to address the papers' research questions. The type of data used, the measures developed, the estimation strategy employed are aspects that differ according to the level of analysis (micro vs. macro) and the focus of research. By paying attention to such elements the course thus aims at providing students with the ability to develop an independent research proposal on the field covered by the course.

Course Requirements:

Active class participation is strongly encouraged. In order to have a productive class discussion, students are expected to have read the papers listed in the *Compulsory readings* sections of the syllabus, by focusing on the research questions addressed by each of them, the empirical strategy

employed, along with the contribution offered by the papers and critical aspects that could be developed further or differently. By doing this, at home preparation of class discussions becomes an excellent way to start thinking about research.

Students might then be asked to prepare a 45-minutes class presentation of a research paper.¹ As a suggestion, a typical presentation usually covers the following aspects:

- a) Research question and motivation;
- b) Empirical strategy and data building;
- c) Main findings;
- d) Original contribution to the literature and managerial implications;
- e) Personal constructive suggestions for extensions or refining.

Finally, this course does not include a final written examination, but preparation of a research proposal on an aspect related to the topics covered by the course. The 2-page research proposal should identify a relevant research question, provide a motivation to it, briefly discuss the related literature, as well as propose an empirical approach to address the research question.

Reading List:

1. TECHNOLOGICAL CHANGE AND DYNAMICS

What determines the timing of technological revolutions? Can they be predicted? What is a dominant design? What is an “S-curve” and when is it helpful and should it be used? Is there any difference between an “S-curve” and the “Chasm”? How should firms face technological change?

Compulsory readings:

- Anderson, P. and M. Tushman (1990). “Technological discontinuities and dominant designs: A cyclical model of technological change”, *Administrative Science Quarterly*, 35, 604-633.
- Henderson R.M. and K.B. Clark (1990). "Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms." *Administrative Science Quarterly*, 35(1),9-30.

Basic bibliography:

- Rogers E.M. (1962). *Diffusion of Innovations*. Glencoe: Free Press. ISBN 0-612-62843-4 (fifth edition: 2010).
- Dosi G. (1982). “Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change.” *Research Policy*, 11(3): 147-162.
- David P. (1990). “The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox.” *American Economic Review*, 80(2), 355-361.
- Bower J.L. and C.M. Christensen (1995), “Disruptive Technologies: Catching the Wave”, *Harvard Business Review*, 73(1), 43-54.
- Suárez F.F. and J.M. Utterback (1995). "Dominant designs and the survival of firms." *Strategic Management Journal*, 16(6): 415-430.

¹ Details of the assignments will be personally communicated to students.

- Christenson C. (1997). *The Innovator's Dilemma*. Harvard Business School Press, Cambridge, Mass.
- Klepper S. (1996). "Entry, Exit, Growth, and Innovation over the Product Life Cycle." *American Economic Review*, 86(3): 562-583.
- Teece D.J., Pisano G. and Schuen A. (1997). "Dynamic Capabilities and Strategic Management." *Strategic Management Journal*, 18: 509-533.
- Dosi G., Nelson R. and Winter S. (2000). *The Nature and Dynamics of Organizational Capabilities*. Oxford University Press, New York.
- Garcia R. and Calantone R. (2002). "A Critical Look at Technological Innovation Typology and Innovativeness Terminology: A Literature Review." *The Journal of Product Innovation Management*, 19: 110-132.
- Zollo M. and Winter S.G. (2002). "Deliberate Learning and the Evolution of Dynamic Capabilities." *Organization Science*, 13(3): 339-351.

2. UNIVERSITIES, BASIC RESEARCH AND THE ECONOMICS OF SCIENCE

How do universities influence firms' innovative activity? Does scientific knowledge differ from technological knowledge? Is scientific knowledge related to basic research? What are the institutional limits to an effective interaction between university and industry?

Compulsory readings:

- Nelson R. (1959). "The Simple Economics of Basic Scientific Research." *Journal of Political Economy*, 67(3): 297-306.
- Rosenberg N. (1990). "Why Do Firms Do Basic Research (With Their Own Money)?" *Research Policy*, 19(2): 165-174.
- Perkmann M., Tartari V., McKelvey M., Autio E., Broström A., D'Este P. et al. (2013). "Academic Engagement and Commercialisation: A Review of the Literature on University-Industry Relations." *Research Policy*, 42(2): 423-442.

Basic bibliography:

- Merton, R.K. (1973). *The Sociology of Science: Theoretical and empirical investigations*. Chicago, IL: University of Chicago Press.
- Dasgupta P. and David P.A. (1994). "Toward a new economics of science." *Research Policy*, 23(5): 487-521.
- Clark B.R. (1998). *Creating Entrepreneurial Universities: Organizational pathways of transformation*, Oxford, UK: International Association of Universities & Elsevier Science Ltd.
- Etzkowitz H. and Leydesdorff L. (2000). "The dynamics of innovation: From National Systems and "Mode 2" to a Triple Helix of university-industry-government relations." *Research Policy*, 29(2): 109-123.
- Mowery D.C., Nelson R.R., Sampat B.N. and Ziedonis A.A. (2001). "The Growth of Patenting and Licensing by US Universities: An assessment of the effects of the Bayh-Dole act of 1980." *Research Policy*, 30(1): 99-119.
- Balconi M., Breschi S. and Lissoni F. (2004). "Networks of Inventors and the role of Academia: An exploration of Italian patent data." *Research Policy*, 33(1): 127-145.
- Murray F. and Stern S. (2007). "Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge? An Empirical Test of the Anti-Commons Hypothesis." *Journal of Economic Behavior & Organization*, 63: 648-687.

- Lacetera N. (2009). "Different Missions and Commitment Power in R&D Organizations: Theory and Evidence on Industry-University Alliances." *Organization Science*, 20(3): 565-582.
- Aghion P., David P.A. and Foray D. (2009). "Science, technology and innovation for economic growth: Linking policy research and practice in 'STIG Systems'." *Research Policy*, 38(4): 681-693.
- Geuna A. and Muscio A. (2009). "The Governance of University Knowledge Transfer: A Critical Review of the Literature." *Minerva*, 47: 93-114.
- Stephan P.E. (2010). "The Economics of Science." In Hall B.H. and Rosenberg N. (eds.). *Handbook of The Economics of Innovation*, Vol. 1, Oxford (UK): Elsevier [substitutes Stephan P.E. (1996). "The economics of science." *Journal of Economic literature*, 34(3), 1199-1235].

3. THE GEOGRAPHY OF INNOVATION

What are knowledge externalities? Why do innovations tend to agglomerate geographically? Can local and global innovation systems coexist?

Compulsory readings:

- Jaffe A.B., Trajtenberg M. and R. Henderson (1993). "Geographic Localization and Knowledge Spillovers as Evidenced by Patents Citations." *Quarterly Journal of Economics*, 108(3), 577-598.
- Gassmann O. and Von Zedtwitz M. (1999). "New Concepts and Trends in International R&D Organization." *Research Policy*, 28(2): 231-250.
- Breschi S. and Lissoni F. (2001). "Knowledge Spillovers and Local Innovation Systems: A Critical Survey." *Industrial and Corporate Change*, 10(4): 975-1005.

Basic bibliography:

- Cantwell J. (1995). "The Globalisation of Technology: What remains of the product cycle model?" *Cambridge Journal of Economics*, 19: 155-155.
- Patel P. (1995). "Localised Production of Technology for Global Markets." *Cambridge Journal of Economics*, 19(1), 141-153.
- Archibugi D. and Michie J. (1995). "The Globalisation of Technology: A new taxonomy." *Cambridge Journal of Economics*, 19(1): 121-140.
- Zucker L.G., Darby M.R. and Armstrong J. (1998). "Geographically Localized Knowledge: Spillovers or markets?." *Economic Inquiry*, 36(1): 65-86.
- Almeida P. and Kogut B. (1999). "Localization of Knowledge and the Mobility of Engineers in Regional Networks." *Management Science*, 45(7): 905-917.
- Kumar N. (2001). "Determinants of Location of Overseas R&D Activity of Multinational Enterprises: The case of US and Japanese corporations." *Research Policy*, 30(1): 159-174.
- Thompson P. and Fox-Kean M. (2005). "Patent Citations and the Geography of Knowledge Spillovers: A reassessment." *American Economic Review*, 450-460.
- Feldman M.P. and Kogler D.F. (2010). "Stylized Facts in the Geography of Innovation." In Hall B.H. and Rosenberg N. (eds.). *Handbook of The Economics of Innovation*, Vol. 1, Oxford (UK): Elsevier [substitutes Feldman M.P. (1993). "An Examination of the Geography of Innovation." *Industrial and Corporate Change*, 2(3), 451-470].

4. NATIONAL SYSTEMS OF INNOVATION

What are the main actors in innovation systems? What are the relationships existing among them? What is the role of universities? What are the boundaries of innovation systems?

Compulsory readings:

- Carlsson B. (2006). "Internationalization of Innovation Systems: A survey of the literature." *Research Policy*, 35(1): 56-67.
- Soete L., Verspagen B. and ter Weel B. (2010). "Systems of Innovation." *CPB Discussion Paper* no. 138. The Hague, NL: Netherlands Bureau for Economic Policy Analysis.

Basic bibliography:

- Porter M. (1990). *The Competitive Advantage of Nations*. Basingstoke, UK: Macmillan.
- Nelson R.R. (1992). "National Innovation Systems: A Retrospective on a Study", *Industrial and Corporate Change*, 1(2), 347-374.
- Lundvall B.-A. (ed.) (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London, UK: Pinter.
- Nelson R.R. (ed.) (1993). *National Innovation Systems: A Comparative Analysis*. New York: Oxford University Press.
- Edquist C. (1997). *Systems of Innovation: Technologies, Institutions and Organizations*. London, UK: Pinter.
- Lundvall B.Å., Johnson B., Andersen E.S. and Dalum B. (2002). "National Systems of Production, Innovation and Competence Building." *Research Policy*, 31(2): 213-231.
- Freeman C. (2004). "Technological Infrastructure and International Competitiveness." *Industrial and Corporate Change*, 13(3): 541-569.
- Sharif N. (2006). "Emergence and development of the National Innovation Systems concept." *Research Policy*, 35: 745-766.
- Lundvall BÅ. (2007). "National innovation systems-analytical concept and development tool." *Industry and Innovation*, 14(1): 95-119.

5. TECHNOLOGICAL REGIMES AND SECTORAL SYSTEMS OF INNOVATION

What is the notion of technological regime? And of industrial pattern of innovation? How can the Pavitt's taxonomy be used? How sectoral systems of innovations differ from both national systems of innovation and technological regimes? What does the concept of appropriability mean?

Compulsory readings:

- Pavitt K. (1984). "Sectoral Patterns of Innovation: Towards a Taxonomy and a Theory." *Research Policy*, 13(6): 343-373.
- Breschi S., Malerba F. and L. Orsenigo (2000). "Technological Regimes and Schumpeterian Patterns of Innovation." *Economic Journal*, 110(463): 388-410.

Basic bibliography:

- Levin R., Klevorick A., Nelson R. and S. Winter (1987). "Appropriating the returns from industrial research and development." *Brookings Papers on Economic Activity*, 3, 783-820.
- Klevorick A., Levin R.C., Nelson R. and S. Winter (1995). "On the sources and significance of interindustry differences in technological opportunities." *Research Policy*, 24(2), 185-205.
- Malerba F. (ed.) (2004). *Sectoral Systems of Innovation: Concepts, Issues and Analyses of Six Major Sectors in Europe*. Cambridge, UK: Cambridge University Press.

- Geels F.W. (2004). "From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about dynamics and change from sociology and institutional theory." *Research Policy*, 33(6): 897-920.
- Malerba F. (2005). "Sectoral systems of innovation: A framework for linking innovation to the knowledge base, structure and dynamics of sectors." *Economics of Innovation and New Technology*, 14(1-2): 63-82.
- Leiponen A. and Drejer I. (2007). "What Exactly are Technological Regimes?: Intra-industry heterogeneity in the organization of innovation activities." *Research Policy*, 36(8): 1221-1238.

Course calendar:

(please, check the Google Calendar on the PhD Management web site to confirm dates below)

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|----|--------------|-------------|-------------|
| 1. | May 16, 2017 | 14:00-18:00 | |
| 2. | May 17, 2017 | 9:00-13:00 | 15:00-17:00 |
| 3. | May 18, 2017 | 9:00-13:00 | 15:00-17:00 |
| 4. | May 19, 2017 | 9:00-13:00 | |