

# **ECONOMIC OF INNOVATION AND SUSTAINABILITY**

**A.Y. 2021/2022**

**Plinio Limata**

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## ***OBJECTIVES & OUTCOMES***

The course will introduce the students to theories, models and empirical evidence on innovation, dynamics and evolution of different sectors of the economy, with the goal to provide a broad overview of the field and to identify the main research questions. The topics of the course will range from the sources, characteristics and impact of technological change and innovation, to innovation and the dynamics of firms, industries and the economy, to the relevance of technology in the catch-up and competitiveness of firms, industries and countries, to the role of institutions in fostering technological change. The course will critically analyze the good and bad face of innovation. The course will dive deep into the drawbacks of innovation and it will fathom the instances in which innovation can be used to reach the Sustainable Development Goals. The program consists of 19 major topics, one for each class.

## ***PRACTICAL INFORMATION***

Course timetable: There will be 40 hours of lectures split into 20 2-hour sessions, on Monday (10 am – 12 pm; Room 7 – Pompeo Magno), and Friday (10 am – 12 am; Room 13– Pompeo Magno)

The online lessons can be accessed here: <https://meet.google.com/wny-neki-gkw>

Office hours for student reception: Tuesday 12 am – 14 am (Tuesday 12 am – 14 am (Booked with a previous email, the reception can take place in person or online)

## ***PREPARATION & CLASS PARTICIPATION***

Each class, except for Classes 1 and 2, will be structured in the following way. In the first part of the class, the professor will introduce the topics by addressing and framing the main issues in a broad way. In the second part of the class, students presentations will take place. A student will present a specific paper related to the topics in no more than 15 minutes. The presentation will include a short summary of the paper, the main research questions, the way they have been addressed and answered in the paper and some personal comments. Students who will present and discuss a paper will send to the professor their PPT slides 24 h. in advance of their presentation. After the presentations of each paper by a student, some discussion in the class will take place. An introductory course such as this one covers a wide range of topics. Students are required to do the assigned reading before lectures. All students are required to read the assigned readings (\*). All students will send to the professor, via e-mail, a very short synthetic written summary and comment on each reading before each class (max 1 page per paper). The assigned reading material will be provided by the professor while, more advanced material, if not found, can be requested too. This structure does not hold for Class 1 and 2.

## ***ASSESSMENT & EVALUATION***

1. -Discussion in class and 1 page written comments: 1/4 of final grade
2. -Presentations of papers: 1/4 of final grade
3. -Term paper: 1/2 of final grade
4. This breakdown will count for 100% of the grade.

## ***GUIDELINES for the TERM PAPER:***

The term paper will be a short paper (max 10 pages) which can be:

- a) a review and critique of some papers regarding a specific topic of the course;
- b) a proposal concerning original research in one of the topics examined in the course.

For examples:

1. Technological change and job losses: was Schumpeter right?
2. \*The Fourth Industrial Revolution: Possibilities and Pitfalls for developing Countries
3. \*Social entrepreneurship and innovation: possibilities for sustainable development
4. \*Saving the environment: nanotechnologies to the rescue?
5. The economics of metaverses: technology and complex systems in a virtual world
6. Sectoral patterns of innovation in the services sector
7. The creative economy: fad or fact?
8. \*Academic entrepreneurship: more hype than results?
9. Schumpeter's legacy to the body of knowledge in Economics of Innovation: a summary
10. \*Networks and innovation: a critical analysis of the notion that networks foster innovation.
11. The economics of technology sharing: making sense of the open source movement.
12. \*Technological change and employment: a fresh look at the evidence.
13. \*Assessing the success of collaborative research programs between the private sector and  
1. higher education institutions in a country of your choice (e.g. Brazilian wine /fruit market).
14. Diffusion of new technology: a summary of the theory and the implications for policy.
15. Catching up through technology absorption: possibilities for developing countries.
16. The drawbacks of innovation and how to solve them
17. Technology in neoclassical and evolutionary perspective: a comparison
18. \*Innovation and smart cities: how cities take care of social innovation
19. \*The National system of innovation approach: relevance for developing countries.
20. Regional systems of innovation and the evolution of industries: an overview of the literature.
21. Creative destruction in an industry (or sector) of your choice [a case study].
22. \*Innovation for smart, sustainable and inclusive growth [a case study]
23. \*Innovation for greater good: how innovation can help to achieve sustainable development goals [choose one or more integrated goals]
24. Any topic of your choice (within the framework of the Economics of technological change); to be agreed with me.

The essay must comply with all the requirements of a formal academic essay. For references, please use Google Scholar bibliography APA or Harvard style.

**Textbooks:**

- 1) OXFORD HANDBOOK OF ECONOMICS OF INNOVATION (OHEI), 2005, Edited by Jan Fagerberg and David C. Mowery,
- 2) ECONOMICS OF INNOVATION (EI), 2010, Volume 1 and 2, Edited by Hall, B.H., and Rosemberg, N.

**Readings:**

The assigned reading material will be provided by the professor while, more advanced material, if not found, can be requested too.

<b>MODULE CONTENT</b>	
1	<b>INTRODUCTION: BASIC CONCEPTS ON INNOVATION</b> <ul style="list-style-type: none"><li>• OHEI, Chapter 1: Innovation: A Guide to Literature (Jan Fagerberg)</li><li>• OHEI, Chapter 13 : Innovation trough time (Kristine Bruland and David C. Mowery)</li><li>• EI, Chapter 19: General purpose of technology (Timothy Bresnahan)</li><li>• Mokyr, J. (2018). The Past and the Future of Innovation: some lessons from Economic History. Explorations in Economic History.</li></ul>
2	<b>EVOLUTIONARY THEORY OF ECONOMIC AND TECHONOLOGICAL CHANGE</b> <ul style="list-style-type: none"><li>• EI, Chapter 3 : Technological change and industrial dynamics as evolutionary processes (Dosi G., Nelson R.)</li></ul>
3	<b>THE FIRM, COMPETENCES AND INNOVATION</b> <ul style="list-style-type: none"><li>• OHEI, Chapter 2, The Innovative Firm (William Lazonick)</li><li>• EI, Chapter 16: Technological Innovation and the Theory of the Firm: The Role of Enterprise-Level Knowledge, Complementarities, and (Dynamic) Capabilities (Teece)</li><li>*Arora A., Cohen W. Walsh J. The acquisition and commercialization of invention in American manufacturing: incident and impact Research Policy 2016, 45, pp.1112-1128</li><li>* Dosi, G., Marengo, L. 2007. "On the Evolutionary and Behavioral Theories of Organizations: A Tentative Roadmap." Organization Science Perspective, 18(3): 491-502.</li></ul> ----- <p>Helfat C. Vertical firm structure and industry evolution Industrial and Corporate Change 2015 August, 4</p>
4	<b>INNOVATION AND INDUSTRIAL DYNAMICS</b> <ul style="list-style-type: none"><li>• EI, Chapter 3 : Technological change and industrial dynamics as evolutionary processes (Dosi G., Nelson R.)</li><li>• Malerba F. (2006). "Innovation and industry evolution", Journal of Evolutionary Economics.</li><li>* Klepper S. "Entry, exit, growth and innovation over the product life cycle" American Economic Review 1996, 86, 562-583</li><li>* Jacobides M. and Winter S. The co-evolution of capabilities and transaction costs: explaining the institutional structure of production Strategic Management Journal 2005 26, 395-413</li></ul> ----- <p>Moeen M. and Agarwal R. Incubation of an Industry: Heterogeneous Knowledge Bases and Modes of Value Capture Strategic Management Journal 2016, 38, 566-587</p>
5	<b>INNOVATION SYSTEMS AND INSTITUTIONS</b> <ul style="list-style-type: none"><li>• OHEI, Chapter 7: Systems of Innovation: Perspectives and Challenges (Charles Edquist)</li><li>• OHEI, Chapter 11: The Geography of Innovation: Regional Innovation Systems (Bjørn T. Asheim and Meric S. Gertler)</li><li>• EI, Chapter, 27: Systems of Innovation (Luc Soete, Bart Verspagen, and Bas Ter Weel)</li><li>*OHEI, Chapter 14 : Sectoral Systems: How and Why Innovation Differs across Sectors (Franco Malerba)</li></ul>

	<p>*Murmann P. The coevolution of industries and important features of their environments Organization Science 2013 n.1 58-78</p> <p>-----</p> <p>Adner R. Kapoor R. Value creation in innovation ecosystems: Strategic Management Journal 2010 31 306-333</p> <p>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 Technologies OHEI, Chapter 8: Universities in National Innovation Systems (David C. Mowery and Bhaven N. Sampat)</p> <p>OHEI, Chapter 16: Innovation in Services (Ian Miles)</p>
6	<p><b><i>INNOVATION FOR SUSTAINABLE DEVELOPMENT</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 13: Innovation through Time (Kristine Bruland and David C. Mowery)</li> <li>• Why sustainability is now the key driver of innovation. Harvard business review, 87(9), 56-64. <a href="https://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation">https://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation</a></li> </ul> <p>* Leach, M., Rockström, J., Raskin, P., Scoones, I., Stirling, A. C., Smith, A., &amp; Folke, C. (2012). Transforming innovation for sustainability. Ecology and Society, 17(2).</p> <p>* Mazzucato, M. (2018). Mission-oriented innovation policies: challenges and opportunities. Industrial and Corporate Change, 27(5), 803-815.</p>
7	<p><b><i>GREEN INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• EI, Chapter 21: Energy, The Environment, and Technological Change (David Popp, Richard G. Newell, and Adam B. Jaffe)</li> <li>• Dutz, M. A., &amp; Sharma, S. (2012). Green growth, technology and innovation. The World Bank.</li> </ul> <p>* Mazzucato, M. (2015). The green entrepreneurial state. In The politics of green transformations (pp. 152-170). Routledge.</p> <p>* Calza, F., Parmentola, A., &amp; Tutore, I. (2017). Types of green innovations: Ways of implementation in a non-green industry. Sustainability, 9(8), 1301.</p> <p>-----</p> <p>OECD Publishing. (2010). OECD science, technology and industry outlook 2010</p>
8	<p><b><i>DEMAND AND INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 13: Innovation through Time (Kristine Bruland and David C. Mowery)</li> <li>• Why sustainability is now the key driver of innovation. Harvard business review, 87(9), 56-64. <a href="https://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation">https://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation</a></li> </ul> <p>* Baldwin C. Von Hippel E. Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation Management Science 2011 March pp. 1399-1417</p> <p>* Chatterji A. Fabrizio K. How do Product users Influence Corporate Invention? Organization Science 2012 n.4 p. 971-987</p> <p>-----</p> <p>Adner R. When are technologies disruptive: a demand based view of the emergence of competition Strategic Management Journal 2003, 8</p>
9	<p><b><i>THE DIFFUSION OF NEW TECHNOLOGIES</i></b></p> <ul style="list-style-type: none"> <li>• EI, Chapter 17: The diffusion of Innovation (Paul Stoneman and Giuliana Battisti)</li> <li>• OHEI, Chapter 17 : Innovation and Diffusion (Bronwyn H. Hall)</li> </ul> <p>* David P. Clio and the economics of QWERTY Economic Journal 1985 75, 332-337</p> <p>* Eggers J.P. Competing technologies and industry evolution: the benefits of making mistakes in the flat panel display industry Strategic Management Journal 2014 February pp. 159-178</p> <p>-----</p> <p>Geroski P. , Models of technology diffusion, Research Policy 2000 vol. 29(4-5)</p>
10	<p><b><i>MEASURING INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 6: Measuring Innovation (Keith Smith)</li> <li>• EI, Chapter 25: Patent Statistics as an Innovation Indicator (Sadao Nagaoka, Kazuyuki Motohashi, and Akira Goto)</li> </ul> <p>* Nelson A. Earle A. Howard-Grenville J. Haack J. Young D. Do innovation measures actually measure innovation? Research Policy 2014 pp.927-940</p>
11	<p><b><i>PATENTS, TECHNOLOGIES AND INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• EI, Chapter 7: Property Rights and Innovation (Katharine Rockett)</li> <li>• OHEI, Chapter 10 : Innovation and Intellectual Property Rights (Ove Granstrand)</li> </ul>

	<p>* Cohen W. Goto A. Nagata A. Nelson R. Walsh J. R&amp;D spillovers, patents and the incentives to innovate in Japan and the US Research Policy 2002</p> <p>* Hall B. Ziedonis R. The patent paradox revisited: an empirical study of patenting behaviour in the US semiconductor industry: 1979-1995 Rand Journal of Economics Spring 2001</p> <p>-----</p> <p>Aharonson B. Schilling M. Mapping the technological landscape: measuring technology distance, technological footprint and technology evolution Research Policy 2016, 45, 81-96</p> <p>Mendonca S. Santos Pereira T. Godinho M. Trademarks as an indicator of innovation and industrial change Research Policy 2004 pp.1385-1404</p>
12	<p><b><i>START-UPS, SPINOUTS AND INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• OECD 2018: A portrait of innovative start-ups across countries (Stefano Breschi, Julie Lassébie, Carlo Menon)</li> </ul> <p>* Helfat C. and Lieberman M. The birth of capabilities: market entry and the importance of pre-history Industrial and Corporate Change 2002 11, 4, 725-760</p> <p>* Czarnistzi D. and Delanote J. Young Innovative Companies: the new high-growth firms? Industrial and Corporate Change 2013 October pp.1315-1340</p> <p>-----</p> <p>Klepper S. and Sleeper S. Entry by spinoffs Management science 2005, 8, 1291-1306</p> <p>Adams P. Fontana R. Malerba F. User-industry spinouts: downstream knowledge as a source of new firm entry and survival Organization Science 2016, 27,1, 18-35</p> <p>Agarwal R. and Shah S. Knowledge sources of entrepreneurship: firm formation by academic user and employee innovators Research Policy 2014, 43, 1109-1133</p>
13	<p><b><i>INNOVATION AND WEALTH CREATION</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 18: Innovation and Economic Growth (Bart Verspagen)</li> <li>• EI, Chapter 19 - International Trade, Foreign Direct Investment, and Technology Spillovers (Wolfgang Keller)</li> <li>• EI, Chapter 23 - Growth Accounting (Charles R.Hulten)</li> </ul> <p>*Gordon, R. J. (2018). Declining American economic growth despite ongoing innovation. Explorations in Economic History, 69(C), 1-12.</p> <p>* Hasan, I., &amp; Tucci, C. L. (2010). The innovation–economic growth nexus: Global evidence. Research Policy, 39(10), 1264-1276.</p>
14	<p><b><i>CATCH-UP, NEW EMERGING LEADERS AND TECHNOLOGY</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 19: Innovation and Catching-Up (Jan Fagerberg and Manuel M. Godinho)</li> <li>• EI, Chapter 20 : Innovation and Economic Development (Jan Fagerberg, Martin Srholec, and Bart Verspagen)</li> </ul> <p>*Lee K. and Malerba F. Economic Catch-up by Latecomers in Richard Nelson et al. Modern evolutionary economics: an Overview. Cambridge University Press 2018</p> <p>* Malerba F. and Nelson R. Catching up in different sectoral systems: evidence from six industries Industrial and Corporate Change 2011</p> <p>-----</p> <p>Hidalgo C.A., Klinger B. Barabasi A. Hausmann R. The product space conditions and the development of nations, Science 2007 27, 317, pp. 482-487</p> <p>RIIS &amp; Embassy of Switzerland South Africa, 2016. “A perspective on innovation in South Africa”.</p> <p>Kruss, G, Petersen, I, Rust, J and Tele, A. 2017. “Promoting a science, technology and innovation policy for inclusive development in South Africa”, HSRC Policy Brief. March 2017</p>
15	<p><b><i>FINANCING INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 9: Finance and innovation (Mary O'Sullivan)</li> </ul>

	<ul style="list-style-type: none"> <li>• EI, Chapter 14 - The Financing of R&amp;D and Innovation (Bronwyn H. Hall and Josh Lerner)</li> <li>• Case study: Case studies in funding innovation: Can't do it a-loan How innovation funding helped Kiva launch and develop <a href="https://www2.deloitte.com/insights/us/en/topics/innovation/case-studies-infunding-innovation-kiva.html">https://www2.deloitte.com/insights/us/en/topics/innovation/case-studies-infunding-innovation-kiva.html</a></li> <li>* Hall, B. H., Moncada-Paternò-Castello, P., Montresor, S., &amp; Vezzani, A. (2016). Financing constraints, R&amp;D investments and innovative performances: new empirical evidence at the firm level for Europe.</li> <li>* Kerr, W. R., &amp; Nanda, R. (2015). Financing innovation. Annual Review of Financial Economics, 7, 445-462.</li> </ul>
16	<p><b><i>PUBLIC POLICY FOR INNOVATION</i></b></p> <ul style="list-style-type: none"> <li>• OHEI Chapter 22: Science, Technology, and Innovation Policy (Bengt-Åke Lundvall and Susana Borrás)</li> <li>• EI, Chapter 28: Economics of Technology Policy (W. Edward Steinmueller)</li> <li>• Mazzucato, M., &amp; Semieniuk, G. (2017). Public financing of innovation: new questions. Oxford Review of Economic Policy, 33(1), 24-48.</li> </ul> <p>*Bleda M. Del Rio P. the market failure and the system failure rationale in technological innovation systems Research Policy 2013 42, 1035-1052</p> <p>* Lazzarini S. Strategizing by the government: can industrial policy create firm-level competitive advantage? Strategic Management Journal 2015 36, pp. 97-112</p> <p>-----</p> <p>Colombo M. Giannangeli S. and Grilli L. Public subsidies and the employment growth of high-tech start-ups: assessing the impact of selective and automatic support schemes Industrial and Corporate Change 2012 n. 5 pp. 1273-1314</p> <p>Cimoli M. Dosi G. Nelson R. Stiglitz J. Institutions and policies shaping industrial development LEM WP series 2006/2</p> <p>Foldvary, F E, Hammer, E J, 2016. "How advances in technology keep reducing interventionist policy rationales, Technology in Society 47, pp.16- 24.</p> <p>Metcalf, S. 2007. Innovation systems, innovation policy and restless capitalism. F. Malerba, S. Brusoni, eds. Perspectives on Innovation. Cambridge University Press, New York.</p>
17	<p><b><i>THE DRAWBACK OF INNOVATION: INEQUALITY AND EXCLUSIVE GROWTH</i></b></p> <ul style="list-style-type: none"> <li>• Lazonick, W., &amp; Mazzucato, M. (2013). The risk-reward nexus in the innovation-inequality relationship: who takes the risks? Who gets the rewards?. Industrial and Corporate Change, 22(4), 1093-1128.</li> <li>• Aghion, P., Akcigit, U., Bergeaud, A., Blundell, R., &amp; Hémous, D. (2018). Innovation and top income inequality. The Review of Economic Studies, 86(1), 1-45.</li> <li>* Lazonick, W., Mazzucato, M., &amp; Tulum, Ö. (2013, December). Apple's changing business model: What should the world's richest company do with all those profits?. In Accounting Forum (Vol. 37, No. 4, pp. 249-267). Elsevier.</li> </ul> <p>*Naudé, W., Siegel, M., &amp; Marchand, K. (2017). Migration, entrepreneurship and development: critical questions. IZA Journal of Migration, 6(1), 5.</p>
18	<p><b><i>INNOVATION AND EMPLOYMENT</i></b></p> <ul style="list-style-type: none"> <li>• OHEI, Chapter 21 : Innovation and Employment (Mario Pianta)</li> </ul> <p>*Ugur, M, Mitra, A. 2017. Technology Adoption and Employment in Less Developed Countries: A Mixed-Method Systematic Review, World Development Vol.96, pp.1-18.</p>

	*Bogliacino, F., Pianta, M. 2010. Innovation and Employment: a Reinvestigation using Revised Pavitt classes, <i>Research Policy</i> , 39, pp.799- 809.
19	<p><b><i>MODELLING INNOVATION AND INDUSTRY EVOLUTION: HISTORY FRIENDLY MODELS</i></b></p> <ul style="list-style-type: none"> <li>• Malerba F., Nelson R., Orsenigo L., Winter S., “History friendly models of industry evolution: the computer industry” <i>Industrial and Corporate Change</i> 1999, 8: 3-40</li> <li>*Jacobides M. How capabilities differences, transaction costs and learning curves interact to shape vertical scope <i>Organization Science</i> 2008 v. 19, n2</li> <li>*Garavaglia, C. 2010. Modelling Industrial Dynamics with History Friendly Simulations. <i>Structural Change and Economic Dynamics</i>, 21(4): 258-275.</li> </ul> <p>-----</p> <p>Landini, F, Lee, K, and Malerba, F, 2017. “A History-friendly model of the successive changes in industrial leadership and the catch-up by latecomers”, <i>Research Policy</i> 46, pp.431-446</p>