

Aug 11, 2021

**Syllabus: ECON 673 – Economics of Innovation and Artificial Intelligence
Fall 2021**

Class meeting times:

Tuesday & Thursday 10:00-11:20 in HH1108

Instructor:

Prof. Joel N. Blit

Office: Hagey Hall 105

Email: jblit@uwaterloo.ca

Office Hours: Tuesdays 11:25-12:50 (or by appointment)

Objectives:

Innovation is the primary driver of economic growth and hence of improvements to our standard of living. In this course we will study, both from a theoretical and empirical perspective, the incentives to innovate, and how institutions and public policy shape these incentives. The primary question that we will be addressing is how best to incentivize innovation. We will examine the nature of ideas and innovation, intellectual property rights, technology clusters, knowledge spillovers and diffusion, whether immigration contributes to innovation, and numerous other topics. We will also spend some time discussing the young but growing literature on the economics of artificial intelligence (AI), including how to think about AI and its likely impact on the labour market.

Textbook (not required):

- Suzanne Scotchmer. *Innovation and Incentives*, MIT Press, 2006.

Prerequisites:

I will assume that you have taken senior undergraduate microeconomics and econometrics.

My Expectations:

- You will come to class and you will participate
- You will stay on top of the material
- You will complete what you are assigned

Assigned Work:

4 Assignments: The first two assignments will be theory based. For the last two, you will have to work with data. You will therefore require knowledge of Stata or a similar statistical package (or Python). The 4th assignment will be a major assignment worth 22% of your grade. I strongly encourage you to start it at least a month ahead.

Note: instead of the last two data assignments (worth 29%) I am open to you producing a research paper instead.

Readings: For the second part of the course, I will be assigning required readings for each class. You are responsible for reading these ahead of class so that we may discuss them during class.

Presentations/Facilitation: One student will be assigned to be the resident “expert” for each assigned reading in the Paper Sessions section of the course. He/she will be required to present the paper and lead a discussion on the paper. The presentation should address the following aspects of the paper:

1. Research question/main hypothesis
2. Empirical approach/methodology
3. Results
4. Your opinion of the paper (gems and criticisms)

Method of Evaluation:

Midterm Examination:	30% of final grade (Date TBD)
Assignments (4):	35% of final grade (3%, 3%, 7%, 22%)
Paper presentation/facilitation:	25% of final grade
Participation:	10% of final grade

Participation: Your participation grade will depend primarily on 2 things:

1. Your general in-class participation (I am looking for quality not quantity)
2. Your preparedness (in the second half of the course you will be asked to read papers ahead of time so that we can discuss them in class)

Late Assignment Submission:

Late submissions will not be accepted and will earn a grade of 0. Failure to submit will also earn a grade of 0.

Failure to present:

Failure to present your assigned paper on the day that it was to be presented also earns a grade of 0.

Absence from Midterm Exam:

Failure to write an exam results in a grade of zero. Exceptions will only be made under the most extreme circumstances, with a written note, and according to the policies of the department of economics and faculty of Arts.

Course Outline:

The course will be loosely divided into two halves. The first half will focus on theory and draw mostly from Scotchmer's textbook. The second part will be mainly empirical and draw from academic journal articles.

The following is a tentative course outline and will be completed/updated as we proceed through the course.

Part 1

Class 1: Introduction

Class 2&3: Innovation in Canada

Class 4: Productivity in Canada

Class 5: Skill-biased technical change

Class 6: Economics of AI

Class 7: A Brief History (Ch. 1)

Class 8&9: Incentivizing Innovation (Ch. 2)

Class 10: Substitutable Ideas (Ch. 2)

- **Note: Assignment 1 is due at the beginning of class**

Class 11: Intellectual Property Rights (Ch. 3)

- **Note: Assignment 2 is due at the beginning of class**

Class 12&13: Optimal Patent Design (Ch. 4)

Class 14: Uncertain Success (Ch. 4)

Class 15&16: Cumulative Innovation (Ch. 5)

Class 17: Midterm ()

Paper Sessions

* starred readings are optional

Class 18: Patent Protection and Business R&D

- **Assignment 4 is due at the beginning of class**

- Ginarte, J. C. and Park, W. G. "Determinants of patent rights: A cross-national study." *Research Policy* 26.3 (1997): 283-301.
- Blit, J. and Zelaya, M. "Intellectual property rights and firm R&D in a globalized world", Working Paper
- *Allred, Brent B., and Walter G. Park. "Patent rights and innovative activity: evidence from national and firm-level data." *Journal of International Business Studies*, 38.6 (2007), 878-900.
- *Jaffe, Adam B. "The US patent system in transition: policy innovation and the innovation process." *Research policy*, 29.4 (1999), 531-557.
- *Kanwar, Sunil, and Robert Evenson. "Does intellectual property protection spur technological change?" *Oxford Economic Papers*, 55.2 (2003), 235-264.
- *Park, W. and Ginarte, J. C. 1997. "Intellectual property rights and economic growth" *Contemporary Economic Policy*: 15(3), p. 51-61.
- *Park, W. 2012. "North-South models of intellectual property rights: an empirical critique." *Review of World Economics*: 148: 151-180.
- *Qian, Y. "Do national patent laws stimulate domestic innovation in a global patenting environment? A cross-country analysis of pharmaceutical patent protection, 1978-2002" *The Review of Economics and Statistics*, 89.3 (2007), 436-453.
- *Sakakibara, M. and Branstetter, L. "Do stronger patents induce more innovation? Evidence from the 1988 Japanese patent law reforms" Technical report, NBER Working Paper No. w7066, (1999)

Class 19: IPR and Follow-On Innovation

- Williams, H. 2013. "Intellectual property rights and innovation: evidence from the human genome", *Journal of Political Economy*, 121(1)
- Galasso Alberto and Mark Schankerman, 2014. "Patents and cumulative innovation: causal evidence from the courts," *Quarterly Journal of Economics*, forthcoming.
- *Murray, Fiona and Scott Stern. 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 and Organization*, 356 (23): 2341–2343.
- *Furman, J. and Stern, S. 2011. "Climbing atop the shoulders of giants: the impact of institutions on cumulative innovation" *American Economic Review*, 101(5): 1933-63.
- *Murray, Fiona, Philippe Aghion, Mathias Dewatripont, Julian Kolev, and Scott Stern. "Of mice and academics: Examining the effect of openness on innovation." 2008. unpublished MIT mimeo.
- *Jaffe, Adam B., and Josh Lerner. *Innovation and its discontents: How our broken patent system is endangering innovation and progress, and what to do about it*. Princeton University Press, 2011

Class 20: Knowledge Diffusion I

- Jaffe, Adam, Manuel Trajtenberg and Rebecca Henderson (1993) "Geographic localization of knowledge spillovers as evidenced by patent citations." *Quarterly Journal of Economics* 108: 577-598.

- Thompson, P., M. Fox-Kean. 2005. "Patent citations and the geography of knowledge spillovers: a reassessment." *American Economic Review* **95**(1) 450-460.
- Henderson, Rebecca, Adam Jaffe, and Manuel Trajtenberg. 2005. "Patent citations and the geography of knowledge spillovers. A reassessment: comment." *American Economic Review* **95**(1) 461-4.
- Thompson, P., M. Fox-Kean. 2005. "Patent citations and the geography of knowledge spillovers: a reassessment: reply" *American Economic Review* **95**(1) 465-66.
- *Duguet, E., M. MacGarvie. 2005. How well do patent citations measure flows of technology? Evidence from French innovation surveys. *Economics of Innovation and New Technology* **14**(5) 375-393.

Class 21: Knowledge Diffusion II

- Blit, J. and M. Packalen. 2018. A machine learning analysis of the localization of knowledge flows. Working Paper.
- Thompson, P. 2006. Patent citations and the geography of knowledge spillovers: evidence from inventor- and examiner-added citations. *Review of Economics and Statistics* **88**(2) 383-389.
- *Murata, Y., Nakajima, R., Okamoto, R., and Tamura, R. 2011. Localized knowledge spillovers and patent citations: A distance-based approach. *Review of Economics and Statistics, forthcoming*
- *Arts, S., Cassiman, B. and J. C. Gomes, 2018, "Text Matching to Measure Patent Similarity," *Strategic Management Journal* **39**(1) 62-84.
- *Singh, J. and M. Marx, 2013, "Geographic Constraints on Knowledge Spillovers: Political Borders vs. Spatial Proximity," *Management Science* **59**(9) 2056-2078.

Class 22: FDI as a Channel for Knowledge Diffusion

- Branstetter, L. 2006. Is foreign direct investment a channel of knowledge spillovers? Evidence from Japan's FDI in the United States. *Journal of International Economics* **68**(2) 325-344.
- Fons-Rosen, C. 2012. Knowledge flows through FDI: the case of privatisations in central and eastern Europe. Working Paper.
- *Blit, J. 2012. International development through multinationals: Foreign R&D subsidiaries as a medium for the geographic diffusion of knowledge. *Canadian Journal of Economics*. Forthcoming.

Class 23: Immigration and Innovation

- Hunt, Jennifer and Marjolaine Gauthier-Loiselle (2010) "How Much Does Immigration Boost Innovation?" *American Economic Journal: Macroeconomics* **2**: 31-56.
- Kerr W. and W. Lincoln (2010). "The Supply Side of Innovation: H – 1B Visa Reforms and U.S. Ethnic Invention," *Journal of Labor Economics* **28**(3): 473-508.
- *Kerr, William (2008) "Ethnic scientific communities and international technology diffusion." *The Review of Economics and Statistics* **90**: 518-537.

- *Agrawal, Ajay, Devesh Kapur, John McHale, and Alexander Oettl (2011) "Brain drain or brain bank? The impact of skilled emigration on poor-country innovation." *Journal of Urban Economics* 69:43-55.
- *Kerr, William (2008) "Ethnic scientific communities and international technology diffusion." *The Review of Economics and Statistics* 90: 518-537.
- *Oettl, Alexander and Ajay Agrawal (2008), "International labor mobility and knowledge flow externalities." *Journal of International Business Studies* 39: 1242-1260.

Class 24: Immigration and Innovation in Canada and Wrap-Up

- **Assignment 5 is due at the beginning of class**
- Blit, Joel, Mikal Skuterud, and Jue Zhang (2016) "Immigrants and patents: evidence from Canadian cities." University of Waterloo working paper.

Economics Department Deferred Final Exam Policy

Deferred Final Exam Policy found at <https://uwaterloo.ca/economics/current-undergraduates/policies-and-resources/deferred-final-exam-policy>.

Academic Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. See the [UWaterloo Academic Integrity webpage](#) and the [Arts Academic Integrity webpage](#) for more information.

Discipline

A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to [Policy 71 - Student Discipline](#). For typical penalties check [Guidelines for the Assessment of Penalties \(https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/guidelines/guidelines-assessment-penalties\)](#).

Grievance

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70 - Student Petitions and Grievances](#), Section 4 (<https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-70>). When in doubt, please be certain to contact the department’s administrative assistant who will provide further assistance.

Appeals

A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals \(https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-72\)](#).

Note for Students with Disabilities

The [AccessAbility Services](#) office, located on the first floor of the Needles Hall extension (NH 1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.