MICROECONOMICS OF INNOVATION
Ph.D. Economics 7031
Spring 2016

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Classes: Monday 5:05-8PM in Room G10, Old CE Building
Office Hrs: By appointment. Email (vivekghosal@gatech.edu) and we can schedule a meeting.

I may make some changes to readings and dates for submission of exams and quizzes. Any changes will be discussed in class and announced on T-Square. Please check your email for announcements via T-Square and materials posted on the class T-Square site. Create a folder in your email inbox with the "Econ Innovation 7031" name and store all the T-Square announcements/emails there.

Some important dates

January 18:	Martin Luther King Day. No class.
March 21-25:	Spring break.
April 25:	Last class for our course.
April XX:	Final Exam. We will discuss date and logistics for this later.

COURSE OVERVIEW

The course will cover various aspects related to: defining product markets – consumers and firms; models of competition and strategic rivalry between firms such as Cournot, Bertrand and Stackelberg; patents – process and incentives; strategic patenting; patent rivalry; inventions and financing of innovation; R&D expenditures and investments; models of strategic R&D investments; Intellectual Property Rights and policies; comparison of IP laws and enforcement across countries and jurisdictions; industry studies in patenting and R&D; among other topics. A common thread across the various topics we cover will be to understand what types of data are required to test various hypotheses, collection of innovation related data such as patents, understanding the pros and cons of the data, and the econometric models that will be used to estimate the relationships. I will provide a more complete overview in class.

CLASS FORMAT

Will contain a mix of: lectures; extensive use of take-home readings which you will have to explain in class; some take-home assignments and homework based on selected papers reviewed in class; and significant amount of in-class participation – that is, you will be asked to present and explain specific papers and other materials. Some modeling exercises will be assigned as take-home exercises – you are encouraged to form study groups for these if you wish. The class is designed to be interactive, so come prepared to communicate and participate in discussions. While we will cover some theory materials, the ultimate objective will be to provide a more applied and econometric understanding of the topics. Most of the theory materials will be assigned as readings for you to go over, and I will assign homework and possibly take-home test questions. Some of the basic tools covered in Microeconomics will be essential to get a proper perspective of the theoretical issues.

It is vitally important to attend class lectures. The materials can be expansive, and sometime complicated. The class discussion of the materials are very important. If you miss class, I will not go over those materials again in class. Neither will I go over the materials one-on-one in my office. It is your responsibility to come to class and make up lost ground. Part of the problem of missing class is that there are a lot of details discussed in class for which there are no slides/notes. There is absolutely no way for me to recreate this in another class or one-on-one.

Two other important items regarding classes:
(a) I may move 2-3 of the regularly scheduled classes to our agreed upon default of Wednesday from 5:05PM. I have already emailed you and based on your responses we agreed this was the best 'alternate' time slot. If there is a switch, I will announce this in class beforehand.
(b) **No cell phone use in class**. Please turn off the device so that you do not send/receive emails or text during class.

TESTS, QUIZZES AND WRITTEN ASSIGNMENT

* We will discuss this in class. I am writing down the main items below.

1. Tests

There will be **two tests**, a mid-term and a final. The final will be cumulative. Each in-class test will be of 120 minutes (2 hour) duration, and will cover questions on modeling, empirical methods and results, and policy. I will provide more details on each test about one week prior to the test date. Scores will be available about 10 days after the test.

Test 1: 100 points. Tuesday, March 8 (take home).
Test 2: 100 points. Final Exam. (We will discuss details later.)

2. Quizzes

There will be two take-home quizzes. Each quiz will be a smaller version of a regular test. Each quiz will contain a mix of questions on modeling, empirical methods and results and policy. I will provide more details about each quiz about one week prior to the Quiz date. Scores will be available about 10 days after the quiz.

Quiz 1: 50 points. Tuesday, February 23 (take home).
Quiz 2: 50 points. Thursday, March 31 (take home).

3. Makeup Tests and Quizzes

NO makeups will be administered for any test or quiz. The only exceptions are:

1. If you are ill. The accompanying doctor's note must say that you **cannot (or could not)** take the test; and
2. For GT approved official activities provided you produce the official documentation.

* Makeup tests and quizzes can create issues related to fairness and other problems. Since I would exhaust the set of reasonable questions for the regularly scheduled test, writing makeups inevitably implies me searching for different questions to ask. For fairness, the policy of NO makeups will be adhered to without exception irrespective of the student's personal situation.

4. Written Assignment

There is a research paper and presentation requirement. I will discuss this during the initial classes. The assignment will cover aspects of innovation and patenting in a specific industry. In class we will discuss several different industries and the nature of innovation in them. Please start to think about potential industries and topics that may be of interest to you, and patents and related data to complete the assignment. Carrie Zhai who is a 4th year PhD student will do one or two in-class tutorials on accessing patents and other economic data. A bit later I will set up appointments with each of you to discuss your specific interests and provide guidance on the research paper. The idea is to get you to think on your own on topics that may interest you, learn to do research on that topic, and develop good writing and presentation skills.

Assignment is worth 75 points. **Due date: latest by end of day on Sunday, May 1** (no extensions). As you know this deadline well in advance, it will be to your advantage to work on it earlier and finish up. You can turn it in any time before the deadline if you are done.

5. Course Grade

Letter grades will be based on your performance on the two tests, two quizzes, and the research paper and presentation. Given the small class, there is no predetermined system for converting numerical scores to letter grades. It will be based on the performance of all the students in the class and where your score stands relative to the class average performance. I will discuss more details during the first class. I will be happy to discuss any questions you may have.

CORE THEORY MATERIALS

Items A and B provide the **core theory** for various topics. Having taken some graduate Microeconomics will be helpful in going through these materials as I will not cover those basics in class. Items A and B are from a recommended reading: Industrial Organization: Markets and Strategies, Paul Belleflamme and Martin Peitz, Cambridge University Press, 2010. I will post my lecture slides on these topics on T-Square. Handouts for this section will be distributed in class.

A. Consumers, Firms and Markets

1. Overview of topics
2. Markets and Strategies
3. Firms, Consumers and the Market
4. Imperfect Competition: Static Models
5. Imperfect Competition: Dynamic Models

B. R&D and Intellectual Property

1. Innovation and R&D
2. Intellectual Property

ARTICLES

1. These articles will be incrementally posted on the class T-Square site. Folders will be created by category – in the "Resources" section of the site – and the articles can be found there in the order noted below. The articles below are in the same order and name as posted on T-Square.
2. Some articles we will cover in detail, while other articles will serve as informational or supplemental readings, or surveys of relevant literature. Some of the articles may give you insights into what you may want to work on for your research paper.
3. The articles denoted by * we will go over in greater or lesser detail.
4. I will announce the sequence of articles we will cover in class. (It will not follow the exact sequence noted below.) Our focus will mainly be on data and econometrics.

1. General Innovation Issues

*1999_ResPol_Surge Patenting_Kortum
*2000_NBER_Intellectual Assets_Cohen
2002_NBER_Patent Protection Innovation_Lerner
2002_ResPol_Spillover Patent Incentives_Cohen
2003_EER_Innovation Spillover_Bottazzi
2004_EJ_Patent Quality_Lanjouw
2006_ResPol_Patent Systems_Encaoua
*2013_JIE_Patent Thickets_Graevenitz
*2015_OECD_Innovation Growth_West
*2016_NBER_Data Decision Productivity_Brynjolfsson

2. Competition and Innovation

2002_OECD_Competition Innovation Productivity_Ahn
*2005_QJE_Competition Innovation_Aghion
2006_OECD_Competition Innovation_OECD1
2006_ResPol_Value Innovation_Greenhalgh
2009_OECD_Competition Innovation_OECD2
*2011_IJIO_Timing Technology Adoption_Milliou
*2013_EMetri_Technology Spillover_Bloom

3. Industry Innovation Issues

*2001_RAND_Semiconductors Patents_Hall
*2002_JLE_Pharmaceuticals_Lichtenberg
2004_ResPol_Encryption Software_Giarratana
2005_JHE_Pharma Biotech_Danzon
2005_NAT_Pharma Innovation_Cohen
*2005_MSci_Automobiles_Lieberman
2009_MSci_Hospitals_Miller
*2013_JIE_Software_Noel
*2015_Cesifo_Automobiles_Ghosal

4. Financing of Innovation

*2000_RAND_VC Innovation_Kortum
2001_JEP_VC Revolution_Gompers
*2002_SCASS_Financing Innovation_Baldwin
*2009_JFin_Financing Innovation_Brown
2010_HEI_Financing RnD_Hall
2014_NBER_Financing Innovation_Kerr

5. Environment and Innovation

*1995_HBR_Green Competitive_Porter
1995_JEP_Environment Competitiveness_Porter
2000_Tech_Environment Car_Mildenberger
2007_BSE_Cleaner Production_Frondel
*2009_NBER_Environment Technology_Popp
*2009_ResPol_Investments Productivity_Ghosal
2010_IPE_Cap Trade Innovation_Scotchmer
*2010_Tech_Forcing Technological Change_Lee
*2011_ResPol_Environmental Technology_Lee
*2013_REEP_Enviro Innovation_Ambec

ADDITIONAL RESOURCES

*We will not have time to cover these in class, but they present various interesting details.

1. Some General Readings

1. Suzanne Scotchmer. Innovation and Incentives. MIT Press, 2004. [Covers a range of innovation related topics, applied and conceptual.]
2. Adam B. Jaffee and Manuel Trajtenberg. Patents, Citations and Innovations: A Window on the Knowledge Economy. MIT Press, 2002. [Collection of interesting applied articles.]
3. Zvi Griliches. R&D, Patents and Productivity. MIT Press, 1984. [Classic applied articles.]

2. IPR and International Patent Issues

2004. Suzanne Scotchmer. "Political Economy of Intellectual Property Treaties." *Journal of Law, Economics, and Organization.*
2005. Yongmin Chen and Thitima Puttitanun. "Intellectual Property Rights in Developing Countries." *Journal of Development Economics.*
2008. Joseph Stiglitz. "Economic Foundations of Intellectual Property Rights." *Duke Law Journal.*
2009. Albert Guangzhou Hu and Gary H. Jefferson. "A Great Wall of Patents: What is Behind China's Recent Patent Explosion?" *Journal of Development Economics.*