

PPA 776
The Economics of Science and Technology
Spring 2009

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Office Hours:
Monday 10:00-11:30
Tuesday 10:00-noon
or by appointment

Course Description: In an ever-changing world, technological change both influences policy decisions and is influenced by policy. This course looks at the interaction of policy and technological change from both directions. Throughout the course, we will use examples from current policy debates to highlight important issues. The course begins with an introduction to the economic analysis of knowledge. We begin by discussing the role that knowledge plays in the economic growth of nations. Next, we look at why economists consider the creation of knowledge to be a public good, and discuss how the public goods nature of knowledge affects the creation of new knowledge. We then ask how government policy, such as patent protection and government funded R&D, influences the development of new technologies. Next, we look at the diffusion of knowledge. We begin by looking at how new knowledge is transferred, both across institutions in the industrialized world and to developing countries. Finally, we conclude by considering how technological change affects policy. For example, what policies are needed to govern information technology? Should sales taxes be collected on Internet purchases? Should drug companies receive patent protection in developing countries? How can health policy keep up with changing medical technologies?

Goals of the course: The main objective of this course is for you to learn how to think critically about issues relating to science and R&D. Upon completion of this course, you should be able to explain the economic rationale for government involvement in science policy, and be able to discuss what the impact of such involvement will be. In particular, it is hoped that the class will provide you with a better understanding of current issues relating to science and innovation.

Accomplishing these goals requires not only a mastery of some basic economic tools, but also an ability to apply these tools to real world issues. As such, much of the content of the course will apply the basic tools that we discuss in class to current event issues.

Learning to apply economics to the real world takes practice. The assignments for this class are designed to get you thinking and writing using economic analysis. In addition, classroom discussion plays an important role in developing the skills to apply economic theory to the real world. Active participation in discussions, both in class and via e-mail (discussed below) is vital to success in this course. For this reason, class participation will count towards ten percent of your course grade. Don't be afraid to participate because you feel what you have to say isn't important or may not be correct. Many of the things we will discuss in this class have no right answers. Your opinions matter! The class participation grade will consist of two components: participation in general class discussions and participation in discussions on the class e-mail discussion list. I will occasionally use the list to post follow-up questions to topics discussed in class.

Prerequisites: The prerequisite for this course is PPA 723, Managerial Economics for Public Administrators, or an equivalent course in microeconomics. If you have any questions about whether or not you have taken an appropriate course, please see me as soon as possible.

Class Home Page: The home page for this class is:

[http:// classes.maxwell.syr.edu/ppa776](http://classes.maxwell.syr.edu/ppa776)

You can also connect to the home page through my personal home page, which can be found at:

<http://faculty.maxwell.syr.edu/dcpopp/index.html>

The web site includes information about assignments, summaries of lectures, and links to other useful economic sites. These links may be particularly useful as you work on your research paper.

E-mail: All students in the class are required to have an e-mail account and to check e-mail regularly. An e-mail discussion list will be set up for the class, to which you should subscribe. Information on how to subscribe is included below. Participation in a class e-mail discussion list makes up part of your class participation grade. In addition, I will occasionally make announcements about assignments and class material via the discussion list. Not subscribing is not an appropriate excuse for missing these announcements.

E-mail discussion group: I have set up an e-mail discussion group for the class. All students are expected to subscribe to the mailing list. You may use this list for any class related activities, such as asking questions, continuing discussions from class, and instigating new discussions. I will use the list to keep you informed about assignments, answer questions, and instigate discussion. When messages are sent to the list, all students subscribed to the list will get the message.

To subscribe to the list, send an e-mail to listserv@listserv.syr.edu with the following message:

SUB EconSci Jan Smith

Note that this is all that need be in the body of the message, and that it must be typed in exactly as written, except, of course, that you should replace your name for Jan Smith. When you sign up, you will receive a message with detailed instructions for participating in the mailing list. ***This message will ask that you reply, so as to confirm that you intended to join the list. It is important that you remember to reply, or else you will not be added to the list!***

A couple of technical notes: E-mails sent to the list are sent to EVERYONE who subscribes to the list. If you want to send a personal e-mail to a specific class member (or to me), use their e-mail address, not the list's address. The list is a good place to ask questions about class materials, because everyone can see the answer. It is not the way to let me know that you are going to miss class on Wednesday. For that you should send an e-mail to me personally. Also, I am considered the owner of this list. If you experience any problems, please e-mail me directly. My e-mail address is dcpopp@maxwell.syr.edu.

Reading: The textbook for this class is *Technology, Growth, and Development: An Induced Innovation Perspective* by Vernon W. Ruttan. The text is available at the Orange Bookstore. There are several additional articles intended to supplement the text. The class web site includes links to these articles. When possible, direct links to the articles are provided. The remainder are available through the course reserve system at the Syracuse University library – a link to Blackboard, where these items can be found, is included for these articles.

The additional readings have two purposes: to expose you to influential work in the economics of innovation and to highlight the relevance of these theories to current events. The first goal is accomplished through journal articles written by professional economists. At times, these articles may get quite technical. When that occurs, you are encouraged to focus on the main arguments and conclusions of the paper, and to simply browse through the technical parts. The second goal is met by several shorter articles taken from current events publications. Articles in the *Journal of Economic Perspectives* are particularly useful, as they fall under both categories. These articles usually provide summaries of work done by professional economists on current events issues. You may also find it helpful to consult other articles in this journal for paper ideas.

In addition to required readings, the syllabus also includes optional articles. These are marked with an asterisk (*). They are not included on the on-line reading list, but should be available at the library, usually in electronic form. Optional articles provide more detail on selected topics, and may be helpful for your research papers. In particular, Ph.D. students should find the optional articles a useful way to increase their exposure to the economic literature in the field.

Grading: Masters' Students: Your grade in this course will be based on participation in class and e-mail discussions (10%), two take home quizzes (15% each), participation in one of three group policy discussions (10%), a take home final exam (20%), and a research paper (30%). The take home quizzes will be handed out in class, and due the following class meeting. They will focus on applications of the material discussed in class, and will be in the form of short problem or essay questions. The take home final will be given during the final exam period.

Ph.D. Students: In order to get you thinking about the research process, the assignments for Ph.D. students vary slightly. Ph.D. students will participate in the policy discussion, and will do a research paper. However, rather than take the exams, Ph.D. students will be expected to do a referee report of a working paper in the field. In addition, the requirement for the research paper will be different. Ph.D. students should consider the paper to be a research proposal. That is, in addition to identifying an interesting question, you should think about *how* you would go about answering the question. Note that, given the time constraints of a one-semester course, it is not necessary that you carry out the research. The grading for Ph.D. students will be: participation in class and e-mail discussions (10%), participation in one of the group policy discussions (10%), the referee report (30%), and a research paper (50%).

Finally, note that if you miss a class, it is your responsibility to find out if you missed any assignments or handouts. Not being present when an assignment was given out is **not** an acceptable excuse for missed or late work!

Research Paper: The major assignment for this class is a semester-long research paper on a topic of your choosing. The research paper will be due on the last day of class. It should be between 10 and 15 pages, double-spaced. I will hand out more details on the paper, including suggestions for topics, further into the course. The paper should apply the materials of the course to a public policy question. It should include a summary of the relevant theory that applies to your topic, and apply the theory to the problem to reach a conclusion. To make sure that you are on the right track, a one-page statement of your proposed research topic is due **Wednesday, March 4**. In it, you should state the question that you wish to address, briefly describe why it is important, and propose the means by which you will analyze your proposed topic. The final paper will be due at the beginning of our last class meeting on **Monday, April 27**.

Policy Discussions: Throughout the semester, we will look at applications of the theories discussed in class to current policy issues. To enhance the discussion of these topics, students will be divided into groups to lead discussions on three of these topics. Each student will participate in one such group during the semester. The topics and dates for each discussion are:

February 16: Patent policy reform
March 25: The TRIPS agreement
April 15: Science in America

These policy discussions are intended to give you a chance to make use of the theories that we discuss in class in an applied setting. A group of students will be assigned to each session. We will begin each topic with a short presentation to introduce the issue. Each group will then have a chance to present their interests and concerns, as well as suggestions for how policy should be changed (if at all). The class will then continue with a general discussion of the proposals presented. Members of each of the groups assigned to the topic will be expected to take a lead role in the discussion. I will announce the group assignments shortly. Students who have a preference for any of the above topics should send me an e-mail as soon as possible.

Academic Honesty: Students are expected to abide by the academic rules and regulations established by Syracuse University. These require students to “exhibit honesty in all academic endeavors. Cheating in any form is not tolerated, nor is assisting another person to cheat. The submission of any work by a student is taken as a guarantee that the thoughts and expressions in it are the student's own except when properly credited to another. Violations of this principle include giving or receiving aid in an exam or where otherwise prohibited, fraud, plagiarism, or any other deceptive act in connection with academic work. Plagiarism is the representation of another's words, ideas, programs, formulae, opinions, or other products of work as one's own, either overtly or by failing to attribute them to their true source” (*Syracuse University Bulletin* 2003-2004: p. 2). Of particular importance, while you are free to cite the views of others in your work, the final product must be *in your own words*, and any references to the works of others, whether directly quoted or merely paraphrased, must be cited. A good reference on the proper attribution of sources can be found at <http://www.dartmouth.edu/~sources/>. For more information on Syracuse University's academic integrity policies, see <http://academicintegrity.syr.edu>.

In compliance with section 504 and the Americans with Disabilities Act (ADA), Syracuse University is committed to ensure that “no otherwise qualified individual with a disability...shall, solely by reason of disability, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity...” If you feel that you are a student who may need academic accommodations due to a disability, then you should immediately register with the Office of Disability Services (ODS) at 804 University Ave., Room 309 3rd Floor, 315-443-4498 or 315-443-1371 (TDD only). ODS is the Syracuse University office that authorizes special accommodations for students with disabilities.

Reading List

I. Introduction

January 12 – Introduction

Reading: Ruttan, Chapter 1

January 14 – Technology and Economic Growth

Reading: Ruttan, chapter 2.

Easterlin, Richard A. (2000), “The Worldwide Standard of Living Since 1800,” *Journal of Economic Perspectives*, 14(1), pp. 7-26.

Grossman, Gene M. and Elhanan Helpman (1994), “Endogenous Innovation in the Theory of Growth,” *Journal of Economic Perspectives*, 8(1), pp. 23-44.

“Economic Focus: Closing the Growth Gap,” *The Economist*, October 29, 2005, 82.

“Economic Focus: The Growth Machine,” *The Economist*, May 18, 2002, 74.

*Romer, Paul M. (1990), “Endogenous Technological Change,” *Journal of Political Economy*, 98, pp. S71-S102.

II. The Economics of Knowledge

January 21 – Knowledge as a Public Good

Reading: Geroski, Paul (1995), “Markets for Technology: Knowledge, Innovation, and Appropriability,” ch. 4. in Paul Stoneman, ed. *Handbook of the Economics of Innovation and Technological Change*, pp. 90-131.

Mansfield, Edwin, John Rapoport, Anthony Romeo, Samuel Wagner, and George Beardsley (1977), “Social and Private Rates of Return from Industrial Innovations,” *The Quarterly Journal of Economics*, 91(2), pp. 221-240.

*Arrow, Kenneth, (1962), “Economic Welfare and the Allocation of Resources for Invention,” *The Rate and Direction of Inventive Activity: Economic and Social Factors*, National Bureau of Economic Research, pp. 609-625.

*Nelson, Richard, (1959), “The simple economics of basic research,” *Journal of Political Economy*, 67, pp. 297-306.

January 26 – Measuring Knowledge

Reading: May, Robert M. (1997), “The Scientific Wealth of Nations,” *Science*, 275, pp. 793-796.

Basberg, Bjorn L. (1987), “Patents and the measurement of technological change: A survey of the literature,” *Research Policy*, 16, pp. 131-141.

*Griliches, Zvi (1990), “Patent Statistics as Economic Indicators: A Survey,” *Journal of Economic Literature*, 28(4), pp 1661-1707.

*Griliches, Zvi (1995), “R&D and Productivity: Econometric Results and Measurement Issues,” ch. 3. in Paul Stoneman, ed. *Handbook of the Economics of Innovation and Technological Change*, pp. 52-89.

*Griliches, Zvi (1979), “Issues in assessing the contribution of research and development to productivity growth,” *Bell Journal of Economics*, 10, 92-116.

*“R&D and Productivity Growth,” Congressional Budget Office Background Paper, June 2005.

III. Sources of Technological Change

January 28 & February 2 – Sources of Technological Change

Reading: Ruttan, Chapters 3 & 4

Link, Albert N. and Donald S. Siegel (2003), “Sources of technological knowledge,” ch. 8 in Link and Siegel (eds.) *Technological Change and Economic Performance*, pp. 60-69.

Nemet, Gregory F. (2008), “Does Learning By Doing Improve Energy Technology?” *LaFollette Policy Report*, 17(2), pp. 17-20.

Rosenberg, Nathan (1982), “Learning by Using” *Inside the Black Box: Technology and Economics*, pp. 120-140.

“Catch the wave,” *The Economist*, February 20, 1999, pp. S7-S8.

“Companies and innovation: Less glamour, more profit,” *The Economist*, April 24, 2004, p. 11.

“Don’t laugh at gilded butterflies,” *The Economist*, April 24, 2004, pp. 71-73.

“Out of the dusty labs,” *The Economist*, March 3, 2007, pp. 74-76.

*Kortum, Samuel. and Joshua Lerner (1998), “Stronger protection or technological revolution: what is behind the recent surge in patenting?” *Carnegie-Mellon Conference Series on Public Policy*, 48, pp. 247-304.

IV. Policies to Promote Innovation

February 4 – What is Intellectual Property Protection (IPP)?

Reading Besen, Stanley M. and Leo J. Raskind (1991), “An Introduction to the Law and Economics of Intellectual Property,” *Journal of Economic Perspectives*, 5(1), pp. 3-27.

Bernstein, David, “Music Royalties Rise, Even as CD Sales Fall,” *The New York Times*, January 26, 2004, p. C6.

Levy, Steven, “Glitterati vs. Geeks,” *Newsweek*, October 14, 2002, pp. 40-42.

Varian, Hal R., “Economic Scene: The Internet carries profound implications for providers of information,” *The New York Times*, July 27, 2000, C2.

“A fine balance,” *The Economist*, January 25, 2003, p. S13-S17.

“The slow death of digital rights,” *The Economist*, October 13, 2007, p. 75.

“Twist and shout,” *The Economist*, June 11, 2005, p. 59.

*Jaffe, Adam B. (2000), “The US Patent System in Transition: Policy Innovation and the Innovation Process,” *Research Policy*, 29, pp. 531-557.

*Peitz, Martin and Patrick Waelbroeck, “An Economist’s Guide to Digital Music,” *CES Working Paper #1333*, available on-line at <http://SSRN.com/abstract=628961>.

*Varian, Hal R (2005), “Copying and Copyright,” *Journal of Economic Perspectives*, 19(2), pp. 121-138.

February 9 – How Firms Use Intellectual Property Protection

- Reading:* Greenhalgh, Christine and Mark Rogers (2007), “The value of intellectual property rights to firms and society,” *Oxford Review of Economic Policy*, 23(4), pp. 541-567.
- Levin, Richard C., Alvin K. Klevorick, Richard R. Nelson, and Sidney G. Winter (1987), “Appropriating the Returns from Industrial Research and Development,” *Brookings Papers on Economic Activity*, 3, pp. 783-831.
- “An open-source shot in the arm?” *The Economist*, June 12, 2004, pp. S17-S19.
- “Beyond capitalism?” *The Economist*, June 12, 2004, pp. 16-17.
- “Patently Absurd,” *The Economist*, June 23, 2001, pp. S40-S42.
- “The arms race,” *The Economist*, October 22, 2005, pp. S6-S12.
- *Lerner, Josh and Jean Tirole (2005), “The Economics of Technology Sharing: Open Source and Beyond,” *Journal of Economic Perspectives*, 19(2), pp. 99-120.
- *Hall, Bronwyn H. and Rosemarie Ham Zedonis (2001), “The patent paradox revisited: an empirical study of patenting in the U.S. semiconductor industry, 1979-1995,” *RAND Journal of Economics*, 32(1), 101-128.

February 11 – Case: Medical Biotechnology

- Reading:* Henderson, Rebecca. Luigi Orsenigo, and Gary P. Pisano (1999), “The Pharmaceutical Industry and the Revolution in Molecular Biology: Interactions Among Scientific, Institutional, and Organizational Change,” ch. 7 in *Sources of Industrial Leadership: Studies of Seven Industries*, David C. Mowery and Richard R. Nelson, eds, Cambridge University Press, Cambridge, UK, pp. 267-311.
- Tedeschi, Bob, “E-commerce: As the debate continues, opinions are divided over the merits of allowing online drug purchases from Canada,” *The New York Times*, March 8, 2004, C4.
- Davey, Monica, “Illinois to Help Residents Buy Drugs from Canada and Afar,” *The New York Times*, August 17, 2004.
- “Beyond the pill,” *The Economist*, October 27, 2007, p. 76.
- “The bitterest pill,” *The Economist*, January 26, 2008, pp. 62-63.
- “Testing times,” *The Economist*, June 18, 2005, pp. S5-S10.

February 16 IPP Policy Issues

- Reading:* Hunt, Robert M., “You Can Patent That? Are Patents on Computer Programs and Business Methods Good for the New Economy?” *Business Review*, Quarter 1, 2001, pp. 5-15.
- Lemley, Mark A. and Carl Shapiro (2005), “Probabilistic Patents,” *Journal of Economic Perspectives*, 19(2), pp. 75-98.
- Barnes, Robert and Alan Sipress, “Rulings Weaken Patents’ Power: High Court Decides on Two Key Cases,” *The Washington Post*, May 1, 2007, p. D1.
- Varian, Hal R., “Economic Scene: A patent that protects a better mousetrap spurs innovation. But what about one for a new way to amuse a cat?” *The New York Times*, October 21, 2004, C2.
- National Academies (2004), “Patent System for the 21st Century: Summary of a STEP Board Report.”
- “A patent improvement,” *The Economist*, September 8, 2007, S28-S29.
- “Inventive ideas,” *The Economist*, November 8, 2003, p. 63.
- *Gallini, Nancy T. (2002), “The Economics of Patents: Lessons from Recent U.S. Patent Reform,” *Journal of Economic Perspectives*, pp. 131-154.

February 18 & 23– Government Subsidies of R&D

Reading: Ruttan, chapter 13, pp. 534-562.

Hall, Bronwyn and John Van Reenen (2000). “How Effective are Fiscal Incentives for R&D? A Review of the Evidence,” *Research Policy*, 29, pp. 449-469.

David, Paul A., Bronwyn H. Hall, and Andrew A. Toole (2000), “Is Public R&D a Complement or Substitute for Private R&D? A Review of the Econometric Evidence,” *Research Policy*, 29, pp. 497-529.

Goolsbee, Austan, “What Baseball Can Teach Those Who Dream of Creating the Next Silicon Valley,” *The New York Times*, August 17, 2006, C3.

Leonhardt, David, “You Want Innovation? Offer a Prize,” *The New York Times*, January 31, 2007, p. C1, C6.

Safire, William, “California’s Stem Cell Gold Rush,” *The New York Times*, December 15, 2004, A33.

“Science and Profit,” *The Economist*, February 17, 2001, pp. 21-22.

“Outrageous Fortune,” *The Economist*, May 19, 2001, pp. 77-78.

*Murray, Fiona and Scott Stern (2007), “When Ideas Are Not Free: The Impact of Patents on Scientific Research,” in *Innovation Policy and the Economy vol. 7*, Adam B. Jaffe, Josh Lerner, and Scott Stern (eds.), MIT Press, Cambridge, MA, pp. 33-69.

Take home quiz 1 handed out in class on Wednesday, February 25. Due in Class Monday, March 2.

V. Diffusion of Knowledge

February 25 – Technology Transfer

- Reading:* Bozeman, Barry (2000), “Technology transfer and public policy: a review of research and theory,” *Research Policy*, 29, pp. 627-655. (skim sec. 6)
- Mowrey, David C. and Timothy Simcoe (2002), “Is the Internet a US invention – an economic and technological history of computer networking,” *Research Policy*, 31, pp. 1369-1387.
- “Research and Development: Funds and Technology Linkages,” chapter 4 in *Science and Engineering Indicators: 2006*. Read pages 4-19 to 4-38.
- *Jaffe, Adam B. and Josh Lerner (2001), “Reinventing public R&D: patent policy and the commercialization of national laboratory technologies,” *RAND Journal of Economics*, 32(1), pp. 167-198.
- *Vonortas, Nicholas (1997), “Research joint ventures in the US,” *Research Policy*, 26, pp. 577-595.

March 2 – Government Policy For Diffusion

- Reading:* Ruttan, Chapter 13, pp. 563-590.
- Flanigan, James, “The Route From Research to Start-Up,” *The New York Times*, January 18, 2007, p. C16.
- Kunhardt, Erich E., “Necessity as the Mother of Tenure?” *The New York Times*, December 14, 2004, A33.
- Morrissey, Susan R., “Maximizing Returns,” *Chemical & Engineering News*, September 15, 2003, pp. 17-20.
- “Baying for blood or Doling out cash?” *The Economist*, December 24, 2005, p. 109.
- *Sampat, Bhaven N. (2006), “Patenting and US academic research in the 20th century: The world before and after Bayh-Dole,” *Research Policy*, 35, pp. 772-789.

March 4 – Theories of Diffusion

- Reading:* Ruttan, Chapter 5
- “Lock and Key,” *The Economist*, September 18, 1999, p. 88.
- “Getting the message,” *The Economist*, March 4, 2006, p. 61.
- *Griliches, Zvi (1957), “Hybrid Corn: An Exploration of the Economics of Technological Change,” *Econometrica*, 25, pp. 501-522.
- *Hall, Bronwyn (2004), “Innovation and Diffusion,” *NBER Working Paper #10212*.
- *Karshenas, Massoud and Paul Stoneman (1995), “Technological Diffusion,” ch. 7 in Paul Stoneman, ed. *Handbook of the Economics of Innovation and Technological Change*, pp. 265-297.

Statement of Research Topic Due Wednesday, March 4

VI. International Technology Diffusion

March 16 & 18 – International Technology Diffusion

- Reading:* Keller, Wolfgang (2001), “International Technology Diffusion,” *NBER Working Paper #8573*.
- Mansfield, Edwin and Anthony Romeo (1980), “Technology Transfer to Overseas Subsidiaries by U.S.-Based Firms,” *The Quarterly Journal of Economics*, 95(4), pp. 737-750.
- Lanjouw, Jean Olson and Ashoka Mody (1996), “Innovation and the international diffusion of environmentally responsive technology,” *Research Policy*, 25, pp. 549-571.
- World Investment Report 2005: Transnational Corporations and the Internationalization of R&D*, United Nations Conference on Trade and Development, chapters V & VI.
- *Krugman, Paul (1995), “Technological Change in International Trade,” ch. 9 in Paul Stoneman, ed. *Handbook of the Economics of Innovation and Technological Change*, pp. 342-365.
- *Coe, David T. and Elhanan Helpman, (1995), International R&D spillovers, *European Economic Review*, 39, pp. 859-887.

March 23 & 25 – International Technology Policy

- Reading:* “Acquiring Knowledge,” chapter 2 in *World Development Report 1998/99: Knowledge for Development*, World Bank.
- Allam, Abeer, “Seeking Investment, Egypt Tries Patent Laws,” *The New York Times*, October 4, 2002, pp. W1, W7.
- Dugger, Celia W., “Study Finds Small Developing Lands Hit Hardest by ‘Brain Drain,’” *The New York Times*, October 25, 2005, p. A9.
- “Fruit that falls far from the tree,” *The Economist*, November 5, 2005.
- “Intellectual property in India: Developing,” *The Economist*, April 14, 2001, p. 58.
- “Patently problematic,” *The Economist*, September 14, 2002, pp. 75-76.
- “Patents and the poor: The rights to good ideas,” *The Economist*, June 23, 2001, pp. 21-23.
- *Forero-Pineda, Clemente (2006), “The impact of stronger intellectual property rights on science and technology in developing countries,” *Research Policy*, 35, pp. 808-824.
- *Hershberg, Eric, Kaoru Nabeshima & Shahid Yusuf (2007), “Opening the Ivory Tower to Business: University-Industry Linkages and the Development of Knowledge-Intensive Clusters in Asian Cities,” *World Development*, 35(6), 931-940.
- *Hu, Mei-Chih and John A. Mathews (2008), “China’s national innovation capacity,” *Research Policy*, 37, 1465-1479.

March 30 – Examples of Technology in Developing Countries

- Reading:* Frew, Sarah E., Rahim Rezaie, Stephen M. Sammut, Monali Ray, Abdallah S. Daar & Peter A. Singer (2007), “India’s health biotech sector at a crossroads,” *Nature Biotechnology*, 25(4), 403-417.
- Dugger, Celia W., “A Bounty of Rice for Africa, Just Out of Reach,” *The New York Times*, October 10, 2007, pp. A1, A12.
- “Imitate or die,” *The Economist*, November 10, 2007, pp. S10-S12.
- “Leapfrogging or piggybacking?” *The Economist*, November 10, 2007, pp. S4-S10.
- “Local heroes,” *The Economist*, February 3, 2007, pp. 79-80.
- “Of internet cafés and power cuts,” *The Economist*, February 9, 2008, 75-77.
- “The next big thing,” *The Economist*, June 18, 2005, pp. S17-S19.
- “Racing down the pyramid,” *The Economist*, November 15, 2008, 76.
- “Southern comfort, eastern promise,” *The Economist*, December 11, 2004, pp. 78-79.
- “To do with the price of fish,” *The Economist*, May 12, 2007, p. 84.
- “Transcending the genre,” *The Economist*, November 10, 2007, p. S6.

April 1 – Drug Patents in Developing Countries

- Reading:* Attaran, Amir and Lee Gillespie-White (2001), “Do Patents for Antiretroviral Drugs Constrain Access to AIDS Treatment in Africa?” *Journal of the American Medical Association*, 286(15), pp. 1886-1892.
- Barder, Owen, Michael Kremer, and Heidi Williams (2006), “Advance Market Commitments: A Policy to Stimulate Investment in Vaccines for Neglected Diseases,” *Economists’ Voice*, 3(3), article 1.
- Kremer, Michael (2002), “Pharmaceuticals and the Developing World,” *Journal of Economic Perspectives*, 16(4), pp. 67-90.
- McNeil Jr., Donald G., “India Alters Law on Drug Patents,” *The New York Times*, March 24, 2005, p. A1.
- Petersen, Melody, “Lifting the Curtain on the Real Costs of Making AIDS Drugs,” *The New York Times*, April 24, 2001, pp. C1, C10.
- Varian, Hal R., “Economic Scene: A big factor in prescription drug pricing: Location, location, location,” *The New York Times*, September 21, 2000, p. C2.
- “A gathering storm,” *The Economist*, June 9, 2007, pp. 71-72.
- “A promising prognosis,” *The Economist*, September 10, 2005, p. 76.
- “Foundation,” *The Economist*, January 29, 2005, pp. 76-77.
- “How Dr Chan intends to defend the planet from pandemics,” *The Economist*, June 16, 2007, pp. 67-68.
- “Quagmire to goldmine,” *The Economist*, May 17, 2008, pp. 77-78.

Take home quiz 2 handed out in class on Wednesday, April 1. Due in Class Monday, April 6.

VII. Information Technology and the Economy

April 6 – Information Technology Policy Issues

- Reading:* Varian, Hal and Carl Shapiro (1997), “U.S. Government Information Policy”.
Chevalier, Judith, “In Search of Wireless Wiggle Room,” *The New York Times*, October 21, 2007.
Levy, Steven, “Info With a Ball and Chain,” *Newsweek*, June 23, 2003, p. 59.
Varian, Hal R., “Economic Scene: In the clash of technology and copyright, file-sharing is only the latest battleground,” *The New York Times*, April 7, 2005, p. C2.
“Changing the rules,” *The Economist*, October 14, 2006, pp. S16-S18.
“Freeing the airwaves,” *The Economist*, May 31, 2003, p. 76.
“On the same wavelength,” *The Economist*, August 14, 2004, pp. 61-63.
“Open up those highways,” *The Economist*, January 19, 2008, 65.

April 8 – Taxation and the Internet

- Reading:* Goolsbee, Austin (2001), “The Implications of Electronic Commerce for Fiscal Policy (and Vice Versa),” *Journal of Economic Perspectives*, 15(1), pp. 13-23.
Tagilabue, John, “From Europe, Creative Taxation,” *The New York Times*, September 28, 2000, pp. C1, C14.
“The tap runs dry,” *The Economist*, May 31, 1997, pp. 21-23.

April 13 – The Digital Divide

- Reading:* Campbell, Duncan (2001), “Can the digital divide be contained?” *International Labour Review*, 140(2), 119-141.
Chinn, Menzie D. and Robert W. Fairlie (2005), “Assessing the Global Digital Divide,” *LaFollette Policy Report*, 15(1), pp. 1-2 & 10-14.
Compaine, Benjamin M. (2001), “Re-examining the Digital Divide,” ch. 12 in *Communications policy in transition: The Internet and beyond*, Benjamin M. Compaine and Shane Greenstein eds., pp. 321-348.
“The real digital divide,” *The Economist*, March 12, 2005, p. 11.
“Calling across the divide,” *The Economist*, March 12, 2005, p. 74.
“Canyon or mirage?” *The Economist*, January 24, 2004, p. 69.
“Reality bites,” *The Economist*, September 1, 2007, pp. 61-62.
“Wi-Pie in the sky?” *The Economist*, March 11, 2006, pp. S22-S24.

VI. Policy Issues

April 15 – Science in America

Reading: “How is America Doing Now in Science and Technology?” chapter 3 in *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, National Academies Press, 2007.

Freeman, Richard B. (2006), “Does Globalization of the Scientific/Engineering Workforce Threaten U.S. Economic Leadership?” ch. 5 in *Innovation Policy and the Economy*, vol 6, Adam B. Jaffe, Josh Lerner, and Scott Stern, eds., pp. 123-157.

Freeman, Richard and John Van Reenen (2008), “What if Congress Doubled R&D Spending on the Physical Sciences?” mimeo handout.
 “A gathering storm?” *The Economist*, November 22, 2008, 73-74.

April 20 – Energy, the Environment, and Technological Change

Reading: Holdren, John P. (2006), “The Energy Innovation Imperative: Addressing Oil Dependence, Climate Change, and Other 21st Century Energy Challenges,” *innovations*, pp. 3-23.

Jaffe, Adam B., Richard G. Newell, and Robert N. Stavins, “Technology Policy for Energy and the Environment,” in Adam B. Jaffe, Josh Lerner, and Scott Stern, eds., *Innovation Policy and the Economy*, vol 4, MIT Press: Cambridge, MA, pp. 35-68, 2004.

Revkin, Andrew C., “Budgets Falling in Race to Fight Global Warming,” *The New York Times*, October 30, 2006, pp. A1, A14.

April 22 – Technology and Health Care

Reading: Glied, Sherry (2003), “Health Care Costs: On the Rise Again,” *Journal of Economic Perspectives*, 17(2), pp. 125-148.

Gelijns, Annetine C., Joshua Graff Zivin, and Richard R. Nelson (2001), “Uncertainty and Technological Change in Medicine,” *Journal of Health Politics, Policy and Law*, 26(5), pp. 913-924.

Dewar, Diane M. (1997), “Medical Technology in the United States and Canada: Where Are We Going?” *Review of Social Economy*, 55(3), pp. 359-378.

Harris, Gardiner, “British Balance Gain Versus Cost of Latest Drugs,” *The New York Times*, December 3, 2008, A1, A18.

“The cost of living,” *The Economist*, June 18, 2005, pp. S14-S16.

April 27 – Antitrust Issues

Reading: Hart, David M. (2001), “Antitrust and technological innovation in the US: ideas, decisions, and impacts 1890-2000,” *Research Policy*, 30, 923-936.

“Knowledge is power,” *The Economist*, September 23, 2000, pp. S27-S32.

“Slackers or pace-setters?” *The Economist*, May 22, 2004, p. 72.

“Stay Vigilant,” *The Economist*, September 22, 2007, p. 17.

RESEARCH PAPERS DUE IN CLASS MONDAY, APRIL 27

TAKE HOME FINAL EXAM WILL BE AVAILABLE TO SIGN OUT DURING EXAM WEEK