Georgia Institute of Technology

School of Economics

Spring 2016

ECON 4360/8803
Economics of Telecommunications Networks

Wednesday 5:05 p.m. - 7:55 p.m.

Instructor: *Mikhail Klimenko*

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E-mail*: *Use the e-mail link on the t-square site of this course*

Office Hours: *TBA*

Course Webpage: *Important announcements and assignments will be posted on the t-square site set up for this course. All students must have access to the site and check it regularly.*

Course Overview

This course examines the economic, public policy, and business strategy issues related to the telecommunications industry. The aim of the course is twofold: first, to provide you with basic economics of competition, regulation and evolution of the telecommunications markets; and second, to show how public policy and business strategy perspectives can be employed to analyze the telecommunications industry in historical and future contexts.

We do not use a textbook in this course. Instead we will draw upon a series of papers, articles and chapters from edited volumes. Some of these reading materials are available on the World Wide Web. Articles in most journals are available in electronic format through Georgia Tech library. Those readings that are not available on the Web or through the library's database of electronic journals will be placed on reserve.

At the beginning of the course, classes will be primarily lectures, as we review the economics of networks and telecommunications regulation. The second half of the course will be conducted in a seminar style with occasional lectures. This means that students will be required to lead the

* E-mail caveat: Due to the large number of electronic messages, it will often not be possible for me to respond to individual electronic queries. Therefore, I urge you to be selective in sending me electronic mail, t-square messages, and etc. If you have questions, it would be best if you talk to me right before or after class or during the office hours.

discussion of some of the reading materials. Prior to each discussion, students are required to distribute to the class a summary of the key ideas and issues of the material they are assigned. This may be presented in the bullet form or in the form of PowerPoint slides.

Some of the classes will be devoted to the discussion of the Harvard Business School case studies. The cases can be purchased on-line at the HBS Publishing website: https://cb.hbsp.harvard.edu/cbmp/access/45579041 . Before the discussion, I will prepare a few questions based on the case and you will have to write a report addressing those questions. I encourage you to prepare the cases in groups/teams (2-4 students in each group) and to submit joint reports on the cases. Each member of a group consisting of more than two students should also submit his/her evaluation of the other members' contributions toward the preparation of the report. The evaluations should be on a scale from 1 to 100 and should measure the relative efforts made by group members rather than the share of the total work done for the report. The evaluations by individual members should be submitted to me in sealed envelopes together with the group report on the case or the paper. I will average the contribution scores awarded to each member by his group and multiply these averages by the group's score for the case. These will be the scores for individual group members for the report. I will not grade reports submitted without evaluations from every group member.

The reports should be not more than 10 double-spaced pages in length, excluding title page, footnote page, reference page, and appendix with graphs and diagrams (if included). You should use 12 point Times New Roman font. The report should have the margins measuring one inch on sides, top, and bottom. Any quote or statistics drawn from another source must be cited. All reports should be handed or e-mailed to me before the beginning of the classes at which the assigned cases and papers are discussed. Late assignments will not be accepted, and your grade will be zero for that assignment.

One of the teams will be asked to make a presentation of the main ideas of the case and lead its discussion among other members of the class. Teams are expected to use PowerPoint to make case study presentations. Teams are also expected to send the file with PowerPoint slides to me and other members of the class prior to the case discussion.

Each team is also required to write a final paper for this course. Teams can pick any topic related to economic or public policy issues in the telecommunications industry. After discussing the topic with me, teams should submit a one-page outline of the paper, which is due March 16th. During the last week of classes, each team will be asked to make a short presentation of the main ideas of its paper in class. Teams don't have to submit their papers at the time of presentation. The paper is due at the official time of the final exam. (We don't have the final exam but I use its official time as the due time for the final paper.)

Grades will be based upon the following items: class participation (10%), the homework assignment (20%), leading the discussion of assigned readings (20%), case study reports and presentations (25%), and final research paper and its presentation (25%). For each assignment you will receive an absolute and a standardized score. The final grade will be calculated by taking the weighted average of your standardized scores for the assignments. The cutoff for an 'A' will be one-half standard deviation. The cutoff for a 'C' will be minus one-half standard deviation. 'B' will be between the cutoffs. Undergraduate and graduate students will be graded on separate curves.

Attendance in class is required. Students are responsible for all class lectures, case studies, and required readings and are expected to have read the required materials before the beginning of each class.

If you are taking the class pass/fail, you need to attend the class regularly, do the homework assignment, submit the research papers and the case reports, take part in the case discussions, and obtain a 'C' in the class to get a satisfactory grade.

Important announcements as well as messages to individual students will be sent via the t-square website. All students must have and use an account on this site, available through the OIT.

Class Schedule and Reading Assignments. (Subject to change as the course progresses.)

Weeks	Dates	Reading assignments
1	01/13	**Introduction. Basics telecommunications concepts.**
2	01/20	**Industry Overview. Interactions among the production technology, regulatory policy, and industry structure. Natural Monopoly.** • W.W. Sharkey, "Representation of technology and production," in Martin Cave et al. (eds.), *Handbook of Telecommunications Economics*, Volume I, North-Holland: Amsterdam, 2002. (Chapters from this volume are available as on-line through the GT library.) **Theory of Economic Regulation.** • Viscusi, W. K., J. M. Vernon, J. E. Harrington (**VVH**), 2000, *Economics of Regulation and Antitrust*. Cambridge, Mass.: MIT Press. Ch. 10. Introduction to Economic Regulation. (Chapters from this volume are available as on-line through the GT library.)
3	01/27	• *Brian Levy & Pablo T. Spiller, 1994. "The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunications Regulation," *Journal of Law, Economics and Organization*, vol.10, n.2, pp.210-241. • *A. Shleifer, "Efficient Regulation," Harvard University Working Paper, January 2010. http://scholar.harvard.edu/files/shleifer/files/efficient_regulation_010610.pdf

4	02/03	**Economic Theory of Natural Monopoly.** • **VVH**. Ch. 11. Theory of Natural Monopoly. • *Serafica, Ramonette, 1998, "Was PLDT a Natural Monopoly? An Economic Analysis of pre-reform Philippine telecoms," *Telecommunications Policy* 22, n. 4/5, pp. 359-370. **Regulating Natural Monopoly.** • **VVH.** Ch. 12. Natural Monopoly Regulation. • Economides, Nicholas, "Telecommunications Regulation: An Introduction," in Richard R. Nelson (ed.) *The Limits and Complexity of Organizations*, Russell Sage Foundation Press, New York, 2005 http://www.stern.nyu.edu/networks/Telecommunications_Regulation.pdf **Case Study: *Regulating Broadband in Chile: The Debate Over Open Access*. (Harvard Business School and Kennedy School of Government Case HKS670).**[1]
5	02/10	**Evolution from monopoly to competition in the telecommunications industry.** **VVH**, Ch. 15. Dynamic Issues in Natural Monopoly Regulation: Telecommunications. • *Brock, G. "Historical overview of telecommunications regulatory structure," in *Handbook of Telecommunications Economics*, V. 1, Ch. 2, pp. 44-75. • Vickers, John, 1997, Regulation, Competition and the Structure of Prices, *Oxford Review of Economic Policy*, v. 13, n. 1 **Case Study: *Bridging the Digital Divide: Indosat's Drive for Broadband Penetration in Indonesia* (Harvard Business School Case HKU784)**
6	02/17	• Mark Armstrong & David E.M. Sappington, 2006. "Regulation, Competition and Liberalization," *Journal of Economic Literature*, vol. 44(2), pages 325-366. • *Spulber, D., 2002 , "Competition Policy in Telecommunications," in *Handbook of Telecommunications Economics*, V. 1, Ch. 2, pp. 478-507.
7	02/24	**Economics of Networks I: Externalities. Interconnection and Access Pricing.** • Economides, Nicholas, 2007. "The Internet and Network Economics," in *Internet and Digital Economics. Principles, Methods and Applications.* Cambridge University Press, 2007, pp. 239-267. (A version of this chapter is available at http://www.stern.nyu.edu/networks/Economides_Internet_and_Network_Economics.pdf) • Oz Shy, (**OS**) *The Economics of Network Industries.* Cambridge University Press, 2001. Chapter 5 (Sections 5.1 and 5.2). (Chapters from this volume are available as on-line through the GT library.) http://site.ebrary.com.prx.library.gatech.edu/lib/gatech/home.action • *Shapiro C. and H. Varian, 1999, *Information Rules*. Harvard Business School Press. Ch. 7. (Available on-line as a part of the HBS Publishing coursepack with case studies.) • *Liebowitz, S. and Margolis, S., Ch. 3 in *Handbook of Telecommunications Economics*, V. 1, pp. 76-97.

[1] The Harvard Business School cases can be purchased on-line at the HBS Publishing website, which contains the coursepack for this course: https://cb.hbsp.harvard.edu/cbmp/access/45579041

8	03/02	**Economics of Networks II: Interconnection and Access Pricing.** • Economides, Nicholas and Lawrence White, 1995, Access and Interconnection Pricing: How Efficient is the Efficient Component Pricing Rule? *The Antitrust Bulletin*, vol. XL, no. 3, pp. 557-579. (Also available at http://raven.stern.nyu.edu/networks/95-04.pdf) • **OS** Ch.5, Section 3. • *Noam, E., "Interconnection Practices," Ch. 9 in *Handbook of Telecommunications Economics*, V. 1, pp. 387-424 **Case Study: *Interconnectivity in China's Telecoms Market.* (Harvard Business School Case HKU597).** **Homework assignment will be distributed**
9	03/09	**Economics of Networks III: Standardization and Compatibility**. • Besen, S. and J. Farell., 1994, Choosing How to Compete: Strategies and Tactics in Standardization, *The Journal of Economic Perspectives*, v. 8, n. 2, p. 117-131. • **OS** Ch.4. • *Shapiro and Varian, Ch. 8, 9. **Case Study: *Adobe Systems, Inc.* (Harvard Business School Case 801199).**
10	03/16	**Economics of the Internet infrastructure, Internet applications and e-commerce**. • Kende, M. (2000). "The Digital Handshake: Connecting Internet Backbones". *Journal of Communications Law & Policy*, v. 11, pp. 1–45 http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp32.pdf • Economides, Nicholas, "The Economics of the Internet Backbone," in *Handbook of Telecommunications*. Amsterdam: Elsevier Publishers (2006). http://www.stern.nyu.edu/networks/ECONOMICS_OF_THE_INTERNET_BACKBONE.pdf • *Eisenach, Jeffrey (2012) "Broadband competition in the Internet ecosystem," AEI Economic Studies Series. http://www.aei.org/files/2012/10/17/-broadband-competition-in-the-internet-ecosystem_164734199280.pdf • * Krämer, J., Wiewiorra, L., & Weinhardt, C. (2012). Net neutrality: A progress report. *Telecommunications Policy*, 37(9). 794–813. **Case Study: *Huawei: Cisco's Chinese Challenger*. (Harvard Business School Case HKU599).**
11	03/23	***Spring Recess***.

12	03/30	**Economics of Wireless Communications and Spectrum Auctions.** • Joshua Gans, Stephen King and Julian Wright, 2005, "Wireless Communications," in *Handbook of Telecommunications Economics*, Volume II, Martin Cave et.al. (eds.), North-Holland: Amsterdam, (forthcoming). Download from the author's website: http://profile.nus.edu.sg/fass/ecsjkdw/WirelessCommunications_Final.pdf • Gandal, N., Salant, D., and L. Waverman, 2003, "Standards in wireless telephone networks, " *Telecommunications Policy*, v. 27, n. 5/6, pp.325-332. • *Gao, P., Yu, J., & Lyytinen, K. (2014). Government in standardization in the catching-up context: Case of China's mobile system. *Telecommunications Policy*, 38(2), 200-209. • Campbell-Kelly, M., Garcia-Swartz, D., Lam, R., & Yang, Y. (2015). Economic and business perspectives on smartphones as multi-sided platforms. *Telecommunications Policy*, 39(8), 717–734. • *Clarke, R. N. (2014). Expanding mobile wireless capacity: The challenges presented by technology and economics. Telecommunications Policy, 38(8), 693-708. **Case Study: *NTT DoCoMo: Establishing Global 3G Standards.* (Harvard Business School Case HKU241.)** • Federal Communications Commission (FCC). "All About Auctions." http://library.lp.findlaw.com/articles/00026/003028.pdf • McAfee, P. and J. McMillan, Analyzing the Airwaves Auctions, *Journal of Economic Perspectives*, Winter 1996, vol. 10, n.1, p. 159-175. • McMillan, J., "Why Auction the Spectrum?" *Telecommunications Policy*, April 1995, 19, p. 191-99.
13	04/06	• *Noam, Eli, "Spectrum Auctions: Yesterday's Heresy, Today's Orthodoxy, Tomorrow's Anachronism. Taking the Next Step to Open Spectrum Access." *Journal of Law & Economics* 1998, 41 (S2), p. 765-90. • Lehr, W., Merino Artalejo, M., Eisner Gillet, S., 2003, "Software Radio: Implications for Wireless Services, Industry Structure, and Public Policy," in *Communications and Strategies* 49, p. 15-42 http://people.csail.mit.edu/wlehr/Lehr-Papers_files/LehrGillettMerino%20Software%20Radio%20Comp%20Strategy.pdf • *Chapin, J., & Lehr, W. (2011, September). Mobile broadband growth, spectrum scarcity, and sustainable competition. TPRC. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1992423 **Case Study: YouTube, Google, and the Rise of Internet Video (Harvard Business School Case KEL403).**
14	04/13	**Satellite and Optical Communication Networking** • Federal Communications Commission (FCC). "Regulating Satellite Networks: Principles and Process." http://www.fcc.gov/connectglobe/sec8.html • Ch. 3, "Scarce Resources: Radio Spectrum and Orbital Positions," in *An Introduction to International Telecommunications Law* by C. Kennedy and V. Pastor, Artech House: Norwood, MA, 1996. • *Macauley, Molly K. "Allocation of Orbit and Spectrum Resources for Regional Communications: What's at Stake?" *Journal of Law & Economics* 1998, 41 (S2), p. 737-64. **Case Study: Rise and Fall of Iridium. *(Harvard Business School Case 601040.)***

15	04/20	**Global Telecommunications. Trade in telecommunications services.** • Cowhey and Klimenko, 2001, "The WTO Agreement and Telecommunications Policy Reform." Download from https://openknowledge.worldbank.org/handle/10986/19661 • Klimenko, M., 2009, "Policies and International Trade Agreements on Technical Compatibility for Industries with Network Externalities," *Journal of International* Economics 77 (2009): 151–166. • *Frieden, R., "Balancing Equity and Efficiency Issues in the Management of Shared Global Radiocommunication Resources," 24 *University of Pennsylvania Journal of International Economic Law*, No. 2, 289-327 (Summer, 2003). http://papers.ssrn.com/sol3/papers.cfm?abstract_id=360541 **Case Study: *NTT DoCoMo - Joint Venture with Tata in Indian Mobile Telecom*. (*Harvard Business School Case W10004.*)** **Team Presentations.**