The Sam Nunn School of International Affairs

Georgia Institute of Technology

INTA 3044/8803 – Global Politics of Technology

FALL 2023

MW, 2:00-3:15pm
760 Spring St NW Room 235

Instructor: Dr. Diane Alleva Cáceres

Office Hours: By Appointment; Office - Scheller 4106

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OVERVIEW

In this course, we will examine the economic and political dynamics that influence how regulations governing technology are created and adopted around the world. We also explore why some countries are better than others at innovating.

Goals

By the end of this course, students will be able to:

- Identify, compare and evaluate different sets of policies and institutions (finance, research & development, skills, other) governing different types of technologies across countries;
- Apply theoretical frameworks towards understanding science, technology, and innovation and its impact on economic change;
- Trace a technology over time alongside regulations/institutions designed to govern it;
- Research, analyze and write a Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis and Strategy Recommendation study. Alternatively, students may choose to prepare a policy memo.

This course will investigate the economic and political dynamics technological innovation and the role that policies and institutions play in its diffusion globally. It is divided into four modules:

PART I Defining and Understanding Science, Technology, and Innovation

PART 2 Explaining the Process of Technological Innovation, Diffusion, and Economic Change: Some Theoretical Frameworks and Cases

PART 3 The Role of Regulatory and Technology Standards

PART 4: Governance, Globalization, and STI Policy

We ask: How do we define institutions, particularly science and technology ones? What do we mean by technology? Why do countries adopt similar or different science, technology, and innovation strategies, regulations, and standards in support of economic growth? What are the different paths that technological innovation and diffusion take and how do they impact productivity and competitiveness? Who governs these processes and how? Ultimately these questions help us understand the role of government, markets, and society in shaping global technological and economic change. While the subject is vast, the scope of the course helps keep it manageable. It draws from the scholarly and popular literature as well as industry examples such as digital technology, agribusiness, energy, life sciences and advanced manufacturing. The course also compares US technology innovation strategies with those of Europe, Asia, and selected developing countries, among others.

The course is open to advanced undergraduates and graduate students. Prior work in political science or economics is strongly recommended**.**

I have tried to keep your weekly readings to a manageable level. The course delves more deeply into economic, political, and technological elements. However, you are given flexibility to choose research topics of particular interest to you.

Please keep apprised of current issues regarding the economic and political dynamics of technological innovation by reading a good daily or weekly publication such as The Wall Street Journal, The Financial Times, The New York Times, and/or The Economist. I will also be posting current event articles on Canvas from time to time. These will help link some of the more conceptual themes in the course with real world events.

COURSE REQUIREMENTS

Papers, Projects, Participation and Grades:

Research Paper: 40%. The course requires a 15-20-page, double-spaced research paper (not an essay). The study should examine a research question of your choosing related to any one of the syllabus' four modules or their subtopics. (Portions of paper due throughout the course).

Policy Memo: 35%. Choose a fellow student to collaborate on researching, analyzing, and writing a 15-20-page, double-spaced Policy Memo. Choose government department or political insitution that is confronted by a major global technology issue/opportunity/challenge related to climate change, nuclear energy, digital security, health, fintech, artificial intelligence (AI), or another of your choosing. The instructor will provide sample formats. The goal is to gain experience in clearly writing a Policy Memo that persuades policy/strategy decision-makers to support what you argue to be the most efficient and effective policy/strategy. Details to be discussed at the beginning of the course.

Class Participation: 25%. Class participation is critical to the success of this course. I expect each student to attend all classes and read all assignments prior to the start of each class. In addition, your active engagement in discussions, group projects, and presentations are required:

1. **A 20-minute power-point presentation/critical analysis of an assigned reading** for that class (given the number of students in the course, it will be necessary to partner with another student), and
2. **A 5-minute report/presentation on the latest technology/regulatory news.** The report should define the technology/regulation, address why you think it is important, identify risks, and anticipate how it might impact society (positive and negative).
3. **A major in-class group project** requires students to choose a technology (sample list provided), trace and compare its evolution in two countries alongside regulatory regimes and other institutions from creation to adoption or displacement. Your group will then present your findings to the class. Groups will be formed during the class prior to the first day of the project. These elements comprise your participation grade. All views are welcome as we all learn from each other's insights.

Student Honor Code/Academic Honesty: Adherence to the Student Honor Code is expected. The Academic Honor Code is explained in detail in the GIT General Catalogue or at http://www.deanofstudents.gatech.edu/Honor/. Any instance of suspected academic

dishonesty (e.g., plagiarism; cheating on an examination) will be referred to the Office of the Dean of Students for disciplinary action.

Electronic Media: Please turn off your cell phone before class. Laptops are permitted ONLY for research and reference during class.

Canvas: Canvas will be used as a general bulletin board for the class and site for materials and added readings. It is your responsibility to access this important information source often.

Special Note: The instructor reserves the right to change session topics, project due dates, assignments throughout the semester. However, students will be given adequate notice of changes.

Use of Artificial Intelligence Tools (ChatGPT + Others)

To be discussed in class.

Be aware of the limits of ChatGPT, such as the following:

- If you provide minimum-effort prompts, you will get low-quality results. You will need to refine your prompts in order to get good outcomes. This will take work.

- Don't trust anything it says. If it gives you a number or fact, assume it is wrong unless you either know the answer or can check with another source. You will be responsible for any errors or omissions provided by the tool. It works best for topics you understand.

- AI is a tool, but one that you need to acknowledge using. Please include a description at the end of any assignment that uses AI explaining what you used the AI for and what prompts you used to get the results. Failure to do so is in violation of academic honesty policies.

- Be thoughtful about when this tool is useful. Don't use it if it isn't appropriate for the case or circumstance.

- If you use AI on any assignment, that assignment will be held to a higher standard when grading.

COURSE READINGS

Readings designated with a "◆" symbol are downloadable from Canvas

PART I	Defining and Understanding Science, Technology, and Innovation

WEEK 1	Course Introduction, Questions, and Concepts

Aug. 21

Course Introduction
Student Introductions
Syllabus Review

Aug. 23

How do we define science? Technology? Innovation?

How do we classify industries in terms of their technology intensity?
◆https://www.oecd.org/sti/ind/48350231.pdf (technology intensity definition and classification)

How do we measure and compare science, technology, and innovation status among countries?
◆OECD (2016), Measuring Science, Technology and Innovation. OECD Directorate for Science, Technology and Innovation. OECD Publications. Paris 2016. https://www.oecd.org/sti/STI-Stats-Brochure.pdf

OECD Main Science and Technology Indicators (comparing countries)
https://www.oecd.org/sti/msti2023.pdf

Data to compare STI status among countries – STI Scorecard
https://www.oecd.org/sti/scoreboard.htm#explore

Additional sources:
Key STI statistics, databases and publications:
https://www.oecd.org/sti/stistatistics.htm
Science, technology and innovation policy reports/links:
https://www.oecd.org/science/inno/
http://www.oecd.org/science/sci-tech/

What are the STI key issues and trends?

OECD (2021), OECD Science, Technology and Innovation Outlook 2021, OECD Publishing, Paris. https://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2023_0b55736e-en (Executive Summary + Governance of science, technology and innovation for crisis and recovery)

WEEK 2	Historical Context: Technology Cases

Aug. 28 ◆Fallows, James (2013), The 50 Greatest Breakthroughs Since the Wheel, The Atlantic, (Nov. 2013).

Aug. 30 ◆David, Paul, 1985. Clio and the Economics of QWERTY, American Economic Review, American Economic Association, vol. 75(2), pages 332-37, May.

◆F.M. Scherer (1965), Invention and Innovation in the Watt-Boulton Steam-Engine Venture, Technology and Culture, Vol. 6, No. 2 (Spring, 1965), pp. 165-187.

PART 2	Explaining the Process of Technological Innovation, Diffusion and Economic Change: Some Theoretical Frameworks and Cases

WEEK 3	The Politics of Innovation

Sept. 4 **SCHOOL HOLIDAY – LABOR DAY – NO CLASS**

Sept. 6 ◆Johan Schot, W. Edward Steinmueller, Transformative change: What role for science, technology and innovation policy?: An introduction to the 50th Anniversary of the Science Policy Research Unit (SPRU) Special Issue, Research Policy, Volume 48, Issue 4, 2019, Pages 843-848,

Country Innovation Strategy Cases: China, US, and Sweden

China:

◆Serger, S. S., & Breidne, M. (2007). **China's fifteen-year plan** for science and technology: an assessment. Asia Policy, 4(1), 135-164.
◆**China's 14th Five-Year Plan. (March 12, 2021**). Xinhua News Agency. https://cset.georgetown.edu/wp-content/uploads/t0284_14th_Five_Year_Plan_EN.pdf

United States:
--US Senate. (May 2021). Summary of US Innovation and Competition Act. https://www.democrats.senate.gov/imo/media/doc/USICA%20Section-by-Section%205.19.21.pdf
--Harrington, J. (July 1, 2021). What the **U.S. Innovation and Competition Act** Gets Right (and What It Gets Wrong). CSIS. https://www.csis.org/analysis/what-us-innovation-and-competition-act-gets-right-and-what-it-gets-wrong
◆US Inflation Reduction Act – Clean Energy - Guidebook

Sweden:
◆**Swedish** Ministry of Enterprise, Energy and Communications. (2012). The Swedish Innovation Strategy. Executive Summary and Introduction.
–Swedish Innovation Policy. (2021). https://www.government.se/government-policy/swedish-innovation/

Recommended:

--Taylor, T. (2016). The politics of innovation: why some countries are better than others at science and technology. Oxford University Press. (Chapters 1 and 4)
--US Senate Republican Party Committee. (May 2021). S.1260 – THE UNITED STATES INNOVATION AND COMPETITION ACT https://www.rpc.senate.gov/legislative-notices/s1260_the-united-states-innovation-and-competition-act
--US Senate Democrats. (May 2021). The United States Innovation and Competition ACT. https://www.democrats.senate.gov/newsroom/press-releases/schumer-files-bipartisan-us-innovation-and-competition-act-of-2021-as-substitute-amendment-to-endless-frontier-act

WEEK 4	The Economics of Innovation: Foundational Theories

Sept. 11	◆J.A. Schumpeter (1911) The Theory of Economic Development, Ch. 2,4,6
Sept. 13	◆Metcalfe, J. S. (2006). Innovation, competition, and enterprise: foundations for economic evolution in learning economies. Innovation, science, and institutional change: a research handbook, 105-121.

WEEK 5	**Innovation Systems: Institutions, Networks and Organizations**

Sept. 18	◆North, D.C. (1991). Institutions. The Journal of Economic Perspectives Vol. 5, No. 1 (Winter, 1991), pp. 97-112 ◆Hall, Peter, & Taylor Rosemary. "Political Science and the Three New Institutionalisms", Political Studies. Vol. 44 Pp. 936-057. ◆Hall, P., & Soskice, D. (2001). "Introduction" in Varieties of Capitalism: The Institutional Foundations of Comparative Advantage. Oxford: Oxford University Press.
Sept. 20	◆Binz, C., & Truffer, B. (2017). Global Innovation Systems—A conceptual framework for innovation dynamics in transnational contexts. Research Policy. ◆Lundvall, B. Å. (2007). National innovation systems—analytical concept and development tool. Industry and innovation, 14(1), 95-119. ◆Cooke, P. (2001). Regional innovation systems, clusters, and the knowledge economy. Industrial and corporate change, 10(4), 945-974. ◆Malerba, F. (2002), 'Sectoral systems of innovation and production,' Research Policy, 31(2), 247–264.

Recommended:

◆Manuel Laranja, Elvira Uyarra, Kieron Flanagan, Policies for science, technology and innovation: Translating rationales into regional policies in a multi-level setting, Research Policy, Volume 37, Issue 5, 2008, Pages 823-835

WEEK 6	**Diffusing Technologies and Institutions**

Sept. 25	◆Mario Gruber, An evolutionary perspective on adoption-diffusion theory, Journal of Business Research, Volume 116, 2020, Pages 535-541.

◆Quang Bui. A Review of Innovation Diffusion Theories and Mechanisms. Proceedings of the Twentieth DIGIT Workshop, Fort Worth, Texas, December 2015

Sept. 27

◆Addisu A. Lashitew, Rob van Tulder, Yann Liasse, Mobile phones for financial inclusion: What explains the diffusion of mobile money innovations?, Research Policy, Volume 48, Issue 5, 2019, Pages 1201-1215.

◆Jacobsson, S., & Johnson, A. (2000). The diffusion of renewable energy technology: an analytical framework and key issues for research. Energy policy, 28(9), 625-640.

◆Casper, S. (2006). 21 Exporting the Silicon Valley to Europe: How Useful is Comparative Institutional Theory? Innovation, Science, and Institutional Change: A Research Handbook: A Research Handbook, 483.

WEEK 7	**IN-CLASS GROUP PROJECT**

Oct. 2 IN-CLASS GROUP PROJECT - Tracing and Comparing Technology Diffusion, Adoption or Displacement between Countries

Oct. 4 IN-CLASS GROUP PROJECT - Tracing and Comparing Technology Diffusion, Adoption or Displacement between Countries

We will be forming subgroups and each group will select a technology to trace based on the resources listed below OR a technology of your own choosing.

See James Fallow's article - "The 50 Greatest Breakthroughs Since the Wheel" in *The Atlantic Magazine* in Canvas for a historical ranking of major technological breakthroughs.

More recent technological advances:

Privacy & Security: Cyber Security technologies
Space Technology
Health: Stem cells or robotics
Finance: Blockchain, Digital Currencies
Advanced manufacturing/other: Artificial Intelligence
Energy & Environment: Clean technologies; alternative energy (wind, solar, wave etc.)

Food/Food processing: Genetically modified organisms (GMOs); robots; delivery apps etc.

WEEK 8	IN-CLASS GROUP PROJECT PRESENTATIONS

Oct. 9 **SCHOOL HOLIDAY - FALL BREAK – NO CLASS**

Oct. 11 IN-CLASS GROUP PROJECT + Presentations

WEEK 9	Technological Innovation: Capacity and Measures

Oct. 16 IN-CLASS GROUP PROJECT + Presentations

Oct. 18

◆Furman, J. L., Porter, M. E., & Stern, S. (2002). The determinants of national innovative capacity. Research policy, 31(6), 899-933.

◆Andrew Watkins, Theo Papaioannou, Julius Mugwagwa, Dinar Kale, National innovation systems and the intermediary role of industry associations in building institutional capacities for innovation in developing countries: A critical review of the literature, Research Policy, Volume 44, Issue 8, 2015, Pages 1407-1418,

◆ OECD/Eurostat (2018), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en.

Recommended:

Economic Perspective - Revisited

◆Romer, M. Paul. 1994. “The Origins of Endogenous Growth,” JEP. Vol. 8. (1):3-22.

◆Solow, Robert. 1994. “Perspective on Growth Theory,” JEP. Vol. 8 (1):45-54.

◆Nelson, R. and S. Winter (1982), An Evolutionary Theory of Economic Change, Cambridge (MA): Harvard University Press, Parts I and II (pp. 1-136).

(POLICY MEMO DUE at beginning of class)

PART 3	The Role of Regulatory and Technology Standards

What are regulatory and technology standards? How are they created, diffused globally and what are their effects?

WEEK 10	Understanding and Creating Standards

Oct. 23

◆ Paul Moritz Wiegmann, Henk J. de Vries, Knut Blind, (2017). Multi-mode standardisation: A critical review and a research agenda. Research Policy. Pages 1370-1386.

◆Funk, J. L., & Methe, D. T. (2001). Market-and committee-based mechanisms in the creation and diffusion of global industry standards: the case of mobile communication. Research Policy, 30(4), 589-610.

Case:

◆Central bank digital currencies: foundational principles and core features. https://www.bis.org/publ/othp33.htm

https://www.globalasia.org/v15no4/feature/digital-currency-wars-us-china-competition-and-economic-statecraft_vinod-k-aggarwaltim-marple

Oct. 25

◆Bekkers, R., Iversen, E., & Blind, K. (2011). Emerging ways to address the reemerging conflict between patenting and technological standardization. Industrial and Corporate Change, 21(4), 901-931.

Case:

World Economic Forum (October 2020). Global Standards Mapping Initiative: An overview of blockchain technical standards. White Paper. http://www3.weforum.org/docs/WEF_GSMI_Technical_Standards_2020.pdf

WEEK 11	Cases

Oct. 30

◆Kim, D. H., Lee, H., & Kwak, J. (2017). Standards as a driving force that influences emerging technological trajectories in the converging world of the Internet and things: An investigation of the M2M/IoT patent network. Research Policy.

Nov. 1

◆Guler, I., Guillén, M. F., & Macpherson, J. M. (2002). Global competition, institutions, and the diffusion of organizational practices: The international spread of ISO 9000 quality certificates. Administrative science quarterly, 47(2), 207-232.

◆"The digital divide over consumer data widens: Regulatory divergence in America, Europe and Asia spells trouble." *Financial Times.* July 26, 2017.

PART 4 Governance, Globalization, and STI Policy

WEEK 12	Who Governs? Science, Technology, and Innovation (STI) Policy

Nov. 6

◆Gijs Diercks, Henrik Larsen, Fred Steward, Transformative innovation policy: Addressing variety in an emerging policy paradigm, Research Policy, Volume 48, Issue 4, 2019, Pages 880-894.

Nov. 8

◆Hooghe, Liesbet and Gary Marks. "Unraveling the Central State, but How? Types of Multi-Level Governance." The American Political Science Review, Vol. 97, No. 2 (May, 2003), pp. 233-243.

◆Schreurs, M. A. (2008). From the bottom up: local and subnational climate change politics. *The Journal of Environment & Development*, *17*(4), 343-355.

--OECD. Cross-border governance arrangements for STI, http://dx.doi.org/10.1787/sti_in_outlook-2016-18-en . Read the document on-line.

◆Kuhlmann, S., & Shapira, P. (2006). How is innovation influenced by science and technology policy governance? Transatlantic comparisons. In Innovation, science, and institutional change. A research handbook. Oxford University Press, Oxford, 232-255.

Recommended:

◆Breznitz, D. 2007. Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland. New Haven: Yale University Press. Chapter 1 and Conclusion.
--Narula, R. (2014). Globalization and technology: Interdependence, innovation systems and industrial policy. John Wiley & Sons. Introduction.
◆Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. Review of international political economy, 12(1), 78-104.
◆ Mueller, M. L. (2010). Networks and States: The Global Politics of Internet Governance.

WEEK 13	Channels of Technological Innovation: FDI and Trade

How does FDI and global trade spur innovation? What role do governments and the private sector play in governing the process?

Nov. 13

◆Kiriyama, N. (2012). Trade and innovation: synthesis report. OECD.
Case: Singapore
--Special Report - Singapore: Charting The Future. (September, 2020). Financial Times.
https://www.ft.com/content/8008075d-1d38-4886-b42f-c2d66f147394?shareType=nongift
https://www.ft.com/content/92ce5bb1-2168-4da3-b4de-0e0821a4fb02?shareType=nongift

◆Zahler, A., Iacovone, L., & Mattoo, A. (2014). Trade and innovation in services: Evidence from a developing economy. The World Economy, 37(7), 953-979.

Nov. 15

◆Stiglitz, J. E., & Greenwald, B. C. (2014). Creating a learning society: A new approach to growth, development, and social progress. Columbia University Press. Chapter 12.

RESEARCH PAPER DUE Nov. 15

WEEK 14	Special Issue: Privacy & Security

Nov. 20	◆Kshetri, N. (2013). Privacy and security issues in cloud computing: The role of institutions and institutional evolution. Telecommunications Policy, 37(4), 372-386. ◆Weber, R. H. (2010). Internet of Things–New security and privacy challenges. Computer law & security review, 26(1), 23-30. ◆Mention, A. L. (2021). The age of FinTech: Implications for research, policy and practice. The Journal of FinTech, 1(01), 2050002.
Nov. 22	**SCHOOL HOLIDAY – THANKSGIVING – NO CLASS**

WEEK 15	**Special Issue: Ethics in Science & Technology**
Nov. 27	◆The Ethics of Invention Technology and the Human Future. Selin, C. Book Review. Science, 2016 Aug 19, Vol.353(6301), pp.756-756 (Sheila Jasanoff) -- Jasanoff, S. (2016). The ethics of invention: technology and the human future. WW Norton & Company. Chapter 1. https://www.google.com/books/edition/The_Ethics_of_Invention_Technology_and_t/nBqZCgAAQBAJ?hl=en&gbpv=1&dq=The+Ethics+of+Invention+Technology+and+the+Human+Future.+Jasanoff&printsec=frontcover ◆Jasanoff, Sheila, McGonigle, Ian, and Stevens, Hallam (2021) Science and Technology for Humanity: An STS View from Singapore. East Asian Science, Technology and Society, 15 (1) pp. 68-78.
Nov. 29	◆M. Ladikas et al. (eds.) (2015), Science and Technology Governance and Ethics: A Global Perspective from Europe, India and China: Introduction, Chapters 1 and 8. Waters, Richard. (2017). Frankenstein fears hang over AI: Artificially intelligent systems must not replicate human bias. Financial Times. February 16, 2017. https://www.ft.com/content/8e228692-f251-11e6-8758-6876151821a6#myft:saved-articles:page

WEEK 16	**Final Instructional Week**
Dec. 4	Final Instructional Day

Course Review
(No Final Exam)