



PPHA 45210 – Regional Innovation and Growth (Fall 2022)

Monday and Wednesday, 9:00 a.m. to 10:15 a.m.

Office hours: Wednesday 10:30-12

Why do some cities and regions thrive while others struggle? How can regional policymakers support sustainable, equitable economic growth, enabled by local private enterprise, technology development, and industry? And what does a productive relationship between government and the private sector look like? This applied course will focus on the roles of research and innovation in driving regional economic growth. Learning from the successes of tech-driven “superstar” cities and the challenges of smaller cities, this course will prepare students to develop realistic, region-specific development goals and strategies, whether coming from the private, public, or nonprofit sector perspective. Our discussions will also familiarize students with the critical and rapidly evolving technology market, and the proper role of government in managing that market and protecting citizens.

Course objectives:

1. Gain familiarity with entrepreneurship, venture capital, technology, and applied research, and understand how entrepreneurship and technology development support local growth and economic vitality.
2. Understand regional production through a function of talent, capital, and technology.
3. Understand how public policy has acted to support the growth of regional technology economies and design a strategy for supporting regional economic growth.
4. Understand the critical issues that technology presents policy makers from a perspective of economic fairness, privacy, and respect for humanity.

Textbook: “The Entrepreneurial State” by Mariana Mazzucato.

Additional materials: Spreadsheet with relevant Municipal Statistical Area (MSA) data, additional data that I will provide you, and selected readings.

Course Description: This course will familiarize students with the process for growing a regional innovation economy, and the full range of challenges that technology presents policy makers. We will cover the importance of applied research, the process of technology transfer, clusters, and the role of government support and public policy. We will explore the growth of the San Francisco regional economy (for obvious reasons), while also referring to institutions within the Chicago regional economy. To guide our discussion through the various policy levers used to strengthen regional economic performance, I will take the approach of narrating the growth of the U.S. and international economies since World War II.



Instructor: Thomas Day

Tom is a state and local government consultant with Guidehouse. Tom holds degrees from Penn State University, the Medill School of Journalism at Northwestern University, and the University of Chicago's Harris School of Public Policy. He has authored opinions for the Washington Post, Deadspin, ESPN the Magazine, Philadelphia Magazine, and Crain's Chicago Business, and was a McClatchy Newspapers bureau correspondent in Afghanistan in 2009 and 2010.

ADA student accommodations: Any student who believes they may need assistance should inform the Harris Dean of Students office by the end of the first week of class. The Dean of Students office will coordinate any student accommodations with Harris instructors. Students with disabilities who have been approved for the use of academic accommodations by Student Disability Services (SDS) and need a reasonable accommodation(s) to participate fully in this course should follow the procedures established by SDS. Please meet with me to discuss your access needs.

Diversity statement: The University of Chicago is committed to diversity and rigorous inquiry that arises from multiple perspectives. I wholeheartedly support this commitment. If there are adjustments that I make to support a more inclusive learning environment, please let me know.

Late-work policy: All assignments are expected to be submitted by email to me by 9:00 a.m. the Monday they are due. If you would like an extension, please email me with an explanation and expect that the maximum additional time I can provide will be an additional week.

Academic integrity: Collaborating with your colleagues is encouraged. Drawing upon the insight of others is (obviously) required. Copying the work of your classmates and plagiarism will earn you swift referral to Harris School dean of students. All written work must include proper citations.

Grading: You will be graded on three problem sets and your final project. The breakdown is as follows:

30% problem sets
70% final project

Pass/fail policy: Students who wish to take the course pass/fail rather than for a letter grade must use the Harris Pass/Fail request form and must meet the Harris deadline, which is generally 9:00 a.m. on the Monday of the fifth week of courses. Students who take the course pass/fail must attend class meetings and turn in all assignments, achieving marks on assignments that are overall commensurate with at least a C- letter grade.



Week-by-week schedule:

Week 1: Why do economies grow? Why do some regions grow faster than others? And what is the ultimate goal of economic growth?

Lecture 1: We will begin by understanding course expectations. We will then define success for regional economies, a seemingly simple concept that is often lost in regional economic development. We will discuss why we are so focused on cities as a platform for technology development and economic growth. We will outline the economic variables support regional growth that we will explore in this course. We will define an understanding of the role of government and its relationship with the private sector – not one as market manager, but as an actor in the market itself, serving to shape markets rather than simply correct market failures. Finally, we will examine Robert Solow’s exogenous growth model that predominated after the Industrial Revolution, the updated version of the model authored by Paul Romer, and examine relevant data to understand why growth across regional economies has diverged. The Solow and Romer models define technology as a critical variable in regional growth, and we will define exactly what technology is, moving beyond using “tech” as a symbol.

Concepts: Solow and Romer’s growth models, the post-WWI convergence and post-Great Recession divergence of regional economies, U.S. place-based policies, deindustrialization, Growth Per Capita and why we use it as the most critical dependent economic variable.

Reading: “A Contribution to the Theory of Economic Growth” by Robert Solow; “Endogenous Technical Change” by Paul Romer; “Tech: The Goal, or Just Another Path to Growth?” by Thomas Day. *Optional:* “Why Software is Eating the World” by Marc Andreessen.

Data: Brookings Metro Monitor data.

For next week: Open and examine a data set that I will provide and select a city within the top 40 largest municipal statistical areas to evaluate for this course.

Week 2: Where does technology come from? How do federal-university partnerships drive innovation? And what was the real story of how a Northern California orchard became “Silicon Valley”?

Lecture 2.1: Our second week will be focused on the intersection between government and technology. We will draw a map of U.S. research community and understand how research has often been funded by the U.S. military since before World War II. This relationship continues to this day, and we will explore the evolving relationship

between the U.S. government, the Pentagon, and the technology industry. As we will discover, the novel technologies of today trace their roots back to fundamental discoveries enabled by public support of basic research – and we will appreciate the importance of basic science in enabling future technological progress. We also will pinpoint laboratories and facilities where researchers are advancing the understanding of the physical world.

1942: The Roosevelt Administration, confronted with a German military that arguably outclasses the Allied Powers in military technology, commissions the U.S. Office of Scientific Research and Development, under the leadership of Vannevar Bush.



Lecture 2.2: We will explore the process for bringing a technology into the commercial market beginning with the fundamental discovery that enabled it (using immunotherapy as an example) and explore the role of public funding in research commercialization. We will discuss the concepts of technology push and market pull, and ask ourselves, “Does government create value?” (Answer: yes!).

Concepts: Basic and applied research, general purpose technologies, technology readiness levels, national laboratory system, the end of American dominance of R&D, technology push and market pull, the COVID-19 vaccine and mRNA technology, Japanese robotics industry, DARPA, 18F.

Reading/Viewing: “The Entrepreneurial State” by Mariana Mazzucato, chapter 1-2; “The Secret History of Silicon Valley” by Steve Blank (YouTube recording); “Stagnation and Scientific Incentives” by Jay Bhattacharya and Mikko Packalen; “Is America Really Running Out of Original Ideas” by Derek Thompson (The Atlantic). *Optional:* “Can the Pentagon Lead the Tech Sector Again?” by Thomas Day; “The Rise of ‘ARPA-everything’ and What it Means for Science” by Jeff Tollefson (Nature); “Have economists been thinking incorrectly about growth?” by Peter Coy (NY Times).

Problem Set 1 assigned: First problem set with ensure complete understanding of the Solow and Romer models and will ask you to explore the research assets of your market.

Week 3: How are cities designed to maximize the impact of technology on their local economies? How can regions attract the private capital needed to support R&D?

Lecture 3.1: We put our urban planning hats on and discuss how cities are designed to best support technology-enabled growth. We will explore efforts to increase urban density and reign in suburban sprawl. We will explore the role of local real estate and innovation districts like Cambridge’s Kendall Square. And we will explore how cities are designed to support match technology push (generated at universities and local R&D facilities) with market pull, engineering collaborations with local firms and capital managers with research laboratories within market verticals.

Lecture 3.2: The second lecture of week 3 is all about venture capital. We will look at the functions of venture capital and understand how deal structure can influence (perhaps socially disastrous) downstream consequences. We will also discuss the venture capital market and understand VC as a driver of regional growth, how it can enflame racial and gender inequity, and why some state and local policymakers in regions without much local VC have stepped into the funding void.

Concepts: Qualified Opportunity Zones, innovation districts, urban density, locally commissioned venture capital funds, sequence of venture capital funding and structure of venture capital funds, gender and racial inequity in venture capital markets.

1956: Silicon comes to the Valley, and the first silicon-based microprocessors are produced, putting in motion the creation of digital economy, and with it, a financing model uniquely tailored to the software industry.



Reading/Viewing: “The Entrepreneurial State” by Mariana Mazzucato, chapters 3-4; chapter from “Jump-Starting America” by Jonathan Gruber and Simon Johnson; “Geography, Venture Capital, and Public Policy” by Josh Lerner; “As Americans Spread out, Immigration Plays a Crucial Role in Local Population Growth,” by William Frey (Brookings). *Optional:* “Dreaded Commute to the City Is Keeping Offices Mostly Empty” by Konrad Putzier (WSJ); “How Large Cities Can Grow Denser and Flourish: What the 2020 Census Reveals About Urban Sprawl” by Eric Kober (Manhattan Institute).

Data: Zillow Home Value Index, U.S. Census data on growth of cities and suburbs, Pitchbook data on venture capital investment.

Problem Set 1 due

Week 4: How should cities and regions build on their unique assets and advantages? Is it wise to build a regional economy around one core industry or even one company? Or should policymakers look to diversify regional economies?

Lecture 4.1: Harvard Business School's Michael Porter has popularized the "clusters" concept, or the idea that regional economies grow around industries unique to a region's assets. Porter also explores four failed strategies that have undermined previous efforts regional growth: Repealing regulations and lowering taxes to attract industry, building aesthetically pleasing downtowns, going to extreme lengths to attract a headquarters or plant

(Amazon HQ2), and following "the next big thing" in technology. We will look at Porter's work and programs guided by cluster-focused economic development, including Milwaukee's development strategy focused on water technology and the Northern California wine cluster. We will also explore growth strategies that drive technology push – R&D tax credits, for example – and strategies drive market pull, such as tax credits for private actors to purchase new technologies.

Lecture 4.2: The theme of the second lecture of week 4 is the mutually beneficial relationship between a city and a large employer. We will discuss how to read corporate tax filings, and how to project the value a corporation holds for investors, and by extension, its home market. We will also take a more critical look at publicly subsidized job training programs, research and development tax credits, and the tens of billions of dollars that American cities and states have provided in relocation incentives.

Concepts: Clusters and the importance of aligning a region's research institutions, local incentives to lure corporate relocations, Chicago's 13 percent approach (against cluster formation), R&D tax credits, Form 10-K.

1957: The “traitorous eight”, a group of eight engineers employed at Shockley Semiconductor Laboratory in Mountain View, California, leave to form Fairchild Semiconductors, setting in motion the rapid development of the entire semiconductor industry that would assert decades of American leadership in computational technologies.



Reading/Viewing: “Making Sense of Incentives” by Timothy Bartik (Upjohn Institute); "Clusters and the New Economics of Competition" by Michael Porter (Harvard Business Review); "Reshaping Regional Economic Development: Clusters and Regional Strategy" by Michael Porter (YouTube recording); “The New Challenges of Assessing Big Tech’s Impact,” by Michael Gofman and Zhao Jin (ProMarket); *Optional:* “Turn Detroit into Drone Valley” by Marc Andreessen (Politico), “A Chance for Disarmament in the Economic Development Subsidy Wars,” by Michael D. Farren and Mercatus Center (Governing); “Cities That Hyped Crypto Are Now Contending With the Crash” by Sharon O’Malley (Route Fifty).

Data: Inc. 5000 Fastest-Growing Private Companies in America.

Problem Set 2 assigned: Second problem set will examine the economic assets of each city, and where they align with industry.

Week 5: How can cities and regions keep and attract educated and skilled workers? (How have cities *repelled* skilled workers?) Just how far should policymakers go to attract these works? What is the role of social networks – acting entirely in the private sector – in supporting regional growth?

Lecture 5.1: In Week 1 we defined a production function that includes technology. This week we will define the relationship between talent and production. Has the relationship between talent (skills) and

regional growth increased in recent years? How about wages net of housing and regional growth? We will explore the vital role of housing supply in supporting labor productivity growth. We will explore the race 2017-2018 competition for Amazon’s second headquarters and discuss why cities would be so willing to freely hand out economic incentives to Amazon and other large companies. We will seek to understand the importance of addressing the socially progressive views and the lifestyle demands of most high-skill workers. This week will be critical in understanding how agglomerating talent into cities drives growth, why a handful of American cities are fast leaving the rest behind, and why this divergence is reaching crisis levels.

Lecture 5.2: Our second lecture of week 5 will briefly cover the role of culture in growing regional economies, then pivot to a discussion of technology infrastructure. We will also explore broadband policy and the challenges facing rural communities as talent increasingly flocks to urban areas and discuss how this might change as the world emerges from COVID-19.

Concepts: Regional culture, Boston v. San Francisco, the “PayPal mafia,” the movement of people into cities, housing prices and government-driven restrictions on housing supply, noncompete agreements, the race for Amazon’s HQ2, positive association between production and employment of grads in traded sectors, broadband policy, net neutrality, immigration and regional growth.

1968: In the “mother of all demos,” Douglas Engelbert presents his computer hardware and software system at a conference in San Francisco, marking the beginning of the personal computer revolution that would, over decades, dramatically increase the value of STEM education.



Reading: Chapters from “Regional Advantage” by Annalee Saxenian; chapter from “The New Geography of Jobs” by Enrico Moretti; “Migrant” by Scott Galloway. *Optional:* “Absent New FCC Broadband Maps, Local Govs Plot Coverage” by Jed Pressgrove (GovTech).

Data: Pew Center data on under-30 population by city; Bureau of Labor Statistics data on occupation by MSA; U.S. Census migration data.

Week 6: How do R&D, innovation, and the patent process affect regional growth? What policies can increase these markers of technological change and increase productivity?

Lecture 6.1: We will explore the patenting process, patent law, and the correlation between patenting and regional growth. We will also untangle who is funding R&D at what stage and understand why it is so critical that government support high-risk, high-reward research projects. And we will discuss the critical role of technology transfer in advancing technologies and growing regional economies.

Lecture 6.2: Our second lecture of Week 6 will focus on startup culture, its good and self-destructive elements. We will discuss the sweeping changes in R&D in the United States during the 1970s, and how new models for technology commercialization emerged that put special emphasis on startups. Startups commercializing technologies in the high sciences require much more early-stage capital than startups building mobile applications. To help solve this challenge the U.S. federal government has created the Small Business Innovation Research (SBIR) program, which we will explore. With obvious significance to current events, we will also understand the process of clinical trials and validating therapeutics and vaccines.

Concepts: Patent law, standards, patent trolls, Human Genome Project, technology transfer, Bayh-Dole Act, SBIR, clinical trials, Joseph Schumpeter, engineering relationships between scientists and business managers (“Mark and Sheryl”).

Reading: “The Entrepreneurial State” by Mariana Mazzucato, chapter 5-6; “Here’s Why It’s So Hard to Bring Science to Market” by Greg Satell (Digital Tonto).

Data: U.S. Patent and Trademark data on patenting activity by MSA.

1980: President Jimmy Carter signs the Bayh-Dole Act into law, allowing inventors, research institutions, and small businesses to share ownership of an invention that was enabled by federal funds.

Problem Set 2 due

Problem Set 3 assigned: Third problem set will require students take the provided data set and begin not only understanding correlations between explanatory variables – including patents, venture financing, and workforce education – and growth, but begin understanding how to increase regional growth.



Week 7: Who is driving R&D and innovation in the private sector? How does the growth in open-source innovation affect different regions? What policies can best facilitate technology transfers that raise productivity?

Lecture 7.1: Gone are the days where General Electric will take on the risk attendant to building out an invention under their own R&D budget. What happened? What is the new model for supporting corporate innovation and privately funded R&D? We will use our first lecture of week 7 to understand how corporate innovation has changed and allowed for a market where small- and medium-sized businesses struggle to challenge “big tech.”

Lecture 7.2: We will begin by discussing the growth of open-source innovation. We will then examine the current state of manufacturing supply chains, and understand how the national and international conversation has changed since COVID-19. Finally, we will also ask the tough questions about why the West’s manufacturing economy struggled, and explore policy solutions.

Concepts: Stock buybacks, financialization, private equity, corporate innovation, corporate venture capital, the “innovator’s dilemma,” M&A, open-source innovation, the “fourth industrial revolution,” the National Network of Manufacturing Institutes, offshoring and reshoring of manufacturing.

Reading: “The Entrepreneurial State” by Mariana Mazzucato, chapters 7-8; chapter from “Innovator’s Dilemma” by Clayton Christensen. *Optional:* “American Capitalism’s Great Crisis and How to Fix It” by Rana Foroohar (Time Magazine); “Have Business Roundtable Companies Lived Up to Their Stakeholder Commitments?” by Lucian Bebchuk and Roberto Tallarita (ProMarket).

Data: National Science Foundation data on business R&D done in Metropolitan Statistical Areas.

1982: The U.S. Securities and Exchange Commission issues a rule that effectively legalizes stock buybacks, a process that had previously been recognized as market manipulation, allowing corporations to purchase large holdings of its own shares.

Week 8: How has R&D and technology policy moved to the center of global power competition? Instead of simply competing with China, should the U.S. be replicating its industrial policies? How will increasing antitrust scrutiny of big tech firms affect future innovation and productivity growth?

Lecture 8.1: A generation ago, more than 200,000 Chicagoans were employed in steel manufacturing; now steel has withered away in the South and West Sides. As America’s manufacturing base has given way to a new information economy, China has created special economic zones – export-driven growth, growth focused on agile physical capital, atomized ecosystem of small exporters – including the coastal city of Shenzhen. We will explore how the manufacturing value chain has changed since China entered the WTO, and how it is changing again with digital and on-site manufacturing technologies. We will also discuss the Chinese and American innovation models, and how the Chinese government has expanded public support for private enterprise to advance their economy right up to the point where they threaten to bypass the U.S. in critical fields of technology.

2001: China is welcomed into the World Trade Organization and the dot com bubble bursts.



Lecture 8.2: This is our “big tech” lecture. We will discuss the growth of the big five tech firms – Google, Facebook, Amazon, Microsoft, and Apple – and the role of anti-trust enforcement in regulating these firms. We also will discuss the changing international market for technology, and the flow of capital that knows no borders, putting startup entrepreneurs at the intersection of global politics.

Concepts: Tech Cold War, supply chains, China’s special economic zones, Committee on Foreign Investment in the United States (CFIUS), Made in China 2025, the U.S. Innovation and Competition Act, the big five technology companies, American and global regulation of technology corporations.

Reading/Viewing: “The Entrepreneurial State” by Mariana Mazzucato, chapter 9; “Umpires, Not Kings,” by Scott Galloway. *Optional:* Interview with Matt Stoller, author of “Goliath”; “When Geopolitical Risk Rises, Innovation Stalls,” by Vivek Astvansh, Wesley Deng, and Adnan Habib (Harvard Business Review).

Data: U.S. Department of Commerce data on exports from municipal areas; U.S. Department of Commerce’s Export Analysis Tool.

Problem Set 3 due

Week 9: How did 2007-2009 financial crisis change regional economies? How has COVID-19 changed regional economies? What new sectors will drive value in the 2020s? And are we at the beginning of several new technology frontiers that could fundamentally change humanity?

Lecture 9.1: We will discuss current trends that define technology market, including the current race to build 5G networks, autonomous vehicles, and the Internet of Things (IOT). Our conversation will explore how policymakers can anticipate the dramatic economic changes these new technology fields will catalyze in the near future, and how to make technology work for, not against, communities.

Lecture 9.2: Our course will end with a look toward the future and discuss what I believe to be the most promising drivers of future value, including quantum computing, nanotechnology, and genomic sciences.

Concepts: 5G, quantum computing, nanotechnology, genomics, CRISPR, Elon Musk v. Jeff Bezos and the race to space.

Reading/Viewing: *Optional:* “What America Needs is a Liberalism that Builds” by Ezra Klein (NY Times); “How U.S. policymakers can enable breakthroughs in quantum science” by Michael G. Raymer and Saikat Guha (Brookings); Interview with Dr. Matthew Tirrell, dean of the Institute for Molecular Engineering at the University of Chicago.

Data: Brookings data on impact of COVID-19 on MSAs; Raj Chetty’s “Track the Recovery” data.

2008: Lehman Brothers, holding more than \$600 billion in assets, files for Chapter 11 bankruptcy, throwing the global economy into the chaos and marking the beginning of a post-Great Recession economy where “tech cities” dominate everyone else.

Final Project due