Regional innovation strategies: How regional economies can build a local lab-to-product chain, adapt to technological changes to support growth, and confront the challenges that new technologies present policymakers

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 through technology transfer and entrepreneurship;
4. Understand the critical issues that technology presents policy makers from a perspective of economic fairness, privacy, and respect for humanity.


Additional materials: Spreadsheet with relevant Municipal Statistical Area (MSA) data; selected readings. Though it isn’t required, I advise you sign up for regular email updates from Pitchbook, the Information Technology and Innovation Foundation, MacroPolo (Paulson Institute), ProMarket (Stigler Center), and if you are a New York Times subscriber, the NY Times’ On Tech newsletter.

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 the director of research for Five Forks consulting and a consultant with Intueor Consulting. Previously he helped build The Bunker (now Bunker Labs) into a national nonprofit organization supporting military veteran entrepreneurs. 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 9:35 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 in Chicago style.

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

- 20% class participation
- 10% problem sets
- 50% final project

**TA:**
**Week-by-week schedule:**

**Week 1: Robert Solow’s *Exogenous* Growth Theory, Paul Romer’s *Endogenous* Growth Model, and place-based policies and strategies**

**Lecture 1.1:** 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. We will define success for regional economies, a seemingly simple concept that is often lost in regional economic development, and apply production functions in an empirical setting.

**Lecture 1.2:** We will cover U.S. place-based policies and programs that have attempted, with limited success, to catalyze regional growth. We will explore the dramatic changes that have defined the last three decades in the American and international economy after the introduction of the personal computer, where the manufacturing economy has been replaced by the information economy and productivity has been decoupled from wage growth. With these changes have come regional efforts to respond and keep pace. To put these economic changes in context, we will evaluate the economic changes that have defined Chicago, which responded to the post-Great Recession economy with a massive effort to build more than 100 coworking spaces and incubators in the futile attempt to build a “startup culture.” Chicago is not alone in this approach. We will discuss the role of innovation districts and evaluate their records of success.

**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.


**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: Federal and university laboratory system, and why growth has stagnated**

**Lecture 2.1:** Our second week will be focused on the intersection between defense 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 Pentagon and the technology industry. We will delineate basic and applied research and cover the federal government’s technology readiness levels. 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.

**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.
commercialization. And we will discuss the concepts of technology push and market pull, and ask ourselves, “Does government create value?” (Answer: yes!).

**Lecture 2.2:** What **really** advances technology from one’s imagination to the marketplace? Is it the entrepreneur pushing a technology or market pull of technology demand? (That’s a rhetorical question.) Multiple popular TV shows, a multibillion-dollar real estate company (that imploded before their planned IPO), and innovation districts built in nearly every major U.S. city have collectively building an international “startup culture.” Has this produced a modernized society that has advanced technology faster than any previous time in history? It has not. Indeed for several decades we have lived in a time of very slow growth without a transformative general purpose technology introduced into the market. We’ll explore what happened.

**Concepts:** Basic and applied research, general purpose technologies, innovation “quad chart,” technology readiness levels, national laboratory system, In-Q-Tel, DIU, technology push and pull.

**Reading/Viewing:** “The Entrepreneurial State” by Mariana Mazzucato, chapter 1-2; “The Secret History of Silicon Valley” by Steve Blank (YouTube recording); “Can the Pentagon Lead the Tech Sector Again” by Thomas Day; Congressional Budget Office report on Federally Funded Research and Development Centers (FFRDC). Optional: "Chicago’s Potemkin Village" by Thomas Day.

**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: The intersection between R&D and risk capital**

**Lecture 3.1:** Our third week will advance our understanding of market pull to connect demand to urgent national and global problems. From the support of applied research for defense after World War II came several startups that became the foundation of Silicon Valley. We will explore the formative days of Silicon Valley and trace its path toward the present day. The Bay Area’s dominance in software has fueled hyper growth in the region, and we’ll understand why software is “eating the world.”

**Lecture 3.2:** The second lecture of week 3 is all about venture capital and local real estate. 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, and why some state and local policymakers in regions without much local VC have stepped into the funding void. We will also explore the role of local real estate and innovation districts like Cambridge’s Kendall Square.

**Concepts:** The connection between urgent national and international problems and funding for research, locally commissioned venture capital funds, capitalization table structure, Qualified Opportunity Zones, real estate development around tech.


**1956:** Silicon comes to the Valley, and the first silicon-based microprocessors are produced.
Problem Set 1 due

Week 4: Clusters

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 discuss the proper role of a city in supporting value creation for an employer, be it through public purchases of products or supplying data. We will also look at the recent emergence of alternative business models to support socially beneficial growth, and the growing skepticism that these models are effective to achieve what their purported goals.

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, impact investing, “MarketWorld.”


Problem Set 2 assigned: Second problem set will examine the economic assets of each city, and where they align with industry.
Week 5: Talent

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. 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 cover culture and the critical role that informal networks have played in growing regional economies. We will seek to understand the importance of addressing the socially progressive views of most high-skill workers, and addressing the lifestyle demands of high-skill workers. 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, noncompete agreements, the race for Amazon’s HQ2, the (lack of) correlation between the production and stock of grads in non-traded sectors, positive association between production and employment of grads in traded sectors, broadband policy, net neutrality.


Problem Set 2 due

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.
Week 6: Discovering value

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.

Lecture 6.2: We will discuss the sweeping changes in R&D in the United States during the 1970s, and how new models for technology commercialization emerged, looking at the Research Corporation and the University of Wisconsin’s Wisconsin Alumni Research Foundation (WARF). 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.


Problem Set 3: 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: The public sector, technology transfer, and the current R&D gridlock

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 discuss the growth of open-source innovation. We will 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

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.

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.
the West’s manufacturing economy struggled, explore the role of Wall Street and its impact on regional economies, 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"; selected excerpt from “From Global to Local” by Finbarr Livesey; “Understanding the Decline of U.S. Manufacturing Employment” by Susan Houseman. Optional: “American Capitalism’s Great Crisis and How to Fix It” by Rana Foroohar.

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**Week 8: Time of global technology upheaval**

**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.

**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:** Standards, China’s special economic zones, Committee on Foreign Investment in the United States (CFIUS), Made in China 2025, America’s deteriorating manufacturing base and why an iPhone couldn’t be manufactured onshore, why China can build things cheaper and faster and why that’s beginning to change, the big five technology companies, American and global regulation of technology corporations.

**Reading/Viewing:** “The Entrepreneurial State” by Mariana Mazzucato, chapter 9; Chapter from “AI Superpowers: China, Silicon Valley, and the New World Order” by Kai-Fu Lee; “In the Age of AI” (Frontline episode); Chapter from “Goliath: The 100-Year War Between Monopoly Power and Democracy” by Matt Stoller; Interview with Matt Stoller, author of “Goliath.” Optional: “The 5G Ecosystem: Risks & Opportunities for DoD,” published by the U.S. Defense Innovation Board

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**Problem Set 3 due**

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**2001:** China is welcomed into the World Trade Organization and the dot com bubble bursts.
Week 9: Executing a strategy for capturing value

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: quantum computing, nanotechnology, and genomic sciences. We will also seek to understand that there’s much we don’t understand, that future innovation will emerge from knowledge we are creating today about our physical world.

Concepts: 5G, quantum computing, nanotechnology, genomics, CRISPR, molecular engineering, CERN, China’s support for basic research, particle physics.

Reading/Viewing: Interview with Dr. Matthew Tirrell, dean of the Institute for Molecular Engineering at the University of Chicago.

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.

Week 10: Final Projects

Course discussion: The final week will explore the final project. We will examine models that have worked and those that have not worked as intended. Students will be asked to design an inclusive innovation economy from a city that has not yet built one (Chicago, Philadelphia, and Atlanta are examples), using clusters, applied research, data on the current state of that city’s innovation economy, and an inventory of local research and manufacturing assets. The final week will allow students to present their findings.