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Education

Harvard University

Ph.D. Economics, 2021 to 2027 (expected)

University of Chicago

B.A. in Economics (with Honors), 2019

B.S. in Mathematics (with Specialization in Economics), 2019

B.S. in Statistics, 2019

Fields

Innovation, Digitization & AI, Industrial Organization

References

Shane Greenstein (Chair)
sgreenstein@hbs.edu

Robin Lee
robinlee@fas.harvard.edu

Ariel Pakes
apakes@fas.harvard.edu

Jesse Shapiro
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Fellowships & Awards

Dissertation Completion Fellowship, Harvard University	2026
Humane Studies Fellowship, Institute for Humane Studies	2026
John and Kiendl Gordon Funding Award, Harvard University	2026
Lab for Economic Applications and Policy Funding Award, Harvard University	2025-2026
Becker-Friedman Institute Academic Award, University of Chicago	2019
David S. Hu Thesis Award, University of Chicago	2019
Phi Beta Kappa (Junior Year), University of Chicago	2018
Student Marshal, University of Chicago	2018
Dougan Scholar Certificate Program, Chicago Booth School of Business	2016-2019

Teaching

Teaching Fellow for Professor Jesse Shapiro, <i>Computing for Economists</i> (Graduate)	2024-2025
Teaching Fellow for Professor Robin Lee, <i>Industrial Organization</i> (Undergraduate)	2024-2025

Job Market Paper

Returns to Science of Centrally Provisioned GPUs and Optimal Allocation (with Connie Xu)

Artificial intelligence and deep learning methods require expensive capital investments in the form of Graphical Processing Units (GPUs). Given the importance of GPU clusters to computational research, where should infrastructure funding be allocated? We construct a novel panel of university GPU capacity and research output for R1 U.S. universities, combining historical snapshots of research computing websites with bibliometric data from OpenAlex. We use large, discrete computing capacity jumps in an event-study design and find modest effects of cluster upgrades on AI-related publications. However, there is significant heterogeneity: low-tier universities exhibit a larger marginal response to capacity upgrades than high-tier universities. We develop a structural model of the university as a multi-product organization to estimate the production function for GPU-enabled research, derive a capital allocation rule across fields, and use the estimated elasticities to characterize the NSF's revealed preference over efficiency versus equity. Our findings suggest that diminishing returns to computing capital favor a more redistributive allocation of federal cyberinfrastructure grants.

Publications	Greenstein, N., Fontana, R., Greenstein, S., Zhang, R., Zhang, H., Olivarez, O., and Kim, D.Y. Wireless communications equipment markets: evolution, classification, and measurement. <i>Telecommunications Policy</i> 50(6), 103209 (2026). https://doi.org/10.1016/j.telpol.2026.103209	
	Zhang, R. “Building Up Research Capacity at Minority Institutions.” Commissioned paper for <i>A Plan to Promote Defense Research at Minority-Serving Institutions</i> (2024). https://nap.nationalacademies.org/resource/27838/Zhang_Commissioned_Paper.pdf	
	Chetty, R., Jackson, M.O., Kuchler, T. <i>et al.</i> Social capital I: measurement and associations with economic mobility. <i>Nature</i> 608 , 108–121 (2022). https://doi.org/10.1038/s41586-022-04996-4	
	Chetty, R., Jackson, M.O., Kuchler, T. <i>et al.</i> Social capital II: determinants of economic connectedness. <i>Nature</i> 608 , 122–134 (2022). https://doi.org/10.1038/s41586-022-04997-3	
Working Papers	Secrecy, Spectrum, and Certification: Evidence from Wireless Electronic Devices (with Roberto Fontana, Shane Greenstein, and Do Yoon Kim)	
	This paper examines the strategic decisions of firms to withhold information in innovation-intensive markets, highlighting that secrecy contains distinct temporal dimensions. Using all FCC equipment filings from 2001 to 2021, we analyze firms' choices between long-term confidentiality (LTC), which permanently conceals technical information such as block diagrams, and short-term confidentiality (STC), which temporarily delays the public release of marketing information to ensure against launch and coordination risks in the commercialization process. LTC use reflects appropriability concerns and institutional complexities—technically complex products and competitive markets are 12 to 35% more likely to adopt it. By contrast, STC is driven by the commercialization timing of branded products by large firms. Large, domestic, patent-owning firms with regulatorily complex products are more likely to use STC. Technical aspects of the product do not predict STC usage. An exposure-based event study further shows that firms with a high ex-ante propensity to use STC bring products to market faster after policy enactment, with no changes in product complexity or volume.	
	Scientific Input Costs in University Life Sciences Research (with Connie Xu)	
	Scientific research is defined by uncertainty, requiring principal investigators to constantly navigate funding cycles, resource constraints, and unpredictable discoveries. Navigating this uncertainty to sustain a research agenda depends on how scientists are able to absorb these shocks. While prior work often focuses on funding fluctuations, the impact of supply-side cost shocks remains largely unexplored because scientist purchasing behavior is difficult to observe. We explore one such shock in the life sciences—the 2014 Thermo Fisher and Life Technologies merger—using novel procurement records. A matched difference-in-differences design reveals affected prices rose 20% with minimal quantity response. This translates to a 3.2% increase in everyday lab supply costs and a 1% decline in annual publications. Our estimated -0.30 output-cost elasticity equates to nearly 300 fewer annual publications across 12,000 scientists. The decline concentrates among early-career PIs, who possess the least financial slack but generate the highest output per dollar. While they respond by securing additional NIH funding, their output fails to recover, suggesting time is lost to grant writing. Ultimately, these rising input costs act as a hidden friction on scientific innovation.	
Conferences	IIOC, DRUID, AOM, EARIE, TPRC, DISS	2026
Research Positions	Research Assistant to Shane Greenstein, Harvard Business School	2022-2025
	Research Assistant to Raj Chetty and Nathaniel Hendren, Harvard University	2019-2021
Academic Service	Organizer, Harvard Industrial Organization Reading Group	2024-2026
	Mentor, MIT & Harvard Economics Application Assistance and Mentoring Program	2022-2023
Languages	English (native), Mandarin Chinese (fluent), French (basic)	
Citizenship	Canada	