Digital Economics and AI Tutorial Application

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Contact information

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Course of study

I am a 5th-year PhD student in the Department of Economics at UCLA, and plan to go on the job market in fall 2026. My fields are industrial organization and theory, and I have secondary interests in productivity, innovation, and political economy.

Research statement

My research combines theoretical models with modern computational and machine learning methods to study policy-relevant topics in empirical industrial organization and political economy. My research primarily focuses on the impacts of digital technology adoption by firms on productivity, innovation, and labor outcomes.

Dissertation

My committee chair is John Asker, and other committee members are Simon Board, Hugo Hopenhayn, and Will Rafey. The dissertation consists of three chapters, each focused on an aspect of digital technology adoption and policy-relevant impacts.

My job market paper studies the infrastructure-as-a-service (IaaS) segment of the cloud computing market in France using data from 2017 to 2021. I ask whether IaaS adoption increases firm revenue productivity, and whether large adoption fixed costs combined with data egress fees and other switching frictions produce inefficiently low rates of adoption. I find that adoption has risen rapidly over time, rising from 1.2% of firms in my sample in 2017 to 22.2% in 2021, with a substantial minority of IaaS users adopting multiple providers. At the same time, switching frictions are large, with new IaaS users responding more rapidly than incumbents to Microsoft Azure's increase in quality relative to

that of Amazon Web Services. I find that adopting cloud computing increases firm productivity from 0.7% to 3.3%, with heterogeneous effects across sectors and a larger impact for firms that purchase services from multiple cloud providers. I estimate a model of firm dynamics, in which firms produce output and make computing input bundle choices. I find substantial entry and switching costs. Simulating the effects of an egress fee ban in the 2024 EU Data Act, I find welfare increases of €7.2 million per year. By comparison, a proposed mandate increasing software interoperability among cloud providers increases welfare by €612 million per year.

My second chapter, coauthored with Tamay Besiroglu and Neil Thompson and published in *Research Policy*, argues that if deep learning were widely adopted, it would increase capital deepening in R&D and accelerate the rate of innovation and economic growth. Using a dataset on computation and human capital in computer vision, we estimate a production function for progress in the field. To estimate human capital, we train a deep neural network to predict future citations and the rank of journals in which a paper was published, finding a higher precision compared to traditional linear regression-based methods. Using our data, we find that the physical capital share in deep learning-based R&D is between 0.29 and 0.44, higher than most R&D fields in the United States, which range from 0.04 to 0.19. Plugging these results into a simple endogenous growth model, in which physical capital is easier to accumulate relative to human capital, we show that if deep learning fully diffused in the US economy, productivity growth would rise to between 2.1% and 2.4%.

My final chapter focuses on the impacts of deep learning adoption on firms' labor-augmenting productivity, wages, and labor share. I ask how the factor bias and skill bias of various deep learning technologies (computer vision, natural language processing, and generative AI) compare to that of robots. Using 2013-2023 data on a representative sample of Spanish manufacturing firms, I build a model of firm production with heterogeneous labor inputs, labor-augmenting and Hicks-neutral technological change, and adoption decisions for robotics and deep learning. Preliminary results find that both robotics and deep learning, with the exception of NLP, are labor-augmenting as well as skill-biased technologies.

Other work

My other work also focuses on digital technology adoption and innovation. One project, joint with Neil Thompson, uses data from the Information and Communication Technology Survey in the US to study the impact of the slowdown in computing progress on the productivity slowdown by estimating model of firm production featuring computer hardware and software inputs and factor biased technology. A second, joint with Neil Thompson and Emanuele Del Sozzo, leverages trace data on 1 million CPUs from a semiconductor manufacturing firm to construct a new price index for computer hardware.

My other research agenda in political economy focuses on game theoretic models of war, studying the impacts of innovation on arms races and war. One paper, coauthored with Andy Park and Robert Trager and published in *Journal of Conflict Resolution*, builds a model of an arms race for a dangerous new military technology with negative external-

ities, such as nuclear weapons or advanced AI, and studies the role of information in the welfare of such a race. We show that more decisive races, in which small performance leads produce larger probabilities of victory, have lower welfare. In addition, revealing information about rivals' capabilities has two opposing effects on risk: states discover either that they are far apart in capability and compete less or that they are close in capability and drastically reduce safety to win. A second project, joint with R. Daniel Bressler, Robert Trager, and Allan Dafoe, studies the impact of changes in the offense-defense balance, such as might occur from advances in military technology, on the joint welfare of combatants. We show that welfare is U-shaped in offensive advantage. High defensive advantage is optimal, as it generally results in peace. However, as offense dominates and war becomes likely, further offensive advantage increases welfare by lowering the duration and therefore destructiveness of conflict.