

Research Statement

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Research approach

I am an empirical economist who studies the economic interactions of labor and new technology, especially automation. My research field encompasses the intersection of micro-/macro- labor economics, applied microeconomics and urban economics with an emphasis on policy application. I reveal the aggregate implications and uncover the underlying mechanisms using the frameworks deeply rooted in economic theory, and employing micro-econometrics to both micro- and aggregate data.

My methodology is to carefully determine and adopt the best approach, according to the requirements of the research questions. I have learned a variety of frameworks and tools from different schools that facilitates multiple, in-depth angles of analysis. In the Job Market Paper, I use a structural approach to comprehensively assess the mechanism of automation and run policy experiments. In my second paper, “The Effect of Low-skilled Immigration on Robotization”, I have used a quasi-experimental approach, including a natural experiment regarding the Mariel Boatlift from Cuba and an instrumental variable strategy, to empirically establish a causal link of interest. In my third paper, “Using Regional Aging Elasticities to Derive Optimal Taxation on Robots”, I adopt a sufficient statistics approach (Chetty (2009)) to develop a theory-grounded policy test, where estimatable behavioral elasticities serves as informative inputs. In my earlier work, I performed a laboratory experiment to obtain a real negotiation dataset of 80 students to test a simple theory using the bargaining model.

Background

The defining point of my research interests occurred when I encountered a series of pioneering research papers in multiple economic disciplines, presented at the NBER Young Scholars Workshop and Conference on the Economics of Artificial Intelligence. (Agrawal et al., 2019) I was fascinated by the dynamics of scholars from various disciplines, labor, macro economists, theorists, and econometricians, get together to trail blaze the new field. In fact, I noticed that the paper Acemogulu and Restrepo (2018) presented there was perfectly applicable to my organizing question in the Dissertation, and modified it to the workhorse model in my job market paper.

Dissertation

In my dissertation, **Essays on Automation and Political Economy**, I explore the impacts of immigration and an aging population on the adoption of automation and the labor market consequences of automation. In each paper, I use the regional economy, proxied by commuting zones in the U.S., as a unit of analysis within the spatial economy framework.

The direction of my research is clearly shown in my job market paper, “**Immigration, Automation and the U.S. Cities: A Task-based Framework for Welfare Analysis.**” This paper was motivated by a simple observation that aging economies facing secular labor shortage are bound to shift by admitting foreign workers or adopting labor-saving technology. I advance the hypothesis that regional foreign labor inflow guides the penetration of automation. I start by documenting that low-skilled immigration is negatively linked to robotization, while high-skilled immigration is positively associated with computerization across the U.S. commuting zones.

To investigate the mechanism of automation, I develop a two-sector task-based framework in which tasks

are optimally allocated across robots, domestic labor and foreign labor. I semi-parametrically estimate the cross-factor substitution schedules from a series of commuting zone-level immigration elasticities on economic outcomes, estimated using instruments from a historical ethnic settlement pattern in 1940. To the best of my knowledge, this paper is the first to empirically estimate the cross-factor substitution schedule, and task-specific productivities, despite the sizable body of literature employing the task-based approach so frequently used in labor and macro economics.

My dynamic model predicts that immigration's impact on wages during 1980-2015 could be reversed by including effects from immigration-induced automation adjustments. I find that low-skilled immigration alone reduces routine occupation native wages, but it raises wages in the long run by retarding the adoption of automation, resulting in enhanced domestic welfare. Finally, I find that a universal basic income policy targeted to the U.S. citizens will boost dependence on both automation and foreign labor by raising routine occupation native wages.

In my second paper, "**The Effect of Low-skilled Immigration on Robotization**," I examine whether low-skilled immigration entry into manufacturing, construction and agriculture impedes the adoption of automation using industrial robots. Firstly, I show that the Mariel Boatlift in 1980 significantly stifled the adoption of robots in Miami, relative to the control regions. Then, employing an industrial robot dataset for 1980-2015, I document that low-skilled immigration and robot deployment are negatively associated across developed countries, as well as commuting zones and occupational categories within the U.S.

To explain these patterns, I develop a simple task assignment model, which predicts that a short-run wage drop triggered by immigration will nudge establishments to suppress the robotization in the long-run. Employing instruments from 1940 ethnic settlement patterns, I show that an inflow of 1,000 low-skilled foreign laborers reduces adoption of robots by 2.4 robots. This result suggests that restricting immigration will potentially lead to boosting automation, accompanied by unintended rising income inequality.

In my third paper, "**Using Regional Aging Elasticities to Derive Optimal Taxation on Robots**," I reassess the classic view which proposes that capital should not be taxed. I develop a task-based foundation of fiscal policy on autonomous machines, and derive an analytical formula of optimal tax rates for robots, characterized by elasticity of robot adoption with respect to regional aging. There exists an elasticity threshold, above which robots should be taxed. As a next step, I plan to estimate the elasticities using regional demographic aging statistics across the U.S. commuting zones; using these figures in my formula will determine the optimal policy rate and welfare calculations.

Earlier work

My first paper was motivated by my observation that influential political events (e.g. Presidential elections, national referendums) critically threaten the soft-landing of economic negotiations. In "**Political Risk and Negotiations**", I examine how political events affect negotiation dynamics — the players' behaviors and the total bargaining efficiency — using a simple bargaining model with asymmetric information.

I show that a sharp compromise occurs just after the political event, resulting in shorter expected duration of trades and preventing trade breakdowns, implying that small political risks could enhance the total efficiency of bargaining. The model helps explain the puzzling early closing in the 2015 Greece-European Union debt renegotiation driven by Greece's compromise just after their national referendum victory. I obtained real negotiation data by running laboratory experiments under the guidance of Professor Brian Rogers. The evidence broadly supports the predictions from my theory.

In the future

Looking forward, I plan to pursue two avenues of research concerning the interaction of labor and new technology. The first line of potential projects would address the economic consequence of automation or artificial intelligence (A.I.): how automation guides economic dynamism, women's labor force participation, offshored employment in developing countries, and the education reforms.

Another stream of projects would explore the mechanisms of automation: how the adoption and development of automation or A.I. is affected by highly-educated immigrants from China and India; and the regulation of working hours, unionization and a universal basic income policy. In my next academic pursuits, I will be excited to tackle these unexamined questions, collaborating with faculty members and students, and launching a new intellectual journey.

Citations

Acemoglu, Daron, and Pascual Restrepo. "The race between man and machine: Implications of technology for growth, factor shares, and employment." *American Economic Review* 108.6 (2018): 1488-1542.

Agrawal, Ajay, Joshua Gans, and Avi Goldfarb, editors, *The Economics of Artificial Intelligence: An Agenda*, University of Chicago Press (2019)

Chetty, Raj. "Sufficient Statistics for Welfare Analysis: A Bridge between Structural and Reduced-form Methods." *Annual Review of Economics* 1.1 (2009): 451-488.