Digital Economics and AI Tutorial

Alberto Binetti*

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I am a third-year PhD student in economics at Princeton University affiliated with the Industrial Relations Section. I have passed general examinations in Industrial Organization and Labor Economics, and have also taken graduate courses in Political and Behavioral Economics. My research interests concern the economics of technology, with a specific focus on *i)* market failures in nascent and rapidly evolving technology markets (such as compute) and *ii)* the interaction of technology and labor market institutions. Across these themes, I am interested in how markets and institutions shape the use of technology and the distribution of its benefits.

In *"What's Holding Back the Market for Compute?"*, joint with Filippo Paternollo, we study demand and supply in the market for compute, a critical input to AI development and deployment. We aim to identify its main market failures and understand how they propagate through the AI stack. This market is concentrated and growing rapidly, faces capacity constraints, and serves users with widely differing computational needs.

We start by documenting wide price dispersion both across and within GPU models, with hyperscalers commanding a large premium relative to neoclouds and marketplaces. The rental price of an H100 on Vast.ai, one of the leading marketplaces,[1] is less than half the corresponding price on AWS. This suggests users are willing to pay a premium to rent from a reputable provider. Consistent with this, most of the price dispersion within GPU models on Vast.ai is driven by a *verified* badge that is assigned by the platform based on performance. Using machine-level information on prices, occupancy, and verification status, we document that gaining verification is associated with a large, immediate increase in occupancy and prices, compared to similar but unverified machines. Losing verification has the opposite result on quantity but not on prices.

We are partnering with data vendors such as Ramp and Silicon Data to get market-wide transactions, as well as with Vast.ai to have the universe of transactions within a single marketplace. Motivated by discussions with practitioners, we also plan to focus on a specific feature of the compute market: the *shaky vertical ladder*, meaning that difficulties comparing GPU performance across workloads may lead buyers to purchase higher-end compute than they need. This can potentially crowd out other users and, if it reduces buyers' willingness to substitute toward competing providers, reinforce hyperscalers' market power.

*Email: abinetti@princeton.edu, website.

[1] Vast.ai ranks third among neocloud providers by adoption in Ramp's data, with 17% of neocloud buyers purchasing from the platform. For more details, see here.

In *"Bargaining over Technology"*, I study the extent to which workers and firms bargain over technology. Technology-induced displacement has been among the main worries of workers in the US in recent years.[2] If the consequences of technology are uncertain, unions can facilitate risk sharing for risk-averse workers at a risk-neutral firm. Moreover, they can provide workers with a voice to directly influence technological change.

I start by analyzing 4,600 US collective bargaining agreements from 2000 to 2024. I find that 55% of them contain provisions related to technology, ranging from simple information notices to explicit income and employment protection guarantees. These technological clauses are more prevalent in larger firms and in firms where workers are more exposed to automation. Consistent with a trade-off between pay and protection, employment and income protections are negatively correlated with negotiated first-year wage increases. These findings suggest that technology is a frequent subject of collective bargaining, with substantial heterogeneity in the rights and protections negotiated. However, negotiated contracts reflect both workers' preferences and firms' costs and bargaining power.

To isolate the role and magnitude of workers' preferences, I plan to run a nationally representative survey of workers with and without union coverage in the US. The survey will elicit *i)* beliefs and attitudes about technology in the workplace, *ii)* experiences of bargaining over technology, and *iii)* willingness to pay for union representation. The survey will conclude with a choice experiment randomly varying wages and technology provisions in order to estimate the willingness to pay for specific clauses. These measures will then allow me to study how demand for these provisions is influenced by workers' beliefs and experiences, as well as whether workers are willing to pay for voice even once employment and income are protected.

References:
Simon Jäger: simon.jaeger@princeton.edu
Pauline Carry: pauline.carry@princeton.edu

[2] See, for instance, Gallup.