Shiqi Xiang

PhD Student, Economic Analysis and Policy, Rotman School of Management, University of Toronto
105 St. George Street, Toronto, ON M5S 3E6, Canada
shiqi.xiang@mail.utoronto.ca

Application to the NBER Digital Economics and AI Tutorial, January 20–21, 2027

1. Graduate study

I am a third-year PhD student in the Economic Analysis and Policy area at the Rotman School of Management, University of Toronto. I enrolled in 2024 and expect to complete the degree in 2029. In my first two years I completed the PhD core sequence in microeconomic and macroeconomic theory, and field courses in Industrial Organization I and II, Advanced IO Theory, Economics and Strategy, Topics in Innovation, Health Economics, and Behavioural Economics. Before the PhD, I completed a master's degree in Economics and Finance at CEMFI, Madrid, Spain, where I specialized in econometrics, so my econometrics core requirement at the University of Toronto was waived.

2. Research interests

I work in industrial organization and energy economics. I study how firms operate new technologies in markets whose rules were written for older ones, and how market design shapes the returns to those technologies. My current work is on battery storage in the Texas electricity market (ERCOT). Through it I have become interested in a question at the center of digital economics: how algorithmic decision tools change the way firms bid, and what that does to market outcomes.

3. Research in progress

Readiness Is Not All: Subsidizing Technology Adoption or Technology Use? Evidence from Battery Energy Storage Projects (second-year paper). The paper asks whether a subsidy should target technology adoption or technology use. A battery can sell its capacity in two ways: as reserve, a fixed quantity the system operator buys each day, or as energy, charging when power is cheap and discharging at the evening peak. My dissertation builds a two-step model of battery entry, in which batteries first decide whether to enter and then operate in a static equilibrium. The second-year paper estimates the second stage: how a fleet of batteries splits its capacity between the two uses, using ERCOT data from 2018 to 2024. As the fleet grew, batteries filled the reserve market, its price fell, and capacity shifted toward energy. The model lets me compare the market allocation with a planner's, and weigh the investment tax credit, which pays for building a battery, against a payment for each megawatt it puts into the energy market.

Algorithmic and manual bidding under a market redesign (preliminary project). Every day each battery in ERCOT submits offers for reserve and energy, but very different agents design those offers: owners' in-house trading desks, owners that optimize a whole fleet as one portfolio, and third-party optimizers. Several of these optimizers describe their bidding as driven by AI and machine learning and fully automated, while industry observers in 2024 described many ERCOT batteries as managed manually. ERCOT's disclosure data identify the scheduling entity that submits each battery's offers, and I have matched these entities to the bidding agents behind them.

In December 2025 ERCOT introduced real-time co-optimization plus batteries (RTC+B). Reserves

are now procured together with energy every five minutes, and day-ahead reserve awards became financial positions settled against real-time prices. The reform changes what information is worth: the physical choice between reserve and energy moves from the day before to real time, so a battery can act on information that arrives during the day, and the day-ahead market becomes a place to take positions on real-time prices. I plan to use the reform to ask two questions. First, do batteries whose offers come from algorithmic agents adjust faster to the new rules and use the new real-time information more fully than manually managed ones? Second, what does the mix of bidding sophistication in the fleet mean for the reform's gains to the grid, measured by the cost of meeting energy demand and reserve requirements? I classify agents by what they say about their methods, not by how often their bids change, since a sophisticated bidder may optimally leave a good bid in place; batteries that switch agents give variation within the same asset.

Liability and technology adoption (theory). "Liability Relief and Adoption under Safe-Harbor Standards" (revise and resubmit, *Economics Letters*) studies how liability rules and safe-harbor standards affect the adoption of process innovations that require coordination and compliance inside an organization, with hospitals as the motivating case. The same question arises for AI decision tools in medicine and other regulated settings, where who bears the liability for an algorithm's errors shapes whether the tool is adopted.

4. Dissertation and committee

Tentative dissertation topic: *Battery Storage in Electricity Markets: Optimal Entry and Market Design*. Committee: Heski Bar-Isaac (supervisor), Joshua Gans, and Ambarish Chandra.

5. Interest in the tutorial

The bidding project connects my energy work to digital economics. I would like to build it on what the field already knows: how the literature models algorithmic decision-making, how it measures the adoption and quality of AI tools, and which data and identification strategies have worked. The tutorial and the meetings that follow would give me that background while the project is still being designed.