Application File for

2023 Digital Economics and AI Tutorial

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A Summary of Graduate Study

2020 - present, Ph.D. Student in Economics, Department of Economics, Yale University

- Fields of study
  Industrial Organization (major), Econometrics (minor)
- Comprehensive examinations completed
  (Format: Year - Field of Exam - Committee Members)

2022 (Oral)	Industrial Organization	Prof. Steven Berry, Prof. Katja Seim
	Econometrics	Prof. Donald Andrews, Prof. Xiaohong Chen
2021 (Written)	Microeconomics	
	Macroeconomics	

- Courses
  Microeconomics I & II, Macroeconomics I & II, Econometrics I & III & V, Industrial Organization I & II, Labor Economics I & II, Public Finance I, Topics in Empirical Economics and Public Policy, Industrial Organization Prospectus Workshop

Research Statement

I am an incoming fourth-year Ph.D. student in the Department of Economics at Yale University. My research applies empirical industrial organization methods to study the welfare of local small businesses facing the changing industry structure driven by digitization.

Designing Benefits for Local Small Businesses in Digital Platforms

Indirect network effects – determined by the number and heterogeneity of platform users – constitute the platform's attractiveness to potential users and fuel its future growth. How should the benefits from network effects be distributed among platform users, e.g., local small restaurants, and platforms, e.g., *DoorDash*, *UberEats*, *Postmates*, and *Grubhub*? In this project, I construct a dynamic model of food delivery platform growth in which indirect network effects enhance the benefits of joining the platform. I then estimate the model using data combining restaurant listings from major food delivery platforms and dynamic map-based storefront data in New York City. Finally, given the structural estimates, I propose and evaluate alternative benefit-sharing schemes featuring collective bargaining to partially internalize the benefits generated by network effects within restaurant coalitions.

This project focuses on the restaurant industry, which features (i) heterogeneous local small businesses on the supply side, (ii) significant platform penetration, and (iii) limited regulatory tools on platform pricing. Before the pandemic, the US restaurant industry grew at the rate of 3 to 4 percent per year, while the growth of platform-intermediated delivery sales doubled the pace. During the pandemic, platform penetration accelerated. As the pie grows larger, regulatory concerns arise on how the earnings should be divided among restaurants and platforms to maximize the social welfare. Despite restaurants' complaints on excessive commissions charged by platforms, limited regulatory tools have been implemented, including commission caps. Besides, no benefit-sharing scheme in use rewards heterogeneous restaurants for their asymmetric contribution to network externalities, which could lead to suboptimal levels of platform participation by influential restaurants.

I use a combination of datasets on the restaurant industry in New York City for empirical analysis: (i) monthly online food delivery platforms' restaurant listings, (ii) monthly-updated storefront map data, and (iii) consumer panel, including zip code demographics and random sample of dining consumption. For each observation of restaurant listings, data includes rich restaurant characteristics, including cuisine category, price range, average rating score, number of ratings, chain store, and platform partnership. By merging the platform listing data and the storefront map data, I obtain the comprehensive database of each restaurant's platform adoption status each month during the period of study.

I construct a dynamic model of a local restaurant industry featuring platform growth across periods. In each period, consumers in a local market make their two-step dining choices for each meal. A forward-looking consumer first chooses the channel of dining based on the expectation of maximized value generated from each channel. Then she searches and chooses the restaurant available in the given channel that maximizes her utility. Given the demand available from each channel, at the beginning of each period, all restaurants that operated in the previous period simultaneously and independently make their platform entry decisions to maximize their value functions. State variables include the lagged platform penetration status of each rival and the restaurant itself, and channel-specific demand shifters varying across periods, e.g., the start and end of lock-downs.

Finally, given estimates of the model, I propose and evaluate non-cap designs of the benefit-sharing scheme between local small restaurants and platforms. The idea is to partially internalize the benefits of indirect network effects generated by a coalition of heterogeneous restaurants' presence on the platform to themselves. In the counterfactual mechanism design, local small restaurants are allowed to form coalitions and bargain collectively with the platform company for a commission rate exclusively applicable to members of this coalition. In the scenario of disagreement, the platform will lose the whole coalition of restaurants. Model predicts that, under some equilibrium conditions, facing the threat of losing a sizable group of local restaurants – especially when the group contains influential restaurants – the platform will charge a lower commission rate to keep the coalition of restaurants. The discount obtained from collective bargaining reflects the platform's willingness to pay for the network externalities generated by the coalition of restaurants, which varies across coalitions. It requires future work to study the social planner's optimal design of coalitions, which involves trade-offs between intra-coalition restaurant competition and the coalition's total demand availability.