

ECON 688: Empirical Industrial Organization
Spring 2024
Instructor: Dong Woo Hahm (dongwooh@usc.edu)
Office hours: via Zoom upon request

Course Summary This is the second course in the graduate sequence of Industrial Organization. The goal is to cover empirical methods used in industrial organization research, and/or more generally structural approaches to microeconomics as well as how to read such empirical papers. The course is meant to be useful for all students who aims to use a structural model to answer questions in applied microeconomics. The first section of the course will cover demand estimation from choice data. Demand systems often form the center of structural applied microeconomics papers and understanding how to deal with the problems that arise in demand estimation is crucial. We will start from basic econometrics of discrete choice models, and cover BLP, and dynamic discrete choice models etc. The second section will look at several different topics from an empirical point of view. These classes will be run as a mixture of lecture, reading group, and guest lectures. You should read the required papers in advance of the class and be prepared to discuss them.

Time and Location Wednesdays, 4:00-7:20 pm, GFS 229¹

Prerequisite ECON 601, 603, 611, 609, *Recommended but not necessary*: ECON 680.
Students who are not in their second year of Economics PhD: While the course is primarily intended for the second year Economics PhD students, other students are welcome. Please email me prior to registration to see if we can accomodate you.

Course Requirements

1. Participation (20%): Portions of the class are discussion-based. Where the syllabus lists a paper with a star next to it, this indicates that you must read the paper before the class meeting and get ready for discussion. *You will be required to prepare a 30 minutes summary presentation of one assigned reading.*
2. Problem set (20%): There will be at least one problem set assigned, mostly coding.
3. Referee report (20%): One referee report will be assigned. You will need to complete the referee report along with a cover letter summarizing your analysis. One goal of the course is to teach you how to read papers for the purpose of providing constructive criticism. Thus, this assignment will be set after you have had a chance to read and discuss several papers.
4. Research Proposal (40%): You will be required to present a research proposal. You will soon start dissertation research so now is the right time to start thinking about ideas. You will be asked to prepare a 30-minute presentation during the last few classes (no written proposal required). One formal discussant will be assigned to each person, who will discuss the proposal (15 minutes, with slides). Use this opportunity to look for topics that excite you for your dissertation. An ideal proposal should include:
 - Motivation: Why are you interested in this topic? Try to convince other economists that your project is interesting.

¹We might be able to use KAP 319, I'll make an announcement if so.

- Question: What is the precise goal you are after by pursuing the project?
- Contribution: How does your project contribute to the literature, and what new things can we learn?
- Data: What are (potential) data sources that you can use to answer the question?
- Empirical approach: How would you use the data to answer the question?
- Limitations: What are the limitations of the project? It is important to think hard and distinguish what you can do and cannot do, and how you would defend those weaknesses. More importantly, it guides you toward subsequent projects and build your own research agenda.

Other Resources

- [Tirole \(1988\)](#) is an excellent general reference textbook for underlying theory of IO.
- I found the book [Train \(2009\)](#) very helpful for the basics of discrete choice models. An online pdf version can be found [here](#).
- For bayesian approaches, the book [Rossi, Allenby and McCulloch \(2003\)](#) is also very helpful.
- For integrating likelihood with multivariate normal random vectors, [Heiss and Winschel \(2008\)](#)'s sparse grids for quadrature is very helpful. It can be found [here](#).

Course Outline *Note: the course material is subject to change throughout the semester.*

An asterisk (*) right to a paper means it is required reading and you'll have to prepare a summary presentation for the paper you are assigned to.

- Week 1 (1/10): Introduction and econometric foundations — MLE, Method of Moments, Hierarchical Bayes
- Week 2 (1/17): Demand system estimation (Part 1) — discrete choice models (logit, nested logit, mixed logit, probit, estimation–MLE and Bayesian methods, EM)
[Train \(2009\)](#); [Rossi, Allenby and McCulloch \(2003\)](#)
- Week 3 (1/24): Demand system estimation (Part 2) — IV models of product differentiation Part 1
Review: [Gandhi and Nevo \(2021\)](#)
[Berry \(1994\)](#); [Berry, Levinsohn and Pakes \(1995\)](#)
A practitioner's guide to BLP: [Nevo \(2000b\)](#)
- Week 4 (1/31): Demand system estimation (Part 2), continued
[Berry, Levinsohn and Pakes \(2004\)](#); [Petrin \(2002\)](#); [Nevo \(2001\)](#)*
Single agent dynamics (Part 1) — Nested Fixed Point (NFXP) Algorithms
[Rust \(1987, 1994\)](#)
[NFXP Manual by Rust](#)
- Week 5 (2/7): Single agent dynamics (Part 2) — Conditional Choice Probability (CCP) models
[Hotz and Miller \(1993\)](#); [Hotz et al. \(1994\)](#); [Arcidiacono and Miller \(2011\)](#); [Gowrisankaran and Rysman \(2012\)](#)*

- Week 6 (2/14): Applications—merger analysis
[US Department of Justice Horizontal Merger Guidelines](#)
Hausman, Leonard and Zona (1994); Miller and Weinberg (2016)*; Capps, Dranove and Satterthwaite (2003); Farrell and Shapiro (1990); Conlon and Mortimer (2021); Bresnahan (1987); Nevo (2000a)*
- Week 7 (2/21): Applications—vertical contracting and integration
Hastings and Gilbert (2005); Akerberg and Botticini (2002); Asker (2016); Lee (2013); Chipty (2001); Hortacsu and Syverson (2007); Villas-Boas (2007); Mortimer (2008)*
- Week 8 (2/28): Applications—housing markets
Bayer, Ferreira and McMillan (2007); Song (2022)*; Bayer et al. (2016)*
- Week 9 (3/6): Applications—environmental economics
Timmins and Schlenker (2009); Freeman et al. (2019); Bayer, Keohane and Timmins (2009); Timmins and Murdock (2007); Ito and Zhang (2020)*; Ito and Sallee (2018); Bento et al. (2009); Blundell, Gowrisankaran and Langer (2020); Wagner (2022)
- Week 10 (3/13): Spring recess
- Week 11 (3/20): Applications—education markets (Part 1)
Dinerstein, Neilson and Otero (2022); Neilson (2021)*; Dinerstein and Smith (2021)*; Allende, Gallego and Neilson (2019); Allende (2019)
Guest lecture: tba
- Week 12 (3/27): Applications—education markets (Part 2: school choice)
Abdulkadiroğlu, Agarwal and Pathak (2017); Larroucau and Rios (2022); Idoux (2022)*; Laverde (2022); Lufade (2018); Son (2020); Agarwal and Somaini (2018); Hahm and Park (2022); Park and Hahm (2022); Artemov, Che and He (2022); Che, Hahm and He (2022); Otero, Barahona and Dobbin (2021); Akbarpour et al. (2022); Pathak and Shi (2021)*; Abdulkadiroğlu et al. (2020); Kapor, Neilson and Zimmerman (2020)
- Week 13 (4/3): Applications—market design
Gentry et al. (2018); Waldinger (2021)*; Zhang (2010); Verdier and Reeling (2022); Agarwal et al. (2021)*
Guest lecture: tba
- Week 14 (4/10): research proposal presentation
- Week 15 (4/17): research proposal presentation
- Week 16 (4/24): research proposal presentation

References

- Abdulkadiroğlu, Atila, Nikhil Agarwal, and Parag A. Pathak.** 2017. “The Welfare Effects of Coordinated Assignment: Evidence from the New York City High School Match.” American Economic Review, 107(12): 3635–3689. 3
- Abdulkadiroğlu, Atila, Parag A. Pathak, Jonathan Schellenberg, and Christopher R. Walters.** 2020. “Do Parents Value School Effectiveness?” American Economic Review, 110(5): 1502–1539. 3

- Akerberg, Daniel A, and Maristella Botticini.** 2002. “Endogenous matching and the empirical determinants of contract form.” Journal of Political Economy, 110(3): 564–591. 3
- Agarwal, Nikhil, and Paulo Somaini.** 2018. “Demand Analysis Using Strategic Reports: An Application to a School Choice Mechanism.” Econometrica, 86(2): 391–444. 3
- Agarwal, Nikhil, Itai Ashlagi, Michael A. Rees, Paulo Somaini, and Daniel Waldinger.** 2021. “Equilibrium Allocations Under Alternative Waitlist Designs: Evidence From Deceased Donor Kidneys.” Econometrica, 89(1): 37–76. 3
- Akbarpour, Mohammad, Adam Kapor, Christopher Neilson, Winnie van Dijk, and Seth Zimmerman.** 2022. “Centralized School choice with unequal outside options.” Journal of Public Economics, 210: 104644. 3
- Allende, Claudia.** 2019. “Competition Under Social Interactions and the Design of Education Policies.” Working Paper. 3
- Allende, Claudia, Francisco Gallego, and Christopher Neilson.** 2019. “Approximating The Equilibrium Effects of Informed School Choice.” Working Papers. 3
- Arcidiacono, Peter, and Robert A. Miller.** 2011. “Conditional Choice Probability Estimation of Dynamic Discrete Choice Models With Unobserved Heterogeneity.” Econometrica, 79(6): 1823–1867. 2
- Artemov, Georgy, Yeon-Koo Che, and YingHua He.** 2022. “Stable Matching with Mistaken Agents.” 3
- Asker, John.** 2016. “Diagnosing Foreclosure due to Exclusive Dealing.” The Journal of Industrial Economics, 64(3): 375–410. 3
- Bayer, Patrick, Fernando Ferreira, and Robert McMillan.** 2007. “A Unified Framework for Measuring Preferences for Schools and Neighborhoods.” Journal of Political Economy, 115(4): 588–638. 3
- Bayer, Patrick, Nathaniel Keohane, and Christopher Timmins.** 2009. “Migration and hedonic valuation: The case of air quality.” Journal of Environmental Economics and Management, 58(1): 1–14. 3
- Bayer, Patrick, Robert McMillan, Alvin Murphy, and Christopher Timmins.** 2016. “A Dynamic Model of Demand for Houses and Neighborhoods.” Econometrica, 84(3): 893–942. 3
- Bento, Antonio M, Lawrence H Goulder, Mark R Jacobsen, and Roger H Von Haefen.** 2009. “Distributional and efficiency impacts of increased US gasoline taxes.” American Economic Review, 99(3): 667–699. 3
- Berry, Steven, James Levinsohn, and Ariel Pakes.** 1995. “Automobile prices in market equilibrium.” Econometrica: Journal of the Econometric Society, 841–890. 2
- Berry, Steven, James Levinsohn, and Ariel Pakes.** 2004. “Differentiated products demand systems from a combination of micro and macro data: The new car market.” Journal of political Economy, 112(1): 68–105. 2
- Berry, Steven T.** 1994. “Estimating discrete-choice models of product differentiation.” The RAND Journal of Economics, 242–262. 2

- Blundell, Wesley, Gautam Gowrisankaran, and Ashley Langer.** 2020. “Escalation of Scrutiny: The Gains from Dynamic Enforcement of Environmental Regulations.” American Economic Review, 110(8): 2558–2585. 3
- Bresnahan, Timothy F.** 1987. “Competition and Collusion in the American Automobile Industry: The 1955 Price War.” The Journal of Industrial Economics, 35(4): 457–482. 3
- Capps, Cory, David Dranove, and Mark Satterthwaite.** 2003. “Competition and Market Power in Option Demand Markets.” The RAND Journal of Economics, 34(4): 737–763. 3
- Che, Yeon-Koo, Dong Woo Hahm, and YingHua He.** 2022. “Leveraging Uncertainties to Infer Preferences: Robust Analysis of School Choice.” Working Paper. 3
- Chifty, Tasneem.** 2001. “Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry.” The American economic review, 91(3): 428–453. 3
- Conlon, Christopher, and Julie Holland Mortimer.** 2021. “Empirical properties of diversion ratios.” The RAND Journal of Economics, 52(4): 693–726. 3
- Dinerstein, Michael, and Troy D. Smith.** 2021. “Quantifying the Supply Response of Private Schools to Public Policies.” American Economic Review, 111(10): 3376–3417. 3
- Dinerstein, Michael, Christopher Neilson, and Sebastian Otero.** 2022. “The Equilibrium Effects of Public Provision in Education Markets: Evidence from a Public School Expansion Policy.” Working Paper. 3
- Farrell, Joseph, and Carl Shapiro.** 1990. “Horizontal Mergers: An Equilibrium Analysis.” The American Economic Review, 80(1): 107–126. 3
- Freeman, Richard, Wenquan Liang, Ran Song, and Christopher Timmins.** 2019. “Willingness to pay for clean air in China.” Journal of Environmental Economics and Management, 94: 188–216. 3
- Gandhi, Amit, and Aviv Nevo.** 2021. “Empirical Models of Demand and Supply in Differentiated Products Industries.” Working Paper 29257. 2
- Gentry, Matthew L, Timothy P Hubbard, Denis Nekipelov, Harry J Paarsch, et al.** 2018. “Structural econometrics of auctions: a review.” Foundations and Trends® in Econometrics, 9(2-4): 79–302. 3
- Gowrisankaran, Gautam, and Marc Rysman.** 2012. “Dynamics of Consumer Demand for New Durable Goods.” Journal of Political Economy, 120(6): 1173–1219. 2
- Hahm, Dong Woo, and Minseon Park.** 2022. “A Dynamic Framework of School Choice: Effects of Middle Schools on High School Choice.” Working Paper. 3
- Hastings, Justine S., and Richard J. Gilbert.** 2005. “MARKET POWER, VERTICAL INTEGRATION AND THE WHOLESALE PRICE OF GASOLINE.” The Journal of industrial economics, 53(4): 469–492. 3
- Hausman, Jerry, Gregory Leonard, and J. Douglas Zona.** 1994. “Competitive Analysis with Differentiated Products.” Annales d’Économie et de Statistique, , (34): 159–180. 3

- Heiss, Florian, and Viktor Winschel.** 2008. “Likelihood approximation by numerical integration on sparse grids.” Journal of Econometrics, 144(1): 62–80. [2](#)
- Hortacsu, Ali, and Chad Syverson.** 2007. “Cementing Relationships: Vertical Integration, Foreclosure, Productivity, and Prices.” The Journal of political economy, 115(2): 250–301. [3](#)
- Hotz, V. Joseph, and Robert A. Miller.** 1993. “Conditional Choice Probabilities and the Estimation of Dynamic Models.” The Review of Economic Studies, 60(3): 497–529. [2](#)
- Hotz, V. Joseph, Robert A. Miller, Seth Sanders, and Jeffrey Smith.** 1994. “A Simulation Estimator for Dynamic Models of Discrete Choice.” The Review of Economic Studies, 61(2): 265–289. [2](#)
- Idoux, Clemence.** 2022. “Integrating New York City Schools: The Role of Admission Criteria and Family Preferences.” Working Paper. [3](#)
- Ito, Koichiro, and James M Sallee.** 2018. “The economics of attribute-based regulation: Theory and evidence from fuel economy standards.” Review of Economics and Statistics, 100(2): 319–336. [3](#)
- Ito, Koichiro, and Shuang Zhang.** 2020. “Willingness to pay for clean air: Evidence from air purifier markets in China.” Journal of Political Economy, 128(5): 1627–1672. [3](#)
- Kapor, Adam J., Christopher A. Neilson, and Seth D. Zimmerman.** 2020. “Heterogeneous Beliefs and School Choice Mechanisms.” American Economic Review, 110(5): 1274–1315. [3](#)
- Larroucau, Tomas, and Ignacio Rios.** 2022. “Dynamic College Admissions.” Working Paper. [3](#)
- Laverde, Mariana.** 2022. “Distance to Schools and Equal Access in School Choice Systems.” Working Paper. [3](#)
- Lee, Robin S.** 2013. “Vertical Integration and Exclusivity in Platform and Two-Sided Markets.” The American economic review, 103(7): 2960–3000. [3](#)
- Lufade, Margaux.** 2018. “The value of information in centralized school choice systems.” Working Paper. [3](#)
- Miller, Nathan, and Matthew Weinberg.** 2016. “The market power effects of a merger: Evidence from the us brewing industry.” Econometrica. [3](#)
- Mortimer, Julie H.** 2008. “Vertical contracts in the video rental industry.” The Review of Economic Studies, 75(1): 165–199. [3](#)
- Neilson, Christopher A.** 2021. “Targeted Vouchers, Competition among Schools, and the Academic Achievement of Poor Students.” Working Paper. [3](#)
- Nevo, Aviv.** 2000a. “Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry.” The RAND Journal of Economics, 31(3): 395–421. [3](#)
- Nevo, Aviv.** 2000b. “A practitioner’s guide to estimation of random-coefficients logit models of demand.” Journal of economics & management strategy, 9(4): 513–548. [2](#)
- Nevo, Aviv.** 2001. “Measuring Market Power in the Ready-to-Eat Cereal Industry.” Econometrica, 69(2): 307–342. [2](#)

- Otero, Sebastian, Nano Barahona, and Caue Dobbin.** 2021. “Affirmative Action in Centralized College Admission Systems: Evidence from Brazil.” Working Paper. 3
- Park, Minseon, and Dong Woo Hahm.** 2022. “Location Choice, Commuting, and School Choice.” Working Paper. 3
- Pathak, Parag A., and Peng Shi.** 2021. “How well do structural demand models work? Counterfactual predictions in school choice.” Journal of Econometrics, 222(1, Part A): 161–195. 3
- Petrin, Amil.** 2002. “Quantifying the benefits of new products: The case of the minivan.” Journal of political Economy, 110(4): 705–729. 2
- Rossi, Peter E, Greg Allenby, and Robert McCulloch.** 2003. “Bayesian statistics and marketing.” Marketing Science, 22(3): 304–328. 2
- Rust, John.** 1987. “Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher.” Econometrica, 55(5): 999–1033. 2
- Rust, John.** 1994. “Chapter 51 Structural estimation of markov decision processes.” In . Vol. 4, 3081–3143. Elsevier. 2
- Song, Jaehee.** 2022. “The Effects of Residential Zoning in U.S. Housing Markets.” Working Paper. 3
- Son, Suk Joon.** 2020. “Distributional Impacts of Centralized School Choice.” Working Paper. 3
- Timmins, Christopher, and Jennifer Murdock.** 2007. “A revealed preference approach to the measurement of congestion in travel cost models.” Journal of Environmental Economics and Management, 53(2): 230–249. 3
- Timmins, Christopher, and Wolfram Schlenker.** 2009. “Reduced-form versus structural modeling in environmental and resource economics.” Annu. Rev. Resour. Econ., 1(1): 351–380. 3
- Tirole, Jean.** 1988. The theory of industrial organization. MIT press. 2
- Train, Kenneth E.** 2009. Discrete choice methods with simulation. Cambridge university press. 2
- Verdier, Valentin, and Carson Reeling.** 2022. “Welfare effects of dynamic matching: An empirical analysis.” The Review of Economic Studies, 89(2): 1008–1037. 3
- Villas-Boas, Sofia Berto.** 2007. “Vertical Relationships between Manufacturers and Retailers: Inference with Limited Data.” The Review of economic studies, 74(2): 625–652. 3
- Wagner, Katherine R. H.** 2022. “Adaptation and Adverse Selection in Markets for Natural Disaster Insurance.” American Economic Journal: Economic Policy, 14(3): 380–421. 3
- Waldinger, Daniel.** 2021. “Targeting In-Kind Transfers through Market Design: A Revealed Preference Analysis of Public Housing Allocation.” American Economic Review, 111(8): 2660–2696. 3
- Zhang, Juanjuan.** 2010. “The sound of silence: Observational learning in the US kidney market.” Marketing Science, 29(2): 315–335. 3