UNIVERSITY of HOUSTON

# Empirical Industrial Organization

Spring Semester 2023
Tuesday-Thursday: 11:30 AM - 1:00 PM
SR2 134

**Contact information**

Prof. Andrea Szabo
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Office: Online
Office hours: By appointment only. Mostly on Thursdays, check the online schedule.
You can schedule an appointment at http://www.uh.edu/~aszabo2/appointments.htm

**Course Description**

This course provides a graduate-level introduction to empirical industrial organization, both in terms of techniques and applications. We will discuss leading papers in the field of empirical IO covering the estimation of several models and their applications. This class differs somewhat from the courses offered under the same class number in previous years.

1. Estimating production functions. We study recent advances in production function estimation techniques, which includes computing productivity and misallocation measures.

2. Models of product differentiation.
We estimate demand systems for differentiated products, which gives us a framework to estimate own and cross price elasticities, estimate markups, measure market power, evaluate mergers, quantify the benefits of a new product, evaluate the effect of discontinuing a product, examine how information asymmetry (advertising) affects demand estimation and the resulting substitution patterns.

3. Single agent dynamic models, Dynamic games of imperfect competition.
We provide a framework to estimate discrete choice dynamic models. We start with the estimation of single agent dynamic models, such as the optimal investment model. Next, we study the estimation of multiplayer dynamic games. Our main focus is on models of firm entry and exit in oligopoly markets. We analyze industry pricing, industry performance, and optimal industry policy, and measure the welfare cost of government regulations.

4. Dynamic demand estimation, storable and durable goods.
This part of the class introduces recent advances in dynamic durable goods models and models of storable goods to study consumers' inventory behavior and intertemporal substitution.

5. Public utilities.
This segment provides an introduction to recent research on public utilities. We look at pricing of electricity and water in both developed and developing countries. Next, we discuss how non-payment for public utilities can hinder service provision, and possible solutions. We also see how pricing and additional regulations can motivate conservation.

**Prerequisites**
Students are expected to have taken PhD level Microeconomic Theory and Econometrics classes. Students also need to have basic knowledge of dynamic optimization. Programming in STATA and MATLAB will be required to complete homework assignments.

**Textbook and software**
There is no specific textbook for this class. We will be using a combination of lecture notes and journal articles. The required articles are listed below in each section. The additional reading list provides background reading on the topics and serves as a reference to your lecture notes.
You will be required to use STATA and MATLAB software packages. STATA is available for purchase at a discounted price and MATLAB is available for free for UH students.

Students should familiarize themselves with the software packages in order to program the homework exercises. Although we will briefly discuss how to implement specific estimation methods in MATLAB, the class does not provide an introduction to basic computer programming.

**Course Requirements**
The class schedule below contains the main papers we are going to discuss during each class. Students are expected to complete the assigned readings before attending class. For each topic, I will provide an overview of the literature, and we will discuss the assigned paper in detail. Depending on the class, we may spend more time on the overview and less on the details. Students are required to fully understand the assigned papers regardless of how much time we spend on them in class. All of these papers will be part of the exams.

The course has some difficult econometrics, and it is expected that students have a basic comfort level with estimation. It is also expected that students will do requisite background readings in econometric theory where necessary. This class will be rather demanding.

There will be 5 homework assignments and two exams. See below.

## Assignments and Grading

The final grade is based on three homework exercises and on two exams.
Please be prepared to work on these homeworks for several weeks. The due dates for homework assignments are listed in the class schedule.
The exams are worth 50% (25% each) and the homework assignments are worth 50% of your final grade. To receive any grade other than "F" or "Incomplete", a student is required to submit all assignments. There is no exception.

## Class Website

All assignments and handouts will be posted on the class website in Blackboard. Go to http://www.uh.edu/blackboard and click the white "Blackboard Learn" button. Log in with your CougarNet ID and password. Please do not email me homework files, upload everything on Blackboard.

### COVID-19 Information

Students are encouraged to visit the University's COVID-19 website for important information including diagnosis and symptom protocols, testing, vaccine information, and post-exposure guidance. Please check the website throughout the semester for updates. Consult the Graduate Excused Absence Policy for information regarding excused absences due to medical reasons.

### Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact the Justin Dart Jr. Student Accessibility Center (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

### Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Resources for Online Learning

The University of Houston is committed to student success, and provides information to optimize the online learning experience through our Power-On website. Please visit this website for a comprehensive set of resources, tools, and tips including: obtaining access to the internet, AccessUH, Blackboard, and Canvas; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

UH Email

Please check and use your Cougarnet email for communications related to this course. To access this email, login to your Microsoft 365 account with your Cougarnet credentials.

Academic Honesty Policy

High ethical standards are critical to the integrity of any institution, and bear directly on the ultimate value of conferred degrees. All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed. The UH Academic Honesty Policy is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy.

Title IX/Sexual Misconduct

Per the UHS Sexual Misconduct Policy, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and state law and must report incidents of sexual misconduct (sexual harassment, non-consensual sexual contact, sexual assault, sexual exploitation, sexual intimidation, intimate partner violence, or stalking) about which they become aware to the Title IX office. Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the Title IX website at https://uh.edu/equal-opportunity/title-ix-sexual-misconduct/resources/.

Security Escorts and Cougar Ride

UHPD continually works with the University community to make the campus a safe place to learn, work, and live. Our Security escort service is designed for the community members who have safety concerns and would like to have a Security Officer walk with them, for their safety, as they make their way across campus. Based on availability either a UHPD Security Officer or Police Officer will escort students, faculty, and staff to locations beginning and ending on campus. If you feel that you need a Security Officer to

walk with you for your safety please call 713-743-3333. Arrangements may be made for special needs.

Parking and Transportation Services also offers a late-night, on-demand shuttle service called Cougar Ride that provides rides to and from all on-campus shuttle stops, as well as the MD Anderson Library, Cougar Village/Moody Towers and the UH Technology Bridge. Rides can be requested through the UH Go app. Days and hours of operation can be found at https://uh.edu/af-university-services/parking/cougar-ride/.

Syllabus Changes
Please note that the instructor may need to make modifications to the course syllabus. Notice of such changes will be announced as quickly as possible through Blackboard.

**Helpful Information**

**Coogs Care**: https://uh.edu/dsa/coogscare/
**Student Health Center**: https://www.uh.edu/healthcenter/

## Tentative Course Schedule:

| Class # | Date/Day | | | Topic | Problem Sets |
|---|---|---|---|---|---|
| 1 | Jan | 17 | T | Welcome to IO! Syllabus, introduction | |
| **PRODUCTION AND TECHNOLOGY** | | | | | |
| 2-3 | | 19-24 | Th, T | S. Olley and A. Pakes (1996): "The Dynamics of Productivity in the Telecommunications Equipment Industry," *Econometrica,* 64, 1263-98.<br><br>A. Petrin and J. Levinsohn (2003): "Estimating Production Functions Using Inputs to Control for Unobservables," *Review of Economic Studies*, 70(2), 317-342.<br><br>Wooldridge, J. M. (2009): "On Estimating Firm-Level Production Functions Using Proxy Variables to Control for Unobservables," *Economics Letters* 104(3), 112-114. | |
| 4-5-6 | Jan/Feb | 26-31-2 | Th, T, Th | Asker, J., A. Collard-Wexler, and J. De Loecker (2014): "Dynamic Inputs and Resource (Mis)Allocation," *Journal of Political Economy 122(51), 1013-1063.* | |

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|---|---|---|---|---|---|
| | | | | Ackerberg, D. A., K. Caves, and G. Frazer (2015): "Identification Properties of Recent Production Function Estimators," *Econometrica*, 83(6), 2411-2451.<br><br>Gandhi, A., S. Navarro and D. Rivers (2020): "On the Identification of Gross Output Production Functions," *Journal of Political Economy 122(51), 1013-1063.*<br>One class in on Sabine Cluster (https://uh.edu/rcdc/resources/hpc/sabine/) | |
| **DIFFERENTIATED PRODUCTS** | | | | | |
| 7 | Feb | 7 | T | Berry, S., J. Levinsohn, and A. Pakes (1995): "Automobile Prices in Market Equilibrium," *Econometrica*, 63(4), 841-890. | **PS 1 Due** |
| 8-9 | | 9-14 | Th, T | Nevo, A. (2001): "Measuring Market Power in the Ready-to-Eat Cereal Industry," *Econometrica,* 69, 307-342.<br><br>Nevo, A. (1998): "A Practitioner's Guide to Estimation of Random-Coefficients Logit Models of Demand," *Journal of Economics and Management Strategy,* 9(4), 513-548. | |
| 10 | | 16 | Th | Petrin A. (2002): "Quantifying the Benefits of New Products: The Case of the Minivan", *Journal of Political Economy*, 110, 705-729. | |
| 11 | | 21 | T | Goeree M. (2009): "Limited Information and Advertising in the U.S. Personal Computer Industry," *Econometrica*, 76(5), 1017–1074. | |
| 12 | | 23 | Th | *Cath-up, more on BLP and HW.* | |
| 13 | | 28 | T | Collecting survey data to estimate demand: practical advice and examples<br><br>Leung, T.C. (2013): "What is the True Loss Due to Piracy? Evidence from Microsoft Office in Hong Kong," *The Review of Economics and Statistics*, 95(3): 1018–1029<br><br>A. Szabo and V. Pham (2022): "Net Neutrality and Consumer Demand in the Video On-demand Market," Information Economics and Policy 61, 1-20. | |
| 14 | March | 2 | Th | **Midterm I** | |

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| **ESTIMATION OF DYNAMIC MODELS** | | | | | |
| 15 | | 7 | T | Overview of dynamic programming. Value function. Markov Perfect Equilibrium Concept.<br><br>Rust, J. (1987): "Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher," *Econometrica* 55(5), 999-1033. | **PS 2 Due** |
| 16 | | 9 | Th | Hotz, V. J. and R. A. Miller (1993): "Conditional Choice Probabilities and the Estimation of Dynamic Models," *Review of Economic Studies* 60(3), 497-529. | |
| 17-18 | | 14-16 | T, Th | **No Class: Spring Break** | |
| 19 | | 21 | T | Bajari, P., L. Benkard and J. Levin (2007): "Estimating Dynamic Models of Imperfect Competition," *Econometrica* 75(5), 1331-70 | |
| 20 | | 23 | Th | Benkard, L. (2004): "Dynamic Analysis of the Market for Wide-Bodied Commercial Aircraft," *Review of Economic Studies,* 71, 581-611. | |
| 21 | | 28 | T | S. P. Ryan (2012): "The Costs of Environmental Regulation in a Concentrated Industry," *Econometrica*, 80(3), 1019–1061 | |
| **DYNAMIC DEMAND** | | | | | |
| 22 | | 30 | Th | Erdem, T., S. Imai and M. P. Keane (2003): "Brand Quantity Choice Dynamics Under Price Uncertainty," *Quantitative Marketing and Economics*, 1, 5-64.<br><br>Pesendorfer, M. (2002): "Retail Sales: A Study of Pricing Behavior in Supermarkets," *The Journal of Business,* 75, 33-66. | **PS 3 Due** |
| 23 | April | 4 | T | Hendel, I. and A. Nevo (2006): "Measuring the Implications of Sales and Consumer Inventory Behavior," *Econometrica*, 74(6), 1637-1673. | |
| 24 | | 6 | Th | Hendel, I. and A. Nevo (2013): "Intertemporal Price Discrimination in Storable Goods Market," *American Economic Review*, 103(7), 2722-2751. | |

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| 25 | | 11 | T | Gowrisankaran, G. and M. Rysman (2012): "Dynamics of Consumer Demand for New Durable Goods, *Journal of Political Economy,* 120, 1173-1219. | |
| **PUBLIC UTILITIES** | | | | | |
| 26 | | 13 | Th | S. Borenstein (2012): "The Redistributional Impact of Nonlinear Electricity Pricing," *American Economic Journal: Economic Policy*, 4(3): 56–90<br><br>Mansur, E. T. and S. M. Olmstead (2012): "The Value of Scarce Water: Measuring the Inefficiency of Municipal Regulations," *Journal of Urban Economics*, 71(3), 332-346. | **PS 4 Due** |
| 27 | | 18 | T | Szabo, A. (2015): "The Value of Free Water: Analyzing South Africa's Free Basic Water Policy, *Econometrica*, 83(5), 1913–1961.<br><br>Jack, B.K. and G. Smith (2020): "Charging ahead: Prepaid electricity metering in South Africa" *American Economic Journal: Applied Economics*, 12(2): 134-168. | |
| 28 | | 20 | Th | Ferraro, P. J. and M. K. Price (2013): "Using Nonpecuniary Strategies to Influence Behavior: Evidence from a Large-Scale Field Experiment", *The Review of Economics and Statistics*, March 2013, 95(1), 64–73.<br><br>A. Szabo and G. Ujhelyi (2015): "Reducing Nonpayment for Public Utilities: Experimental Evidence from South Africa", *Journal of Development Economics*, 117, 20–31. | |
| 29 | | 25 | T | Current topics in IO | **PS 5 Due** |
| 30 | | 27 | Th | **Midterm II** | |