ECO 310 H1F
EMPIRICAL INDUSTRIAL ORGANIZATION

DEPARTMENT OF ECONOMICS. UNIVERSITY OF TORONTO
Fall 2023

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Course Website in Quercus: https://q.utoronto.ca/courses/311070

- **Lectures (Presential):** Thursdays 10am-12pm – Classroom, Sidney Smith (SS) 1073
- **Tutorials (Presential):** Thursdays 12pm-1pm – Classroom, Sidney Smith (SS) 1073
- **Office Hours (Presential):** Thursdays 4pm-5pm – Max Gluskin House (GE), Office 309

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1. COURSE DESCRIPTION

This course serves as an introduction to Empirical Industrial Organization (IO). IO explores the inner workings of markets, examining how firms engage in competition or collusion and how these interactions shape crucial outcomes, including the variety of available products, their pricing and quality, firm profitability, and consumer well-being. IO places a strong emphasis on the interdependence of decisions made by firms operating within a market. When a firm designs a new product, determines production levels, selects inputs, or sets prices, it must consider how other firms in the market will respond by adjusting their own strategies. These interdependencies form the foundation of firms' decision-making processes and drive competition within the market.

Over the past two decades, research in IO has predominantly taken an empirical turn. IO economists now rely extensively on data related to consumers' and firms' decisions to quantify consumer demand, firms' costs, and overall profitability. They leverage these measurements to gain insights into firms' strategic behaviors and to assess the impact of government regulations on market competition and, ultimately, societal well-being. The increasing availability of rich data pertaining to consumer and firm choices, often referred to as 'big data,' has significantly influenced this field by generating novel empirical inquiries that require innovative models and methodologies.

Empirical IO underscores the significance of integrating data, economic models, and appropriate econometric techniques to address empirical inquiries. Four models serve as the cornerstone for the majority of research in this field: (i) production functions and the assessment of firm productivity; (ii) demand models and the estimation of consumer preferences; (iii) models of price and quantity competition; and (iv) models of market entry and innovation, encompassing both static and dynamic perspectives. This course is structured around these pivotal models.

Econometrics and data analysis are essential tools for economists in the 21st century, and they play a central role in this course. We will cover standard econometric models and methods, including linear regression, instrumental variables estimation, and discrete choice models. Students will gain practical experience by working with economic data and using the STATA statistical software package.

2. COURSE OBJECTIVES

- By the end of this course, students will:

  (i) Understand key features of empirical models encompassing demand, production function, price and quantity competition, and market entry.

  (ii) Grasp endogeneity issues in simultaneous equations models, their implications, and potential solutions.

  (iii) Demonstrate proficiency in using market data to estimate model parameters and interpret the economic implications of these estimations.

  (iv) Acquire practical programming skills using Stata and hands-on experience with real-world data, preparing them to engage in empirical IO research projects.

- **Tutorials are integral to this course**, offering essential experience on programming and working with real-world market data. They are crucial not only for completing assignments but also for addressing practical questions in midterm and final exams. Active participation in all tutorials is expected from students.

3. COURSE PREREQUISITES

- *Microeconomic Theory:* ECO200 Y1, or ECO204 Y1, or ECO206 Y1.

- *Quantitative Methods:* ECO220 Y1, or ECO227 Y1, or (STA237 H1 & STA238 H1), or (STA247 H1 & STA248 H1), or (STA257 H1 & STA261 H1).

***** It is the student's responsibility to ensure s\he has met the prerequisites for this course.**

4. RECOMMENDED COURSES (but not prerequisites)

- ECO380 H1: Markets, Competition, and Strategy. This course covers the theory of IO.
- Applied Econometrics: ECO372 H1, ECO375 H1, or equivalent.

5. CLASS MEETINGS

- **Lectures (Presential):** Thursdays 10am-12pm – Classroom, Sidney Smith (SS) 1073
- **Tutorials (Presential):** Thursdays 12pm-1pm – Classroom, Sidney Smith (SS) 1073
- Please, keep in mind the following **expectations**.

  (i) **Missing a lecture** or tutorial without justification will be penalized with 3 percentage points from your maximum of 10 points from class participation. This does not mean that attending a lecture –without active participation – grants you points in your class participation grade.

  (ii) Show up for classes **on time**, give your best effort to fully engage in learning activities.

6. EVALUATION

- Your final grade will be based on the evaluation of class participation, two problem sets, a midterm exam, and a final exam according to the following weighting:

Class Participation:	10%
Problem sets (2 sets):	40%
Midterm Exam:	20%
Final Exam:	30%

- ***Class Participation (10%).*** Your grade will be based on your active participation in class – asking and responding questions and engaging in discussions on the course material – and on (unannounced) in-class quizzes.

- ***Problem sets (40%).*** There will be two problem sets, each worth 20%. In these problem sets you will have to use the STATA software package.

  - Problem set 1 will be handed out on Thursday, September 21st (it will be posted at the course website in Quercus) and it is **due before Thursday, September 28th, through Quercus before 11:59pm**.

  - Problem set 2 will be handed out on Thursday, November 2nd (it will be posted at the course website in Quercus) and it is **due before Thursday, November 16th, through Quercus before 11:59pm**.

  - Your answers to the problem sets should be typed and submitted in electronic version, preferably in PDF format.

  - Late assignments will not be accepted and will receive a grade of zero.

- ***Midterm Exam (20%).*** Closed-Book exam, no aids allowed. The material covered in this Midterm Exam includes all the lectures and tutorials from Week 1 to Week 7, included. The duration of the exam is 1.5 hours. The exam will take place in class during lecture/tutorial time on **Thursday, October 26th**.

- ***Final Exam (30%).*** Closed-Book exam, no aids allowed. The material covered in this Final Exam includes all the lectures and tutorials from Week 1 to Week 12, included. The duration of the exam is 3 hours. The exam will take place **during the University Final Exam Period**. **Date, Time, and Location to Be Announced**.

7. MISSED DEADLINES

If you miss a deadline due to illness or injury, you must send me an email from your UofT email account within 24 hours of the missed deadline. You may also want to report your absence through the online absence declaration available on **ACORN** under the Profile and Settings menu. You will have to write a make-up test within one week of the missed test, at a time and date chosen by the instructor, and with as little as one day's notice.

8. ACADEMIC CONDUCT

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism—representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program—is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at http://www.writing.utoronto.ca. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity and http://academicintegrity.utoronto.ca**.** All cases of suspected academic misconduct will be referred to the Dean's office.

9. USE OF ARTIFITIAL INTELLIGENCE TOOLS IN ASSIGNMENTS

Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments. However, students are ultimately accountable for the work they submit. Students must submit, as an appendix with their assignments, a description of whether and how they have used artificial intelligence tools. The documentation should include what tool(s) were used, how they were used, and how the results from the AI were incorporated into the submitted work.

10. ACCESSIBILITY

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting http://www.studentlife.utoronto.ca/as/new-registration. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work.

11. E-MAIL POLICY

Use e-mails for appointments, administrative matters, or urgent issues. Questions about the course material, lectures, and tutorials are more appropriate for office hours. I will normally reply to e-mails within 24 hours. You must use your UofT e-mail address and include the course number "ECO 310" in the subject line, otherwise your e-mail may be automatically quarantined as "junk e-mail".

12. TEST SCORE APPEALS

Please write a short paragraph explaining why you should obtain additional points. Turn in a hard copy of this by the end of the week following the week in which exams are first handed back. Your entire exam will then be re-graded, **and your score may go up or down**.

13. COURSE WEBSITE

The course website in Quercus is https://q.utoronto.ca/courses/311070. I will use the course website as a means of communication with the class, so I recommend you check the announcements regularly. In addition, I will periodically post the lecture slides online.

14. COURSE MATERIAL

- There is no textbook. The course is organized around a Book Project, four survey papers in Empirical IO and Structural Econometrics (see Main References below), and published articles on empirical applications. The lecture notes and the surveys are key references for this course.

- You are required to have access to the STATA software package. You can get the student version inexpensively from the software licensing office in Robarts library. The six-month license of STATA/BE is sufficient for this course.

- In addition, a useful supplemental econometrics reference is:

  Jeffrey M. Wooldridge: "Introductory Econometrics: A Modern Approach", 4th Edition or later. Although it is not required, this textbook is available for purchase at the U of T Bookstore. Free copies are available online.

15. MAIN REFERENCES

PDF copies of these references are available online in the course website.

- [ABBP] Ackerberg, D., L. Benkard, S. Berry, and A. Pakes (2006): "Econometric Tools for Analyzing Market Outcomes," *Handbook of Econometrics*, volume 6.

- [AG] Aguirregabiria, V. (2021): Book Project: "Empirical Industrial Organization: Models, Methods and Applications." Available at the course website.

- [ASL] Aguirregabiria, V., and M. Slade (2017): "Empirical Models of Firms and Industries," *Canadian Journal of Economics*, 50(5), 1445-1466.

- [ASU] Aguirregabiria, V. and J. Suzuki (2016): "Empirical Games of Market Entry and Spatial Competition in Retail Industries," *Handbook on the Economics of Retail and Distribution*, Chapter 9, pp 201-233. Emek Basker (editor). Edward Elgar Publishing.

- [BR] Berry, S., & Reiss, P. (2007): "Empirical Models of Entry and Market Structure," in *Handbook of Industrial Organization*, Volume 3, pp. 1845-1886.

- [NE] Nevo, A. (2011): "Empirical Models of Consumer Behavior," *Annual Review of Economics*, 3, 51-75.

- [RW] Reiss, P., and Wolak, F. (2007): "Structural Econometric Modeling: Rationales and Examples from Industrial Organization," in *Handbook of Econometrics*, Volume 6, pp. 4277-4415.

16. LIST OF TOPICS

1. Introduction to the Course.
2. Measuring Productivity. Estimation of Production Functions.
3. Measuring Consumer Preferences. Estimation of Demand of Differentiated Products
4. Competition in Prices and Quantities.
5. Empirical Models of Market Entry

17. OUTLINE AND REFERENCES

1. Introduction to the Course

1.1. Measuring and explaining market power
1.2. Data in Empirical IO
1.3. Structural models in Empirical Industrial Organization: An Example
1.4. An overview of the rest of the course

Readings:
- [AG] Chapter 1.
- [RW] Sections 1 to 5.

2. Measuring Productivity. Estimation of Production Functions

2.1 Introduction
2.2. Simultaneity Problem
2.3 Dynamic Panel Data Methods
2.4. Control function methods
2.5. Application.

Readings:
- [AG] Chapter 2.
- [ASL] Section 3.
- [ABBP] Section 2.
- Griliches, Z., and J. Mairesse (1998): "Production Functions: The Search for Identification," in Econometrics and Economic Theory in the Twentieth Century.

3. Measuring Consumer Preferences. Estimation of Demand of Differentiated Products

3.1. Introduction
3.2. Demand systems in product space
3.3 Demand systems in characteristics space
3.4. Application

Readings:
- [AG] Chapter 3.

- [ASL] Section 4.
- [ABBP] Section 1.
- [NE] whole paper.
- [RW] Section 7.
- Berry, S. (1994). "Estimating Discrete-Choice Models of Product Differentiation," *RAND Journal of Economics*, 25(2), 242-262.
- Berry, S., Levinsohn, J., and Pakes A. (1995). "Automobile Prices in Market Equilibrium," *Econometrica*, 63(4), 841-890.

4. Competition in Prices and Quantities

4.1. The Conjectural Variation Approach
4.2. Testing static oligopoly models (Genesove and Mullin: RAND 1998)
4.3. Nevo on Cereals (Nevo, 2001)

Readings:
- [AG] Chapter 4.
- [ASL] Section 3.
- [RW] Section 6.
- Genesove, D., and Mullin, W. (1998). "Testing static oligopoly models: Conduct and Cost in the Sugar Industry," RAND Journal of Economics, Vol. 29(2), pp. 355-377.
- Nevo, A. (2001): "Measuring Market Power in the Ready-to-Eat Cereal Industry," *Econometrica*, 69(2), 307-342.

5. Empirical Models of Market Entry

5.1. Some general ideas
5.2. Bresnahan and Reiss (JPE, 1991)
5.3. Empirical Models of Market Entry with Heterogeneous firms

Readings:
- [AG] Chapter 5.
- [BR] All sections.
- [RW] Section 10
- [ASU] All sections.
- Bresnahan, T. and P. Reiss (1991): "Entry and Competition in Concentrated Markets," *Journal of Political Economy*, 95, 977-1009.

18. LECTURES, TUTIRUALS & IMPORTANT DAYS

- **Week 1**. Thursday, Sep. 7
  - Lecture 1. *Introduction to the course*
  - Tutorial 1. *Refreshing Econometrics*

- **Week 2**. Thursday, Sep. 14
  - Lecture 2. *Measuring Firm Productivity – Intro, Model*
  - Tutorial 2. *Introduction to STATA*

- **Week 3**. Thursday, Sep. 21
  - Lecture 3. *Measuring Firm Productivity – Econometric issues and methods*
  - Tutorial 3. *Estimating Production Functions in STATA*
  - ✓ **Thursday, Sep. 21: Problem Set #1 is handed out**

- **Week 4**. Thursday, Sep. 28
  - Lecture 4. *Measuring Firm Productivity – Empirical applications*
  - Tutorial 4. *Solution to previous years' problem set #1*
  - ✓ **Thursday, Sep. 28: Problem Set #1 is due [online through Quercus before 11:59pm]**

- **Week 5**. Thursday, Oct. 5
  - Lecture 5. *Consumer Demand – Intro*
  - Tutorial 5. *Solution to previous years' problem set #1*

- **Week 6**. Thursday, Oct. 12
  - Lecture 6. *Consumer Demand – Econometric Issues & Methods*
  - Tutorial 6. *Demand Estimation in STATA (1/2)*

- **Week 7**. Thursday, Oct. 19
  - Lecture 7. *Consumer Demand – Empirical Applications*
  - Tutorial 7. *Demand Estimation in STATA (2/2)*

- **Week 8**. Thursday, Oct. 26
  - Lecture 8. *Price & Quantity Competition - Intro*

  ✓ **Thursday, Oct. 26: MIDTERM EXAM (1.5 hours Exam – During Class/Tutorial)**

- **Week 9**. Thursday, Nov. 2
  - Lecture 9. *Price & Quantity Competition – Econometric Issues & Methods*
  - Tutorial 9. *Estimation of Demand and Marginal Costs in STATA*

  ✓ **Thursday, Nov. 2: Problem Set #2 is handed out**

*** **Thursday, Nov. 9: FALL STUDY BREAK – NO CLASSES**

- **Week 10**. Thursday, Nov. 16
  - Lecture 10. *Price & Quantity Competition – Empirical Applications*
  - Tutorial 10. *Merger Analysis in STATA*

  ✓ **Thursday, Nov. 16: Problem Set #2 is due [online through Quercus before 11:59pm]**

- **Week 11**. Thursday, Nov. 23
  - Lecture 11. *Market Entry – Intro*
  - Tutorial 11. *Solution to Problem Set #2*

- **Week 12**. Thursday, Nov. 30
  - Lecture 12. *Market Entry – Methods and Applications*
  - Tutorial 12. *Estimation of Market Entry models in STATA*

  ✓ **FINAL EXAM: During Final Exam Period – To Be Announced**