

# Graduate Empirical Industrial Organisation

2015

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## 1 Overview

This is a course in the Graduate Industrial Organization sequence. The aim to give a solid grounding in the modern empirical tools that have proved useful in understanding the structure of markets, and the strategic behavior of firms and their consumers. The focus is in preparing you for research. This means that some things will happen very quickly: the understanding is that you will need to go back and study the details if you intend to use it in your own work. At the very least, you should end up with a basic road map of the toolbox, and how to think about the issues in using its elements.

## 2 On Learning and Doing IO

Like everything else, the secret to a successful research or professional career in IO is practice, practice, practice. However, like everything else in life this is a constrained problem.

We suggest (and in some cases require) that you read papers ahead of time. Also read them after and make sure you understand them. Discuss them with your friends. What questions does this work lead you to ask? What is good/convincing/insightful? Where does it leave you unsatisfied? Think about these questions first (and thinking might mean mulling over a period of days or weeks) before chasing through the literature. You are more likely to come up with something original if you haven't already read 57 loosely related papers around the subject. If there is a gap then thinking about the issues beforehand should help you find that, rather than staring at the literature and trying to figure out where it is.

Outside of classwork, we *strongly recommend* that you attend the IO seminar and pro-seminar, this will give you a sense of where the frontier is, and will give you an insight into how the process of research actually works (rather than seeing the culmination of that process).

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\*Email: johnasker@econ.ucla.edu. Parts of the course material build on material first developed by Ariel Pakes, and then was further developed when versions of this class was (co-)taught with Heski Bar-Isaac, Allan Collard-Wexler, Joyee Deb, Kei Kawai, Robin Lee and Jidong Zhou.

Non-attendance at the workshop and pro-seminar will be taken as a clear signal that you are not serious about IO as a field.

### 3 Course Requirements

1. Participation: where the syllabus lists a paper with a star next to it, this indicates reading is required before class. This paper will be discussed in class and an inability to discuss the paper will reflect badly on you and, more importantly, you won't get much from the class.
2. Problem Sets: a few problem sets will be given
3. Referee report: An important aspect of doing research (and for that matter of a successful academic career) is the ability to evaluate work - most importantly your own, but also others'. Most likely the final will require you to write a series of referee reports.

Relevant documents for the course and other announcements are going to be posted at <http://www.johnasker.com/IO.html>

### 4 Background Reading

You are expected to remember the micro-theory, game theory, and econometrics that you have already been exposed to.

#### 4.1 Books

Below is a list of books generally useful for work in Industrial Organization:

- Tirole's *The Theory of Industrial Organization* is a required text. If you haven't got it already, buy it. It is an invaluable reference.
- If you don't face financial constraints, you will also find the *Handbook of Industrial Organization*, particularly volume 3 edited by Armstrong and Porter: very worthwhile but usually crazy expensive
- John Sutton, *Technology and Market Structure*
- Luis Cabral *Introduction to Industrial Organization* or Oz Shy, *Industrial Organization* [undergraduate versions of Tirole that are useful when you want to see the simplest possible version of a model - good bedtime reading] **If you want to be an IO economist you should read one of these books cover to cover before starting the third year.**
- Andersen, de Palma and Thisse, *Discrete Choice Theory of Product Differentiation* [a very useful companion to the section on demand estimation that provides all the conceptual underpinnings of the models used to think about product differentiation]

- Robert Wilson, *Nonlinear Pricing*
- Fumio Hayashi, *Econometrics* - a great text with a strong GMM approach to econometrics. Most empirical IO work is done in the GMM setting.
- Pagan and Ullah, *Nonparametric Econometrics* - where we use nonparametrics, this is the best reference.
- Davis and Garces, *Quantitative Techniques for Competition and Antitrust Analysis* - useful for the application of empirical work to applied problems and very useful for demand estimation and antitrust applications.
- Kenneth Train, “*Discrete Choice Methods with Simulation*”, and Kenneth Judd, “*Numerical Methods in Economics*”, also prove useful for implementing recent numerical empirical methods.
- Finally, Paolo Buccirossi (ed.) *Handbook of Antitrust Economics* is a useful reference as well.

## 4.2 Overview and comments on empirical work

The course aims to prepare you as both a producer and consumer of empirical work in IO. The last 25 years has seen a resurgence in empirical work in IO. A large amount of work in IO is now empirical, often combining sophisticated econometrics with serious theory. Even as a theorist interested in IO it is important to be able to be an informed consumer of empirical work.

The empirical component will do four things: first it will provide a coverage of demand estimation. Demand systems often provide the bedrock of empirical IO work and understanding how to deal with the problems that arise in dealing with estimation of demand from micro-econometric data sets is a core skill for the applied IO economist (it is also useful for public finance and other applied micro areas). We will spend about three lectures on this area and its applications.

Second, we will talk about the estimation of entry games and briefly mention dynamics more generally.

Third we will briefly discuss the empirics of auction models. It is important to get some sense of how asymmetric information is handled in an empirical context.

Last, if time permits, we will look at several different applied topics from an empirical point of view. These classes will be run as a reading group. **It is a waste of time to turn up to these classes if you have not done the assigned reading.** When doing the assigned reading try to make sure you can understand the following questions about the paper:

1. What is the research question?
  - How does the research question relate to existing theoretical and empirical literature?
  - Why is it worth asking?
2. What are the data being used here?
  - How was it collected?

- What are the important variables?
  - How are they defined?
  - What is the unit of observation?
3. What is the empirical strategy for answering this research question?
- If you had an ideal data set, what would it look like? What empirical strategy would you use on it?
  - How is the data set in this paper different from that ideal data set?
  - How does identification work in this paper?
  - What are the sources of exogenous variation?
  - How much of the identification is coming from the model and how much from the data?
4. What econometric techniques are being used in this paper?
- Are they appropriate?
  - What is the central estimating equation (or equations)?
  - What is in the unobservable component?
  - What are the instruments being used? Do you think they are valid?
  - How does the econometric model relate to the theoretical framework?
5. What are the main results of the paper?
- What are the economic implications of the results?
6. What do we learn from this paper?
7. What questions does this paper leave unanswered? How might you answer them?

## 5 Outline and selected reading

An asterisk next to a paper means it is required reading before class, two asterisks means that you need to read it carefully before class (i.e. be prepared to lead a ten minute discussion).

### 1. Demand Estimation (2.5)

- \* Working (1927) What do Statistical Demand Curves Show? QJE 41 212-35
- \* Bresnahan (1987) Competition and Collusion in the American Automobile Industry: The 1955 Price War, J.I.E. 35(4) 457-482
- Hausman, Leonard & Zona (1994) Competitive Analysis with Differentiated Products, Annales d'Econ. et Stat.

- Deaton and Muellbauer (1980) An Almost Ideal Demand System AER
- Chaudhuri, Goldberg, Jia (2008) Estimating the Effects of Global Patent Protection in Pharmaceuticals: A Case Study of Quinolones in India, AER
- \* Berry (1994) Estimating Discrete Choice Models of Product Differentiation, RAND 25(2) 242-262
- \* Berry, Levinsohn and Pakes (1995) Automobile Prices in Market Equilibrium Econometrica 63(4) 841-90 [see also the NBER working paper version for arguably a more pleasant read]

#### *Applications*

- Berry, Levinsohn and Pakes (1993), “Applications and Limitations of Some Recent Advances in Empirical Industrial Organization: Price Indexes and the Analysis of Environmental Change,” AER.
- Petrin (2002) Quantifying the Benefits of New Products: The Case of the Minivan, JPE 110(4) 705-29.
- Nevo (1998) A Research Assistants Guide to Random Coefficient Discrete Choice Models of Demand NBER Technical Working Paper T0221
- \* Nevo (2001) Measuring Market Power in the Ready-to-Eat Cereal Industry, Econometrica 69(2) 307-322
- Gentzkow (2007) Valuing new goods in a model with complementarities: online newspapers, AER

#### *Textbook References*

- Hayashi (2000) *Econometrics* [Ch3 has a nice discussion of the standard endogeneity problems in demand estimation in a GMM framework]
- Davis Garces (2010) “*Quantitative Techniques for Competition and Antitrust Analysis*” [Ch9 has an overview of demand estimation techniques]
- Train (2009) “*Discrete Choice Methods with Simulation*” is also a useful reference

### **2. Antitrust and Horizontal Merger Analysis (0.5)**

- DOJ and FTC Antitrust Guidelines
- Nevo, A., “Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry,” RAND, 2000.
- Dafny, L., Duggan, M. and Ramanarayanan, S., “Paying a Premium on Your Premium? Consolidation in the U.S. Health Insurance Industry,” AER 2012.

### **3. Static Entry / Exit Models (2)**

- \* Bresnahan, T.F., and P.C. Reiss, “Entry and Competition in Concentrated Markets”, JPE, 1991, 99 (5)

- \* Berry, S.T., “Estimation of a Model of Entry in the Airline Industry”, *Econometrica*, 1992, 60 (4)
- Berry, S., and Waldfoegel, J., “Free Entry and Social Inefficiency in Radio Broadcasting” *RAND*, 1999.
- Mazzeo, M., *Product Choice and Oligopoly Market Structure*, *RAND*, 2002.
- Berry, S.T. and E. Tamer, “Identification in Models of Oligopoly Entry”, (invited lecture at the 2005 World Congress of the Econometric Society)
- \* Ciliberto, F. and E. Tamer, “Market Structure and Multiple Equilibria in the Airline Markets”, *Econometrica*
- \* Seim, K., “An empirical model of firm entry with endogenous product-type choices,” *RAND* 2006.
- Jia, P., “What Happens When Wal-Mart Comes to Town: An Empirical Analysis of the Discount Retail Industry”, *Econometrica*, 2008

#### 4. Moment Inequalities in Applied Work (2)

- \* Pakes, A., Porter, J., Ho, K. and Ishii, J., “Moment Inequalities and Their Application,” *Econometrica*, forthcoming.
- \* Pakes, A., *Alternative Models for Moment Inequalities*, *ECMA*, 2010.
- Holmes, T. J., “The Diffusion of Wal-Mart and Economies of Density,” *Econometrica*, 79:1, 2011
- Ho (2009) “Insurer Provider Networks in the Medical Care Market”, *AER*
- Ishii, J., “Compatibility, Competition, and Investment in Network Industries: ATM Networks in the Banking Industry,” working paper, 2008.

#### 5. Auction Markets (2)

- \*Athey, Susan and Phillip Haile (2005a), *Non-Parametric Approaches to Auctions*
- \* Athey, Susan and Phillip Haile (2005b), *Empirical Models of Auctions*
- Hendricks, Ken and Rob Porter (1988), *An Empirical Study of an Auction with Asymmetric Information*, *AER*, 78, 865-883.
- Haile, Phil and Elie Tamer (2003), *Inference with an Incomplete Model of English Auctions*, *JPE*, 111, 1-52
- \*Guerre, Perrigne and Vong (2000), *Optimal Nonparametric Estimation of First Price Auctions*, *Econometrica*, 68, 525
- Asker (2010), *A Study of the Internal Organisation of a Bidding Cartel* *American Economic Review*, v100(3), 724-762,
- Asker and Cantillon (2008), *Properties of Scoring Auctions*, *RAND Journal of Economics*

- Li, Perrigne and Vong (2002), Structural Estimation of the Affiliated Private Value Auction Model, RAND, 33,171
- Campo, Perrigne and Vong (2003), Assymetry in First Price Auctions with Affiliated Private Values, Journal of Applied Econometrics, 18, 197
- Kasnokutskaya (2011) Identification and Estimation in Procurement Auctions under Unobserved Auction Heterogeneity, Review of Economic Studies,28 (2011)
- Kasnokutskaya and Seim, Bid Preference Programs and Participation in Procurement, (2009). American Economic Review, 101 (2011)
- Cassola, Hortascu and Kastl (2013) The 2007 Subprime Market Crisis Through the Lens of European Central Bank Auctions for Short-Term Funds, Econometrica , 81(4), 2013, 1309-45.
- Hortascu (2011) Recent Progress in the Empirical Analysis of Multi-Unit Auctions (.pdf) , International Journal of Industrial Organization , v. 29, Issue 3 (EARIE 2010 Special Issue), May 2011, p. 345-349

## 6. Other Issues (1)

Content TBD

# 6 Other Useful References (not exhaustive)

## 1. Empirical Models of Price Discrimination

Leslie (2002) Price Discrimination in Broadway Theatre, forthcoming in RAND, available on Phillip Leslie's website at Stanford GSB.

Goldberg (1996) Dealer Price Discrimination in New Car Purchases: Evidence from the CES, JPE 104(3) 622-54.

Borenstein and Rose (1994) Competition and Price Dispersion in the US Airline Industry, JPE 653-683

Miravete and Roeller (2003) Competitive Nonlinear Pricing in Duopoly Equilibrium: The Early US Cellular Telephone Industry, CEPR Discussion Paper 4069. (on Eugenio Miravete's web site at UPenn)

Shepard (1991) Price Discrimination and Retail Configuration, JPE 99(1), 30-51

Busse, Meghan and Marc Rysman. 2005. Competition and Price Discrimination in Yellow Pages Advertising. RAND Journal of Economics. 36(2): 378-390.

## 2. Empirical work on the boundaries of the firm

Baker and Hubbard (2003), Make vs Buy in Trucking: Asset Ownership, Job Design and Information, AER 551-572

Garicano and Hubbard (2003) Specialization, Firms, and Markets: The Division of Labor Within and Between Law Firms, Mimeo Chicago GSB

### 3. Vertical Markets (3)

#### *Theory:*

Asker and Bar-Isaac (2014), Raising Retailers' Profits: On Vertical Practices and the Exclusion of Rivals *American Economic Review*, 104(2), 672-686

Rey and Tirole (1986) "The Logic of Vertical Restraints", *AER*, 76, 921-939

Tirole, Chapter 4

Whinston (2006) *Lectures on Antitrust Economics* Chapter 4

Bernheim and Whinston (1998) "Exclusive Dealing", *JPE*, 106(1), 64-103

Fumagalli and Motta (2006) "Exclusive Dealing and Entry when Buyers Compete" , *AER*

Joskow (2005), "Vertical Integration", *Handbook of New Institutional Economics*, available at <http://econ-www.mit.edu/files/5510>

McAfee and Schwarz (1994), "Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity", *AER*

Nocke and White (2007), "Do Vertical Mergers Facilitate Upstream Collusion?", *AER*

Rasmusen, Ramseyer and Wiley (1991) "Naked Exclusion", *AER* 81(5), 1137-1145

Rey and Tirole (2007) "Primer on Foreclosure", *Handbook of IO* Vol 3, available at <http://idei.fr/doc/by/tirole/primer.pdf>

Segal and Whinston (2000) *Exclusive contracts and protection of investments*, RAND

Segal and Whinston (2000), "Naked Exclusion - Comment", *AER*

Spengler (1950) "Vertical Integration and Anti-trust Policy", *JPE* 58, 347-352

Whinston (2000), "Tying, Foreclosure, and Exclusion", *AER*

#### *Empirics*

Akerberg and Botticini (2002) "Endogenous Matching and the Empirical Determinants of Contractual Form", *JPE*

Asker (2004), "Diagnosing Foreclosure from Exclusive Dealing", mimeo NYU Stern

Brenkers and Verboven (2006) "Liberalising a Distribution System: the European Car Market", *Journal of the European Economic Association*

Capps Dranove Satterthwaite (2003) "Competition and Market Power in Option Demand Markets" , RAND

Chipty (2001) "Vertical Integration, Market Foreclosure and Consumer Welfare", *AER* 91(3) 428-453

Crawford, Lee, Whinston, Yurukoglu (2014), "The Welfare Effects of Vertical Integration in Multi-channel Television Markets"

Gilbert and Hastings (2005) "Vertical Integration in Gasoline Supply: An Empirical Test of Raising Rivals' Costs", *JIE*



Hastings (2004) “Vertical relationships and competition in the retail gasoline markets” AER (see also AER comment: Taylor Kreisle Zimmerman (2010))

Ho (2006) “Welfare Effects of Restricted Hospital Choice”, JAE

Ho (2009) “Insurer Provider Networks in the Medical Care Market”, AER

Laftonaine Slade (2007) “Exclusive Contracts and Vertical Restraints”, Handbook of Antitrust

Mortimer (2008) “Vertical Contracts in the Video Rental Industry”, ReStud

Slade (1996) Multitask Agency and Contract Choice: An Empirical Assessment, Int. Econ. Review, 465-86

Villas-Boas (2007), “Vertical Relationships between Manufacturers and Retailers: Inference with Limited Data”, ReStud.

#### 4. Bargaining in Vertical Markets (2)

*Theory:*

Muthoo (1999), *Bargaining Theory with Applications*

Nash (1950), “The Bargaining Problem”, EMA

Rubinstein (1982), “Perfect Equilibrium in a Bargaining Model”, EMA

Binmore Rubinstein Wolinsky (1986), “The Nash Bargaining Solution in Economic Modelling”, RAND

Horn Wolinsky (1998), “Bilateral Monopolies and Incentives for Merger,” RAND.

Lee Fong (2013), “Markov-Perfect Network Formation: An Applied Framework for Bilateral Oligopoly and Bargaining in Buyer Seller Networks”, mimeo

Collard-Wexler, A., Gowrisankaran, G., Lee, R. (2014), “Bargaining in Bilateral Oligopoly: An Alternating Offers Representation of the Nash-in-Nash Bargaining Solution”, mimeo

*Bi/Multi-lateral Contracting, Buyer-Seller Networks:*

Cremer and Riordan (1987), “Governing Multilateral Transactions with Bilateral Contracts”, RAND

Kranton and Minehart (2001), “A Theory of Buyer-Seller Networks”, AER

Prat and Rustichini (2003) “Games Played Through Agents”, EMA, 71(4), 989-1026

Segal and Whinston (2003), “Robust Predictions for Bilateral Contracting with Externalities”, ECMA

*Empirics:*

Crawford Yurukoglu (2012) “The Welfare Effects of Bundling in Multichannel Television”, AER

Gowrisankran Nevo Town (2014), “Mergers When Prices Are Negotiated: Evidence from the Hospital Industry”, AER.

Grennan (2012), “Bargaining Ability and Competitive Advantage: Empirical Evidence from Medical Devices”, AER

Ho Lee (2013), “Insurer Competition and Negotiated Hospital Prices”, mimeo.

## 5. Two Sided Markets (2)

### *Theory:*

Armstrong, M. (2006): “Competition in Two-Sided Markets,” *RAND*, 37(3), 668–691.

Rochet, J. and J. Tirole (2006): “Two-Sided Markets: A Progress Report,” *RAND*, 37(3), 645–667.

Jullien, B. and A. Pavan (2013): “Platform Competition under Dispersed Information,” working paper.

### *Empirics:*

Chou Shy (1990) “Network Effects without Network Externalities”, IJIO.

Nair Chintagunta Dubé (2004) “Empirical Analysis of Indirect Network Effects in the Market for Personal Digital Assistants”, QME.

Lee (2012) “Home Videogame Platforms”, in *The Oxford Handbook of the Digital Economy*.

Lee (2013) “Vertical Integration and Exclusivity in Platform and Two-Sided Markets”, AER.

Rysman (2004) “Competition Between Networks: A Study of the Market for Yellow Pages”, RESTUD.

## 6. Single Agent Dynamics, Estimation Approaches, and Dynamic Demand (3)

### *Single Agent Dynamics*

Pakes, A., “Patents as Options: Some Estimates of the Value of Holding European Patent Stocks,” *Econometrica*, 54(4), 1986.

Rust, J., “Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher,” *Econometrica*, 55(5), 1987.

Hotz, J. and R. Miller, “Conditional Choice Probabilities and the Estimation of Dynamic Models,” *ReStud*, 1993.

Hotz, J. and R. Miller, S. Sanders, and J. Smith, “A Simulation Estimator for Dynamic Models of Discrete Choice,” *ReStud*, 1994.

Rust, J., “Structural Estimation of Markov Decision Processes,” *Handbook of Econometrics*, Vol 4, 1994.

Aguirregabiria, V. and Mira, P. “Dynamic Discrete Choice Structural Models: A Survey,” *Journal of Econometrics*, 156, 2010.

### *Dynamic Demand*

Hendel, I. and Nevo, A., “Measuring the Implications of Sales and Consumer Stockpiling Behavior”, *Econometrica*, 2006

Gowrisankaran, G. and Rysman, M., “Dynamics of Consumer Demand for New Durable Goods”, *JPE*, 2012

Aguirregabiria, V. and Nevo, A., “Recent Developments in Empirical Dynamic Models of Demand and Competition in Oligopoly Markets”, 2013, *Proceedings of the Econometric Society World Congress*

Lee, R. (2013) “Vertical Integration and Exclusivity in Platform and Two-Sided Markets”, AER.

Schiraldi, P. (2011) "Automobile Replacement: a Dynamic Structural Approach," RAND.

## 7. Multi-Agent Dynamics and Games (4)

### *Theory, Framework, and Computation:*

Maskin, E. and Tirole, J., "A Theory of Dynamic Oligopoly, I" and "A Theory of Dynamic Oligopoly, II," ECMA 1988; "A Theory of Dynamic Oligopoly, III," EER 1987.

Doraszelski, U. and Pakes, A., "A Framework for Applied Dynamic Analysis in IO", Handbook of IO, vol 3, 2007.

Ericson, R. and Pakes, A., "Markov-Perfect Industry Dynamics: A Framework for Empirical Work", The Review of Economic Studies, 62 (1), 1995, 53-82

Pakes, A. and McGuire, P., "Computing Markov-Perfect Nash Equilibria: Numerical Implications of a Dynamic Differentiated Product Model", Rand, 25, 1994, 555-589

Pakes, A. and McGuire, P., "Stochastic Algorithms, Symmetric Markov- Perfect Equilibrium, and the Curse of Dimensionality", Econometrica, 69 (5), 2001, 1261-1281

Doraszelski, U. and Satterthwaite, M., "Computable Markov-perfect industry dynamics," RAND, 2010.

### *Extensions, Alternative Frameworks:*

Benkard, L., Van Roy, B., and Weintraub, G. (2008) "Markov Perfect Industry Dynamics with Many Firms", ECMA.

Fershtman, C. and Pakes, A., (2010) "Dynamic Games with Asymmetric Information: A Framework for Empirical Work," QJE.

### *Applications:*

Gowrisankaran, G., "A Dynamic Model of Endogenous Horizontal Mergers," RAND, 1999.

Fershtman, C. and Pakes, A., "A Dynamic Oligopoly with Collusion and Price Wars," RAND 2000.

Benkard, L., "A Dynamic Analysis of Wide-bodied Commercial Aircraft", Review of Economic Studies, 2004

Ryan, S., "The Cost of Environmental Regulation in a Concentrated Industry," ECMA 2012.

Collard-Wexler, A. "Demand Fluctuations in Ready-Mix Concrete," ECMA, 2013.

Goettler, R. and Gordon, B., "Does AMD Spur Intel to Innovate More?," JPE, 2013.

Jeziorski, P., "Estimation of Cost Synergies from Mergers: Application to U.S. Radio Industry," RAND 2013.

### *Estimation:*

Pakes, A., and Ostrovsky, M. and Berry, S. "Simple estimators for the parameters of discrete dynamic games (with entry/exit examples)" RAND 2007.

Bajari, P., Benkard, L., and Levin, Jon. "Estimating Dynamic Models of Imperfect Competition," EMA 2007.

8. **Insurance Markets / Adv Selection / Moral Hazard / Reclass. Risk (2)**

Rothschild, M. and Stiglitz, J., "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," QJE, 1976.

Chiappori, P., and Salanie, B., "Testing for Asymmetric Information in Insurance Markets," JPE, 2000.

Einav, L., Finkelstein, A., Ryan, S., Schrimpf, P., and Cullen, M., "Selection on Moral Hazard in Health Insurance," AER 2013.

Einav, L., and Jenkins, M., and Levin, J., "Contract Pricing in Consumer Credit Markets," ECMA, 2012.

Handel, B., "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts," AER, 2013.

Handel, B., Hendel, I., and Whinston, M., "Equilibria in Health Exchanges: Adverse Selection vs. Reclassification Risk," working paper.

Shepard M. (2015) Hospital Network Competition and Adverse Selection: Evidence from the Massachusetts Health Insurance Exchange, mimeo