

ECO 2404/418H

EMPIRICAL APPLICATIONS OF ECONOMIC THEORY

University of Toronto. Department of Economics. Spring 2009

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Office hours: Wed 9:10am-10:30am
Lecture: Wed 11.10am-1.00pm. Room UC152

COURSE DESCRIPTION

This course covers methods and applications in economic theory. This year we will focus on topics that are at the core of the new empirical industrial organization such as estimation of single agent decision problems, estimation of demand and supply, estimation of production functions. We will also cover a number of issues drawn from my research work: innovation, markets for technology and teamwork.

The course will emphasize the interactions between economic theory and empirical methods rather than focusing just on the statistical analysis. There will be no text book, the course will be based on published and working papers. I have organized the course in seven parts (see main references below). The papers which appear with an asterisk (i.e., *) in the reference are mandatory and you should read them. I expect you to participate in the class discussion of these papers.

LECTURES

There will be two hours of lectures every week. Wednesdays from 11.10am to 1.00pm. We will be meeting at UC 152.

COMPUTATION

For undergraduate students. To complete the problem sets you must be familiar or learn a statistical package like Stata or SAS. Learning a computational language such as Matlab, Gauss or Fortran will be useful but not necessary. If you plan to apply for graduate school and are interested in empirical work, then you should seriously consider learning a computational language.

For graduate students (both MA and PhD). You must be familiar with statistical packages like Stata or SAS as well as computer programming (or learn it during the semester).

To address the lack of knowledge of both statistical packages and a computational language at the undergraduate and perhaps at the graduate level too, there will be a teaching assistant to deal with these issues.

EVALUATION

The final exam grade will be based on three or four problem sets and a final exam. Problem sets: 50%, final exam 50%. Students are strongly encouraged to collaborate on problem sets. However, students should write the final answer to the problem sets on your own and submit them individually. Students must acknowledge the help of classmates and others by citing their names in the problem sets. Problem sets submitted within one week after the deadline will receive 50% of the points. Problem sets submitted one week or more after the deadline will receive zero points. The content of the problem sets for undergraduates and graduate students may be different.

CONTENTS OF THE COURSE

1. Introduction (1 week)
2. Estimation of single agent decision problems and simulation methods. An application: Quantifying the value to patent protection. (2-3 weeks)
3. Estimation of demand and supply functions / differentiated products. Instrumental variables and the role of simulation (3-4 weeks)
4. Estimation of production functions. Simultaneity and endogenous firm exit (2 weeks)
5. Innovation, Spillovers and the Markets for Patents, Ideas and Technology (2 weeks)
6. Teamwork and Collaboration (1 week)
7. Empirical Work on Contracting (1 week)

References

1. Introduction

- * [ABBA] D. Akerberg, L. Benkard, S. Berry and A. Pakes, “Econometric Tools for analyzing Market Outcomes,” forthcoming in *Handbook of Econometrics*, Volume 6. Available at <http://www.stanford.edu/~lanierb/research/tools81-6-8.pdf> . Introduction section.
- * Griliches (1990), “Patent Statistics as Indicators: Survey”, *Journal of Economic Literature*, vol. 28, No. 4, pp. 1661-1707.
- * [RW] Reiss, Peter, and Wolak, Frank (2006): “Structural Econometric Modeling: Rationales and Examples from Industrial Organization,” *Handbook of Econometrics*, volume 6, forthcoming. Available at <http://www.stanford.edu/~preiss/makeit.pdf> . Sections 1 to 4.

2. Estimation of Single Agent Decision Problems. Estimation of the Value to Patent Protection

2.1. Single agent decision problems.

- * Rust, J. (1987). “Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher,” *Econometrica*
- * Pakes, A. and Schankerman (1986). “Estimates of the Value of Patent Rights in European Countries During the Post-1950 Period.” *The Economic Journal*, Vol. 96: No. 384, pp. 1052-1076.
- * Pakes, A. (1986). “Patents as Options: Some Estimates of the Value of Holding European Patent Stocks.” *Econometrica*, Vol. 54, No. 4.

2.2. Estimating a single agent decision problem. Estimation of the value to patent protection

- Bessen, J. (2006). “The Value of U.S. patents by Owner and Patent Characteristics.” Working paper. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=949778
- Lanjouw, J. (1998). “Patent Protection in the Shadow of Infringement: Simulations of Patent Value.” *Review of Economic Studies*, vol. 65.
- * Lanjouw, J. O., Pakes, A. and Putnam, J. (1998), “How to Count Patents and Value Intellectual Property: Uses of Patent Renewal and Application Data.” *Journal of Industrial Economics*.
- * Pakes, A. and Schankerman (1986). “Estimates of the Value of Patent Rights in European Countries During the Post-1950 Period.” *The Economic Journal*, Vol. 96: No. 384, pp. 1052-1076.
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- Putnam, J. (1997). “The value of International Patent Rights.” PhD dissertation, Yale University.
- * Serrano, C. (2007), “The Market for Intellectual Property: Evidence from the Transfer of Patents”, Working Paper, University of Toronto.

3. Demand and Supply Estimation / Differentiated Products

3.1. Introduction: Empirical questions and econometric issues

- * [ABBA] Section 1
- * [RW]. Sections 5 to 7.
- Angrist, Josh, Graddy, Kathryn, and Imbens, Guido (2000): "The Interpretation of Instrumental Variables Estimators in Simultaneous Equations Models with an Application to the Demand for Fish," *Review of Economic Studies*, 67, 3, 499-527.
- Hausman, Jerry, G. Leonard, and J. Zona (1994): "Competitive Analysis with Differentiated Products," *Annales D'Economie et de Statistique*, 34, 159-180.

3.2. Models in characteristics space with heterogeneous agents

- * Anderson, S., A. de Palma, and J.-F. Thisse (1992): "Discrete choice theory of product differentiation", Cambridge, MA. MIT Press. Chapter 7.
- Bajari, P. and L. Benkard (2005): "Demand estimation with heterogeneous consumers and unobserved product characteristics: A hedonic approach," *Journal of Political Economy* 113 (6), 1239–1276.
- * Berry, S., (1994), "Estimating Discrete Choice Models of Product Differentiation", *RAND*, vol. 25, no. 2, pp. 242-262.
- Davis, Peter (2006): "The Discrete Choice Analytically Flexible (DCAF) Model of Demand for Differentiated Products," mimeo, LSE.
- Feenstra, R. C. and J. A. Levinsohn (1995, Jan.). Estimating markups and market conduct with multidimensional product attributes. *The Review of Economic Studies* 62 (1), 19–52.

3.3. Simulation-based estimation

- Hajivassiliou, V. and P. Ruud (1994): "Classical Estimation Methods for LDV Models Using Simulation," in R. Engle and D. McFadden (eds.), *Handbook of Econometrics*, vol. 4. North-Holland.
- McFadden, D. and K. Train (2000): "Mixed MNL models for discrete response," *Journal of Applied Econometrics*, 15, 447-470.
- Nevo, Aviv (2000): "A Practitioners Guide to Estimation of Random Coefficients Logit Models of Demand," *Journal of Economics & Management Strategy*, 9(4), 513-548.
- Train, K. (2003): "Discrete Choice Methods with Simulation," Cambridge University Press.

3.4. Applications to static models with aggregate data

- * Berry, S., J. Levinsohn, and A. Pakes (1995): "Automobile Prices in Market Equilibrium," *Econometrica*, 63(4), 841-890.
- Bresnahan, T. (1987): "Competition and Collusion in the American Auto Industry: The 1955 Price War," *Journal of Industrial Economics*, 35, 457-482.
- Bresnahan, T., S. Stern and M. Trajtenberg (1997): "Market Segmentation and the Sources of Rents from Innovation: Personal Computers in the Late 1980s." *The Rand Journal of Economics*, 28, S17-S44.
- * Nevo, A. (2001): "Measuring Market Power in the Ready-to-Eat Cereal Industry,"

Econometrica, 69(2).

- Petrin, A. and K. Train (2005). Control function corrections for omitted attributes in differentiated product models. wp, University of Chicago.

3.5. Applications to static models with consumer level data

- Allenby, G. and P. Rossi (1998): "Marketing models of consumer heterogeneity," *Journal of Econometrics*, 89(1).
- Berry, S., J. Levinsohn, and A. Pakes, (2003): "Differentiated Product Demand Systems From a Combination of Micro and Macro Data: The New Car Market", Harvard University working paper.

3.6. New goods

- Bresnahan, Timothy F. and Robert J. Gordon, eds., 1997, *The Economics of New Goods*, Chicago, IL: University of Chicago Press.
- Gentzkow, Matthew, *Valuing New Goods in a Model with Complementarities: Online Newspapers*, GSB Chicago.
- Hausman, J. A. (1994). Valuation of new goods under perfect and imperfect competition. NBER wp 4970.
- Petrin, Amil. 2002. Quantifying the Benefits of New Products: The Case of Minivans, *Journal of Political Economy*, 110(4), 705-727.
- * Trajtenberg, Manuel (1989): "The Welfare Analysis of Product Innovations, with an Application to Computed Tomography Scanners," *Journal of Political Economy*, 97, 2, 444-79.

4. Production Function Estimation

4.1 Introduction

- * [ABBA]. Section 2.
- * Griliches, Zvi, and Jacques Mairesse (1995): "Production Functions: The Search for Identification," NBER Working Paper No. 5067. <http://www.nber.org/papers/W5067>
- Marschak, Jacob, and William Andrews (1944) "Random Simultaneous Equations and the Theory of Production," *Econometrica*, 12, 3/4, 143-205. See Also Marschak and Andrews, 1945, Errata, 13,1, 91.

4.2. Using lagged inputs as instruments

- Alonso-Borrego, C. and R. Sánchez-Mangas (2001): "GMM estimation of a production function with panel data: An application to Spanish manufacturing firms," Working Paper, Universidad Carlos III. <http://docubib.uc3m.es/WORKINGPAPERS/WS/ws015527.pdf>
- * Blundell, R. and S. Bond (1999): "GMM estimation with persistent panel data: An application to production functions," The Institute for Fiscal Studies. Working Paper Series No. W99/4. <http://www.ifs.org.uk/wps/wp9904.pdf>
- * Bond, S., and M. Söderbom (2004): "Adjustment costs and the identification of Cobb Douglas production functions," Manuscript, Institute for Fiscal Studies, London.

4.3. Control function approach

- Akerberg, D., K. Caves and G. Frazer (2003): "Structural Identification of Production Functions," manuscript.
- Levinsohn, J. and A. Petrin (2003): "Estimating production functions using inputs to control for unobservables," *Review of Economic Studies*, pp. 317-342.
<http://www.nber.org/papers/w7819.pdf>
- * Olley, S., and A. Pakes (1996), "The dynamics of productivity in the telecommunications equipment industry", *Econometrica*, 64, 1263-97.
- Pavcnik, N. (2002): "Trade Liberalization, Exit and Productivity Improvements: Evidence from Chilean Plants", *Review of Economic Studies*.
- Syverson, Chad. Market Structure and Productivity: A Concrete Example, *Journal of Political Economy*, December 2004

5. Innovation, spillovers and the markets for patents, ideas and technology

5.1. Innovation and patents

- Griliches (1990), "Patent Statistics as Indicators: Survey", *Journal of Economic Literature*, vol. 28, No. 4, pp. 1661-1707.
- * Hall, B., Jaffe, A. and Trajtenberg, M. (2001). "The NBER Patent Citation Data File." Working paper, NBER.
- Hall, B., Jaffe, A., and Trajtenberg M. (2004). "Market Value and Patents Citations." *Rand Journal of Economics*.
- Jaffe, A., Henderson R. and Trajtenberg M. (1993), "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations." *Quarterly Journal of Economics*. Vol. CVIII, issue 3, p. 577.
- Leiva, F. (2007). "Innovations as a Network of Ideas: Assessing Patent Values through Citations." Working paper University of Iowa.
- Serrano, C. (2007). "The Dynamics of the Transfer and Renewal of Patents." Working paper, University of Toronto
- Trajtenberg, M. (1990), "A Penny for your Quotes: Patent Citations and the Value of Innovations." *The Rand Journal of Economics*, Spring 1990, 21(1), 172-187.

5.2. Main ideas and some related theories of the market for patents, ideas and technology

- * Arora, A. (1995), "Licensing Tacit Knowledge: Intellectual Property Rights and the Market for Know-how." *Economics of New Technology and Innovation* 4, 41-59.
- Arrow, K. (1962). "Economic Welfare and the Allocation of Resources for Invention." In the *Rate and Direction of Inventive Activity*. Special conference series NBER. Princeton, NJ: Princeton Univ. Press.
- Chatterjee, S. and Rossi-Hansberg, E. (2007). "Spin-offs and the Market for Ideas." Working paper, Princeton University.
- Gallini, N. and Wright, B. (1990). "Technology Transfer under Asymmetric Information." *Rand Journal of Economics*, Vol. 21, No. 1, pp. 147-160.
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- Jovanovic, B. (2007). “Investment Options and the Business Cycle.” Working paper, NYU.
- Llobet, G. and Suarez, J. (2007). “Financially Constrained Innovation, Patent protection, and Industry Dynamics.” Working paper CEMFI.
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- * Gallini, N. (2002). “The Economics of Patents: Lessons from U.S. Patent Reforms.” *Journal of Economic Perspectives*. Vol. 16, No. 2, pp. 131-154. Read pp. 141-144.
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- Silveira, R. and Wright, R. (2006). “Liquidity and the Market for Ideas.” Working paper University of Pennsylvania.
- Teece, D. J. (1986). “Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy.” *Research Policy*, 15, pp. 285-305.

5.3. Empirical work on market for patents and technology

- * Anand, B.N. and Khanna, T., (2000) “The Structure of Licensing Contracts.” *Journal of Industrial Economics*, Vol. 48, No. 1, pp. 103-135.
- * Lamoreaux, N. and Sokoloff, K. (1999). “Inventive Activity and the Market for Technology in the United States, 1840-1920.” NBER Working Paper 7107.
- * Lerner, J. and Merces, R.P. (1998). “The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry.” *Journal of Industrial Economics*, Vol. 46, pp. 125-156.
- Gans, J, Hsu, D., and Stern, S. (2004). “The Impact of Uncertain IP Rights on the Market for Ideas: Evidence from Patent Grant Delays.” Working paper, Northwestern University.
- Levine, A. (2007). “Licensing and Scale Economies in the Biotechnology Pharmaceutical Industry.” Working paper Stanford University.
- * Serrano, C. (2007), “The Market for Intellectual Property: Evidence from the Transfer of Patents”, Working Paper, University of Toronto.
- Serrano, C. (2007). “Technology Transfer and the Business Cycle: Evidence from Individual Patent Owners.” Working paper, University of Toronto.
- * Serrano, C. (2007). “The Dynamics of the Transfer and Renewal of Patents.” Working paper, University of Toronto
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6. Teamwork and collaboration

- Alter, A. (2007). “Estimating the Return to the Organizational Form in the California Venture Capital Industry.” Working paper, Stanford University.
- Åstebro, T. “The Return to Independent Invention: Evidence of Risk Seeking, Extreme Optimism or Skewness-Loving?,” *The Economic Journal*, 113(484), 2003, 226-239

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- Garicano Luis and Hubbard Thomas (2005) "Specialization, Firms, and Markets: The Division of Labor Within and Between Law Firms" Working paper, Northwestern University.
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- Hsu, David H. (2004). "What do Entrepreneurs Pay for Venture Capital Affiliation?" *The Journal of Finance*, Vol. LIX, No. 4.
- Jovanovic B. and Szentes B. (2007). "On the Return to Venture Capital." Working paper, NYU.
- Lazear E. and Oyer P. (2007) "Personnel Economics" draft chapter for Handbook of Organizational Economics, Stanford University
- Levin Jonathan and Tadelis Steven (2005) "Profit Sharing And The Role Of Professional Partnerships" *The Quarterly Journal of Economics*, Vol. 120, No. 1, Pages 131-171
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- * Sorensen A. (2007). "How Smart is Smart Money? A Two-sided Matching Model of Venture Capital." *The Journal of Finance* (forthcoming)

7. Empirical work on contracting

- * Akerberg D. and Botticini M. (2002). "Endogenous Matching and the Empirical Determinants of Contractual Form." *The Journal of Political Economy*, Vol. 110, No. 3.
- Asker, J. (2004). "Diagnosing Foreclosure due to Exclusive Dealing." Working paper, NYU Stern.
- Mortimer, J.H. (2006). "Vertical Contracts in the Video Rental Industry." Working paper, Harvard University.
- Villas-Boas (2007). "Vertical Contracts between Manufacturers and Retailers: Inference With Limited Data." *The Review of Economic Studies*, Vol. 74, 2, pp. 625-652.