ECO 2901
INDUSTRIAL ORGANIZATION II

University of Toronto. Department of Economics. Winter 2021

Instructor: Victor Aguirregabiria
Office: Dept. of Econ. Room 309

Phone: 416-978-4358
E-mail: victor.aguirregabiria@utoronto.ca
Web: http://individual.utoronto.ca/vaguirre

Online Lectures: Thursdays, 3-5pm via Zoom. Link: https://utoronto.zoom.us/j/82328612485

Online Office Hours: Wednesdays-Fridays 5-6pm. Zoom Link: https://utoronto.zoom.us/j/82333857288

COURSE DESCRIPTION

This course deals with Empirical Industrial Organization. It covers topics related to **econometric models and empirical applications** of competition in industries. We study empirically the determinants of firms' behaviour and market outcomes in the context of problems of market entry/exit, investment, innovation, product design, or networks. The course focuses on research papers using **empirical games** to investigate firms' strategies and competition, and how firms' **information and beliefs** play a fundamental role in the nature of competition and on market outcomes and welfare. The material includes recent research that relaxes standard assumptions of rational expectations and allow for **firms' limited information, biased beliefs, and learning**. The course emphasizes the importance of combining data, economic models, and appropriate identification strategies and econometric techniques to answer empirical questions in economics.

MEETINGS
- We have a 2-hours **online lecture** every Thursday from 3pm to 5pm.
    Zoom Link: https://utoronto.zoom.us/j/82328612485
- **Online Office Hours:** Wednesdays-Fridays 5-6pm.
    Zoom Link: https://utoronto.zoom.us/j/82333857288
- We <u>will have</u> class on **Thursday, February 18th**, during Reading Week.

EVALUATION
Your final grade will be based on the following requirements.

- **Problem set (50%)**. I will distribute the problem set online on Thursday, February 25th. Your completed problem set is **due on Thursday, March 11th.**

- **Final exam (50%)**. The final exam is a "Take Home Exam". I will distribute the final exam on the last day of class on Thursday, April 1st. Your completed final exam is **due on Thursday, April 8th.**

OUTLINE AND REFERENCES

PART I: **STATIC MODELS OF MARKET ENTRY AND SPATIAL COMPETITION**

Topic 1: Market entry models: complete information
- Aguirregabiria, V. (2019): "Empirical Industrial Organization: Models, Methods and Applications," Chapter 5.
- Berry, S. and E. Tamer (2007): "Identification in Models of Oligopoly Entry," in Advances in Economics and Econometrics: Theory and Applications, Ninth World Congress, vol. 2, R. Blundell, W.K. Newey and T. Persson, eds., Cambridge Univ. Press.
- Bresnahan, T. and P. Reiss (1991): "Econometric Models of Discrete Games," *Journal of Econometrics*, 48, 57-81.
- Tamer, E. (2003): "Incomplete Simultaneous Discrete Response Model with Multiple Equilibria," *Review of Economic Studies*, 70(1), 147-165.
- Ciliberto, F. and E. Tamer (2009): "Market Structure and Multiple Equilibria in Airline Markets," *Econometrica*, 77(6), 1791-1828.

Topic 2: Market entry models: incomplete information
- Aguirregabiria, V. (2019): "Empirical Industrial Organization: Models, Methods and Applications," Chapter 5.
- Bajari, P., H. Hong, J. Krainer and D. Nekipelov (2007): "Estimating Static Models of Strategic Interactions," *Journal of Business & Economic Statistics*, 28(4), 469-482.
- De Paula, A., and X. Tang (2012): "Inference of signs of interaction effects in simultaneous games with incomplete information," *Econometrica*, *80*(1), 143-172.
- Sweeting, A. (2009): "The strategic timing incentives of commercial radio stations: An empirical analysis using multiple equilibria," *The RAND Journal of Economics*, *40*(4), 710-742.

Topic 3: Market entry and spatial competition
- Aguirregabiria, V. and J. Suzuki (2016): "Empirical Models of Market Entry and Spatial Competition in Retail Industries," in *Handbook on the Economics of Retail and Distribution*, Emek Basker (editor).
- Ellickson, P., S. Houghton, and C. Timmins (2013): "Estimating network economies in retail chains: a revealed preference approach," *RAND Journal of Economics*, 44(2), 169-193.
- Seim, K. (2006): "An Empirical Model of Firm Entry with Endogenous Product-Type Choices," RAND Journal of Economics 37(3).
- Jia, P. (2008): "What Happens when Wal-Mart comes to town? Empirical Analysis of the Discount Retailing Industry," *Econometrica*.

Topic 4: <u>Relaxing assumptions on information structure in discrete choice games</u>
- Aguirregabiria, V., and P. Mira (2019): "Identification of games of incomplete information with multiple equilibria and unobserved heterogeneity," *Quantitative Economics*, *10*(4), 1659-1701.
- Grieco, P. (2014): "Discrete games with flexible information structures: An application to local grocery markets," *The RAND Journal of Economics*, *45*(2), 303-340.
- Magnolfi, L., and C. Roncoroni (2018): "Estimation of Discrete Games with Weak Assumptions on Information," manuscript.

Topic 5: <u>Static games of incomplete incomplete information with non-equilibrium beliefs</u>
- Aguirregabiria, V. (2020): "Identification of Firms' Beliefs in Structural Models of Competition," manuscript.
- Aguirregabiria, V., and E. Xie (2019): "Identification of Non-Equilibrium Beliefs in Games of Incomplete Information Using Experimental Data," manuscript.
- Aradillas-Lopez, A., & Tamer, E. (2008): "The identification power of equilibrium in simple games," *Journal of Business & Economic Statistics*, 26, 261-283.
- Goldfarb, A., & Xiao, M. (2011): "Who thinks about the competition? Managerial ability and strategic entry in US local telephone markets," *American Economic Review*, 101, 3130-3161.
- Hortacsu, A., Luco, F., Puller, S. & Zhu, D. (2019): "Does strategic ability affect efficiency? Evidence from electricity markets," *American Economic Review*, 109(12), 4302-42.

PART II: <u>DYNAMIC GAMES OF OLIGOPOLY COMPETITION</u>

Topic 6: <u>Dynamic games of oligopoly competition: Models and Solution methods</u>
- Aguirregabiria, V. (2019): "Empirical Industrial Organization: Models, Methods and Applications," Chapter 9.
- Ericson, R. and A. Pakes (1995): "Markov-Perfect Industry Dynamics: A Framework for Empirical Work," *Review of Economic Studies,* 62, 53-82.
- Pakes, A. and P. McGuire (1994): "Computing Markov Perfect Nash Equilibrium: Numerical Implications of a Dynamic Differentiated Product Model," *RAND Journal of Economics*, 25, 555-589.

Topic 7: <u>Dynamic games of oligopoly competition: Estimation methods</u>

- Aguirregabiria, V. (2019): "Empirical Industrial Organization: Models, Methods and Applications," Chapter 10.
- Aguirregabiria, V., and M. Marcoux (2019): "Imposing equilibrium restrictions in the estimation of dynamic discrete games," manuscript. University of Toronto.
- Aguirregabiria, V., and P. Mira (2007): "Sequential estimation of dynamic discrete games," *Econometrica*, 75, 1-53.
- Arcidiacono, P., and R. Miller (2011): "Conditional choice probability estimation of dynamic discrete choice models with unobserved heterogeneity," *Econometrica*, 79(6), 1823-1867.

- Bajari, P., L. Benkard and J. Levin (2007): "Estimating dynamic models of imperfect competition," *Econometrica*, 75, 1331-1370.

Topic 8: <u>**Entry, exit, preemption, and cannibalization in retail industries**</u>
- Arcidiacono, P., P. Bayer, J. Blevins, and P. Ellickson (2016): "Estimation of dynamic discrete choice models in continuous time with an application to retail competition," *The Review of Economic Studies*, *83*(3), 889-931.
- Holmes, T. (2011): "The Diffusion of Wal-Mart and Economies of Density," *Econometrica*, 79(1), 253-302.
- Igami, M., and N. Yang (2016): "Unobserved heterogeneity in dynamic games: Cannibalization and preemptive entry of hamburger chains in Canada," *Quantitative Economics*, *7*(2), 483-521.
- Takahashi, Y. (2015): "Estimating a war of attrition: The case of the US movie theater industry," *American Economic Review*, *105*(7), 2204-41.

Topic 9: <u>**Uncertainty and firms' investment decisions**</u>
- Collard-Wexler, A. (2013): "Demand fluctuations in the ready-mix concrete industry," *Econometrica*, *81*(3), 1003-1037.
- Kalouptsidi, M. (2014): "Time to build and fluctuations in bulk shipping," *American Economic Review*, *104*(2), 564-608.
- Kellogg, R. (2014): "The effect of uncertainty on investment: Evidence from Texas oil drilling," *American Economic Review*, *104*(6), 1698-1734.

Topic 10: <u>**Networks and product positioning**</u>
- Aguirregabiria, V., and C-Y. Ho (2012): "A dynamic oligopoly game of the US airline industry: Estimation and policy experiments," *Journal of Econometrics*, 168(1), 156-173.
- Benkard, C., A. Bodoh-Creed, and J. Lazarev (2019): "Simulating the dynamic effects of horizontal mergers: US airlines," *Manuscript, Yale University*.
- Brancaccio, G., M. Kalouptsidi, and T. Papageorgiou (2020): "Geography, search frictions and endogenous trade costs," *Econometrica*. Forthcoming.
- Jeziorski, P. (2014): "Estimation of cost efficiencies from mergers: Application to US radio," *The RAND Journal of Economics*, *45*(4), 816-846.

Topic 11: <u>**Dynamic games of innovation**</u>

- Goettler, R. and B. Gordon (2011): "Does AMD spur Intel to innovate more?" *Journal of Political Economy*, 119(6), 1141-1200.
- Igami, M (2017): "Estimating the Innovator's Dilemma: Structural Analysis of Creative Destruction in the Hard Disk Drive Industry," *Journal of Political Economy*, 125(3), 798-847

Topic 12: <u>Dynamic games with firms' non-equilibrium beliefs and learning</u>

- Aguirregabiria, V. and J. Jeon (2020): "Firms' Beliefs and Learning: Models, Identification, and Empirical Evidence," *Review of Industrial Organization*, forthcoming.
- Aguirregabiria, V., & Magesan, A. (2020): "Identification and estimation of dynamics games when players beliefs are not in equilibrium, working paper," *Review of Economic Studies*, forthcoming.
- Asker, J., Fershtman, C., Jeon, J., & Pakes, A. (2016): "The competitive effects of information sharing," NBER Working Paper, No. 22836. National Bureau of Economic Research.
- Doraszelski, U., Lewis, G., & Pakes, A. (2018): "Just starting out: Learning and equilibrium in a new market," *American Economic Review*, 108, 565-615.
- Fershtman, C., & Pakes, A. (2012): "Dynamic games with asymmetric information: A framework for empirical work," *Quarterly Journal of Economics*, 127, 1611-1661.

CLASS SCHEDULE & REQUIRED READINGS BEFORE CLASS

<u>WEEK- DATE</u>	<u>TOPIC</u>
Week 1: Jan. 14	Topic 1: Market entry models: complete information
Week 2: Jan. 21	Topic 2: Market entry models: incomplete information
Week 3: Jan. 28	Topic 3: Market entry and spatial competition
Week 4: Feb. 4	Topic 4: Relaxing assumptions on information structure in discrete choice games
Week 5: Feb. 11	Topic 5: Static games of incomplete information with non-equilibrium beliefs
Week 6: Feb. 18	Topic 6: Dynamic games of oligopoly competition: Models and Solution methods **[Note: Reading week, but we have class]**
Week 7: Feb. 25	Topic 7: Dynamic games of oligopoly competition: Estimation methods **Problem set will be handed-out**
Week 8: Mar. 4	Topic 8: Entry, exit, preemption, and cannibalization in retail industries
Week 9: Mar. 11	Topic 9: Uncertainty and firms' investment decisions **Problem set is due**
Week 10: Mar. 18	Topic 10: Networks and product positioning
Week 11: Mar. 25	Topic 11: Dynamic games of innovation
Week 12: Apr 1.	Topic 12: Dynamic games with firms' non-equilibrium beliefs and learning **'Take Home' Final Exam set will be handed-out**
Week 13: Apr. 8	**Final Exam is due**