

Autumn 2020
POLSC 30901 & 29102
Game Theory I

Professor Nalepa
mnalepa@uchicago.edu
The University of Chicago
Asynchronous + T:1-2:20 pm

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TA: Bianca DiGiovanni
bdigiovanni@uchicago.edu
TA Office Hours: Thursday, 9:30-11am

Course description

This course is the first part of the formal theory theory sequence in the Political Science PhD program at The University of Chicago. It serves as a prerequisite to Game Theory II in the Winter Quarter. This quarter will be taught as an introduction to game theory.

The origins of game theory reach back to the beginning of the 20th century when John von Neumann paired up with Oscar von Morgenstern to write the “Theory of Games and Economic Behavior.” For von Neumann, game theory was a side project from his main occupation—in 1943 he was consulting on the Manhattan Project to develop the atomic bomb, and from 1944 he worked on designing the first electronic computer. Yet, their joint contribution started a rich research program culminating in the work of John F. Nash, Jr. who initiated the game theoretic study of bargaining. Nash received the Nobel Prize in 1994, along with two other game theorists, John C. Harsanyi and Reinhard Selten. Since then, many other game theorists have been recognized by the Swedish Academy, including, Roger Myerson, Robert Aumann, Amartya Sen, Eleanor Ostrom, and most recently, Jean Tirole.

The course will be centered around several applications of game theory to social and political science: electoral competition, agenda control, lobbying, voting in legislatures, and coalition games,.

Course structure

Due to Covid, this class will be offered in hybrid format: there will be 3-4 asynchronous mini-lectures offered each week along with an 1h 20 minute session of live discussion. The

time listed above is the time of the live discussion. You can watch the asynchronous lecture in your own time by streaming it from canvas, but you must do so at least 48 hours before our live session. The reason is that you must use Piazza (see below) to post questions about parts of the lecture you did not understand. The staff will answer those questions in live sessions as well as zoom office hours.

Required and Recommended Materials

The textbook for this class is **Martin J. Osborne. An Introduction to Game Theory. Oxford University Press 2003** [Osborne].

We will cover chapters 1, 2, 3, 4, 5, 6, and 7 and the mathematical appendix (for mathematical prerequisites see below).

Although the class material will be presented according to the notation from Osborne's textbook, there is no one perfect game theory textbook. You are welcome to consult the following introductory books and re-read the chapters corresponding to the material we covered in class. You may find a different textbook to be a better fit for your needs.

1. Tadelis, Steven. Game Theory: An Introduction. Princeton University Press, 2013.
2. Gehlbach, Scott. Formal Models of Domestic Politics, First Edition. Cambridge University Press, 2013.
3. McCarty, Nolan, and Adam Meirowitz. Political Game Theory: An Introduction. Cambridge University Press, 2007.
4. Myerson, Roger B. Game Theory. Harvard university press, 2013.
5. Kuhn, Harold William. Classics in Game Theory. princeton University press, 1997.

Mathematical prerequisites

The mathematical prerequisites for this course are rather modest. I expect you to know basic set theoretic operations, algebraic operations, fundamentals of calculus, and some formal logic most of which are covered in the mathematical appendix of Osborne and in the **handout** posted in the "Resources" section on Piazza. However, for those of you would like more background material, the most comprehensive presentation I can recommend is:

Pemberton, Malcolm, and Nicholas Rau. Mathematics for economists: an introductory textbook. Oxford University Press, 2015.

You may also find the following book helpful:

Houston, Kevin. How to think like a mathematician: A companion to undergraduate mathematics. Cambridge University Press, 2009.

Exams

There will be two 24 hour take home exams in this class: a midterm distributed on November 18 and a final distributed on December 8 each worth 30% of your grade. In addition, there will be 4 substantial problem sets, each worth 10 %.

Grading

Grades will be assigned according to the following rubric:

A	85-100%
B	71-84%
C	61-70%
D	51-60%
F	$\leq 50\%$

Pluses and minuses will be awarded at the discretion of course staff.

Problem Sets

Every other Tuesday, following the live discussion session, we will distribute a short problem set. The assignments will be completed in groups of 3 or 4 students. We will randomly assign you to a group after the first week of classes. Each group will tender one TYPED submission. Handwritten assignments will not be accepted. The exams (see below) must be completed individually, without the help of your group. No late assignments will be accepted, except for grave emergencies (TBD by the staff on an individual basis).

The purpose of the written homework in this course is to develop your skills in understanding and communicating game theory. It is not to give you busy work or drill. Don't think of your homework as a certificate proving that you have done the assignment. Think of it as an exercise in learning and in reporting what you have learned. There is a lot of truth in the statement "*if you can't explain it, you don't understand it.*" Communicate with the reader. Don't write to the instructor (who already knows how to do the problems), but explain your solutions to someone who needs help, perhaps a classmate who has been absent. Start at the beginning, and be clear, logical and complete.

The purpose of group work is two-fold. First, by sharing ideas you will be able to learn from each other, allowing you to clarify what you have learned from the lectures and readings. Second you will become accustomed to working with other people. Few occupations call for working in isolation. The goal for group assignments is for each group member to understand the entire assignment. Frequently a major part of an assignment will be to summarize the various components of the problem at hand. To do this, you will need to understand the entire assignment. Therefore you should not divide the problems among your group members: each person should work on every part and you should collaborate and discuss your results.

Problem sets will be due the Monday immediately following the Tuesday they were distributed on. No late homework will be accepted, as we will solve the problems in Tuesday's session together.

Canvas

All materials for this class, including extra readings (beyond Osborne), weekly handouts and the Intro to Formal Logic Handout will be available on Canvas. Canvas is also where you will be asked to submit your questions and comments to the asynchronous portion of the lecture. You should have access to all sections of the Canvas page.

Calendar

September 29: Logistics and Introduction to formal modeling

Clarke, Kevin A., and David M. Primo. "Modernizing political science: A model-based approach." *Perspectives on Politics* (2007): 741-753.

Rawls, John. *A theory of justice*. Harvard university press, 2009 (pp. 136-183)

October 6:: Strategic games and examples

Osborne, 13-21 (up to section 2.6) Rousseau, Jean J. "Discourse on Inequality, Part II"

October 13: Nash Equilibrium and best response functions

Osborne, 21-31 and 35-41

Locke, John. "Political writings, ed." David Wootton, Harmondsworth (1993), Chapter 8 (Of the beginning of Political Societies).

October 20: Dominated actions and weak dominance

Osborne, 45-48

Hobbes, Thomas. "Leviathan (Oxford World's Classics)." (1998), Chapter 13-15 of Part I (Of Man)

October 27th: Voter participation and contributing to a public good

Osborne, 42-45

November 3: Tragedy of the Commons Osborne, 55-63

Hardin, Garrett. "The tragedy of the commons." *Journal of Natural Resources Policy Research* 1.3 (2009): 243-253.

November 10: Electoral Competition and Models of Lobbying (Auctions)

Osborne, 80-90

Downs, "An Economic Theory of Democracy," Chapter 8

November 17: Probability, randomization, mixed strategy equilibrium

Osborne's: 17.6.1-17.6.4, 99-123, 134-137 (up to section 4.10)

Osborne's mathematical appendix

November 24: Thanksgiving Holiday

Osborne, 192-196

December 1: Games in extensive form. Backward induction. SPNE

Osborne, 154-173, 225-236

Selten, Reinhard (1978). "The chain store paradox." *Theory and Decision* 9 (2): 127-159

December 8: Models of agenda setting. Relationship between SPE and NE

Osborne, 186-187, 215-221

Romer, T. and H. Rosenthal (1978). "Political Resource Allocation, Controlled Agendas, and the Status Quo." *Public Choice* 33: 27-44.

Recommended readings
Voting and Agenda-Setting

1. Farquharson, R. (1969). "Theory of Voting." Oxford, Blackwell, Oxford University, 1958: xii, 83 p.
2. Miller, Nicholas R. "A New Solution Set for Tournaments and Majority Voting," American Journal of Political Science, 24(1), 68-96
3. McKelvey, R. and R. Niemi (1978) "A multistage game representation of sophisticated voting for binary procedures." Journal of Economic Theory,18, 1-22
4. Snyder, J.M., & Ting, M. (2005). "Why Roll Call? A Model of Position-taking in Legislative Voting and Elections. Journal of Law, Economics, and Organization, 21(1), 153-178.
5. Fox, Justin (2007) "Government Transparency and Policymaking," Public Choice, 131 (1-2) 23-44
6. Shepsley, K. A. (1991). Models of Multiparty Electoral Competition. Chur; New York, Harwood Academic Publishers.

Political Philosophy and Game Theory

7. Skyrms, Brian. "The stag hunt." Proceedings and Addresses of the American Philosophical Association. Vol. 75. No. 2. American Philosophical Association, 2001.
8. Binmore, Ken. Natural justice. Oxford university press, 2005.
9. Binmore, Kenneth George. Game theory and the social contract: just playing. Vol. 2. MIT press, 1994.

Bureaucracy, delegation, expertise, oversight

10. Huber, John and Nolan McCarthy 2004. "Bureaucratic Capacity, Delegation and Political Reform," APSR 98(3), 481-494
11. Gailmard, Sean and John W. Patty. 2007. "Slackers and Zealots: Civil Service, Policy Discretion and Bureaucratic expertise", AJPS 51(4) 873-889
12. Bendor, Jonathan and Adam Meirowitz. 2004. Spatial Models of Delegation APSR 98(2):293-310.
13. Ting, M. M. (2003). "A Strategic Theory of Bureaucratic Redundancy." American Journal of Political Science 47(2): 274-292.
14. Bawn, K. (1997). "Choosing Strategies to Control the Bureaucracy: Statutory Constraints, Oversight, and the Committee System." Journal of Law, Economics, & Organization 13(1): 101-126.

15. Gailmard, Sean. 2009. "Multiple Principals and Oversight of Bureaucratic Policy-making." *Journal of Theoretical Politics* 21(2): 161-186
16. Gailmard, Sean. 2009. "Discretion Rather than Rules: Choice of Instruments to Control Bureaucratic Policy Making." *Political Analysis* 17(1): 25-44
17. Gailmard, S. (2002). "Expertise, Subversion, and Bureaucratic Discretion." *J Law Econ Organ* 18(2): 536-555.
18. McCarty, N. (2004). "The Appointments Dilemma." *American Journal of Political Science* 48(3): 413-428.
19. Figueiredo, R. J. P. d., Jr. (2002). "Electoral Competition, Political Uncertainty, and Policy Insulation." *The American Political Science Review* 96(2): 321-333.
20. Huber, John D. and Nolan McCarty. 2006. "Bureaucratic Capacity and Legislative Performance" in *Macropolitics of Congress*, E. Scott Adler and John Lapinski, eds. Princeton: Princeton University Press.
21. Ferejohn, J. and C. Shipan (1990). "Congressional Influence on Bureaucracy." *Journal of Law, Economics, & Organization* 6: 1-20.
22. Hopenhayn, H. and S. Lohmann (1996). "Fire-Alarm Signals and the Political Oversight of Regulatory Agencies." *Journal of Law, Economics, & Organization* 12(1): 196-213.

Principal-agent models

1. Sappington, D. E. M. (1991). "Incentives in Principal-Agent Relationships." *The Journal of Economic Perspectives* 5(2): 45-66.
2. Maskin, E. and J. Tirole (1992). "The Principal-Agent Relationship with an Informed Principal, II: Common Values." *Econometrica* 60(1): 1-42.

Fair Division

1. Brams, S. J. and D. M. Kilgour (2001). "Competitive Fair Division." *The Journal of Political Economy* 109(2): 418-443.
2. Aumann, R. and M. Maschler (1985). "Game Theoretic Analysis of a Bankruptcy Problem from the Talmud." *Journal of Economic Theory* 36: 195-213.
3. Elster, J. (1992). *Local Justice. How Institutions Allocate Scarce Goods and Necessary Burdens*. New York, Russel Sage Foundation.
4. Kaminski, M., M. (2000). "Hydraulic Rationing." *Mathematical Social Sciences*.
5. O'Neil, B. (1982). "A Problem of Rights Arbitration from the Talmud." *Mathematical Social Sciences* 2: 345-371.

6. Young, P. (1987). "On Dividing an Amount according to Individual claims and Liabilities." *Mathematics of Operations Research* 12(No. 3 August 1987): 398 -414.
7. Young, P. (1994). "Equity in Theory and Practice." Princeton, Princeton University Press: 190 - 199 (Claims and Liabilities).
8. Young, P. (1994). "Equity in Theory and Practice." Princeton, Princeton University Press: 65-80 (Equity, Equality and Proportionality).

Legislative-Executive relations

1. Epstein, D. and S. O'Halloran (1996). "Divided Government and the Design of Administrative Procedures: A Formal Model and Empirical Test." *The Journal of Politics* 58(2): 373-397.
2. Huber, J. D. (1996). "The Vote of Confidence in Parliamentary Democracies." *The American Political Science Review* 90(2): 269-282.
3. Bernhardt, Dan, John Duggan and Francesco Squintani (2009). *American Political Science Review* 103 (4): 570-587
4. Ting, Michael M., (2009) "Legislatures, Bureaucracies and Distributive Spending" . APSA 2009 Toronto Meeting Paper. Available at SSRN: <http://ssrn.com/abstract=1449846>