

Political Science (POLS) 601
Components of Political Inquiry
Fridays 9:00 to 11:50 AM
Allen 2064

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1 Introduction

The purpose of this class is to introduce you to some core approaches to conducting research in political science. We will begin with a discussion of the development of scientific knowledge in general. The remainder of the course will focus on game theory, which is the formal study of strategic (i.e., interdependent) decision-making and an important tool for developing theoretical arguments in political science.

The foundational text for the course will be *Game Theory: An Introduction* by Steven Tadelis (2013, Princeton University Press). There are also a number of optional, supplementary texts listed below.

In addition to weekly homework assignments, there will be two exams during the semester. These may be open book and open notes, or may be closed-everything (this will be decided before the

first exam). The combined homework scores will account for 1/3rd of your grade, and each exam will account for 1/3rd of your grade.

2 A Note on Texts

Your ability to understand an abstract mathematical concept may be dependent upon the way that it is presented to you. As a result, you may find it necessary to compare several versions of the same material before you can obtain a clear understanding. Consequently, you may find it useful to have lots of math/game theory books within arms reach. Also, you don't learn math by reading it, you learn math by doing it. So, you should be doing some problems every day and some of these books will provide you with lots to draw on. This can be expensive, but over time we've found the following books useful. You may also.

Instead of deciding which books you should buy, we will list a set of books as "supplemental texts". It is not necessary for you to read all of these books. We will treat Tadelis as THE textbook for the class, but have listed cognate readings for each subject so that you can consult multiple presentations of the material. We're placing a collection of our books related to this course on a book shelf in Room 2015 that you should feel free to consult. Please only remove them WHILE you are working with a particular text and, if possible, let us know where you are with the book (we'll leave a sign out sheet).

2.1 Game Theory texts

Required:

Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton University Press. [intermediate level]

Cognate:

Dixit, Avinash, Susan Skeath, and David H. Reiley, Jr. 2014. *Games of Strategy*. W.W. Norton & Co. 4th edition. (actually any edition is fine). [introductory level]

Osborne, Martin J. 2004. *An Introduction to Game Theory*. Oxford University Press. (This used to be the core textbook for the class, and is excellent. It is at about the same level as the Tadelis text.) [intermediate level]

Gibbons, Robert. 1992. *Game Theory for Applied Economists*. Princeton University Press. [intermediate level]

Morrow, James D. 1994. *Game Theory for Political Scientists*. Princeton University Press. [intermediate level]

Rasmusen, Eric. 2006. *Games and Information: An Introduction to Game Theory*. 4th ed. Wiley-Blackwell. [intermediate level]

Watson, Joel. 2013. *Strategy: An Introduction to Game Theory*. 3rd ed. W.W. Norton & Co. [intermediate level]

Osborne, Martin J., and Ariel Rubinstein. 1994. *A Course in Game Theory*. MIT Press. [advanced level]

Fudenberg and Tirole. 1991. *Game Theory*. MIT Press. [advanced level, and very comprehensive]

Myerson, Roger. 1991. *Game Theory: Analysis of Conflict*. Harvard University Press. [advanced level]

McCarty, Nolan, and Adam Meirowitz. 2007. *Political Game Theory*. Cambridge University Press. (The Mathematical Appendix may be helpful for a few things we will cover in this course.) [advanced level]

2.2 Supplemental Logic Texts

Velleman, Daniel J. 2006. *How to Prove It: A Structured Approach*. 2nd ed. Cambridge University Press.

Bloch, Ethan D. 2000. *Proofs and Fundamentals: A First Course in Abstract Mathematics*. Birkhauser. (The first two chapters of this text cover the same material as Velleman in a more concise fashion.)

Houston, Kevin. 2009. *How to Think Like a Mathematician: A Companion to Undergraduate Mathematics*. Cambridge University Press.

In Summer Math Camp we went through the material in the first three chapters of Velleman (or its equivalent). It is not strictly necessary that you read any of these books, but they are fantastic references. Bloch gets to the payoff more quickly, which may or may not be a good thing. It is also a lot more expensive.

2.3 Supplemental “Math for X ” texts

Moore, Will H., and David A. Siegel. 2013. *A Mathematics Course for Political & Social Research*. Princeton University Press.

Gill, Jeff. 2006. *Essential Mathematics for Political and Social Research*. Cambridge University Press.

Simon, Carl P., and Lawrence Blume. 1994. *Mathematics for Economists*. W.W. Norton & Co.

We may draw on significant portions of Simon and Blume for any lectures related to math topics, but not enough to warrant listing it as a “required” text (given its high price). It is expensive, but will pay for itself over the years! If it is important to you that the examples be about political phenomena, you may prefer Gill.

3 Other Recommended Texts

Alpha C. Chiang. *Fundamental Methods of Mathematical Economics*. 3rd ed.

Daniel Kleppner and Norman Ramsey. 1985. *Quick Calculus: A Self-Teaching Guide*. New York: Wiley.

John Weiss. *The Calculus Direct*. KINDLE VERSION \$3.99!

Namboodiri, Krishnan. 1986. *Matrix Algebra: An Introduction*. New York: Sage.

David C. Lay. 2003. *Linear Algebra and its Applications*. Boston: Addison Wesley. (We won’t cover Linear (Matrix) Algebra, but wish we could. You’ll encounter this in POLS 603, and possibly POLS 602 as well.)

Kosmala, Witold A.J. 2003. *A Friendly Introduction to Analysis*. 2nd ed. Englewood Cliffs: Prentice Hall. (We won’t get to much of the material in this book (and what we do cover is in Simon and Blume), but wish we could! It is very fun.)

4 Schedule

4.1 Course Introduction, and Summer Math Camp Wrap-up

1. Going over math homework problems, and doing proofs

4.2 Philosophy of Science

2. What Is An Explanation?

- Lave, Charles, and James March. 1993. *An Introduction to Models in the Social Sciences*. University Press of America. Chapters 1-3.
- Elster, Jon. 1989. *Nuts and Bolts for the Social Sciences*. Cambridge University Press. Chapters 1-6 (the rest of book is “suggested reading”).

3. Progress in Science

- Kuhn, Thomas S. 1962. “Historical Structure of Scientific Discovery.” *Science* 136 (3518): 760-764.
- Lakatos, Imre. 1970. “Falsification and the Methodology of Scientific Research Programmes.” (pages 170-196).
- Magee, Bryan. 1985. *Philosophy and the Real World: An Introduction to Karl Popper*. New York: Open Court Press. Chapters 2-3.

4.3 Introduction to Game Theory

Application: The Inefficiency of War, The Veil of Ignorance, Lobbying, Condorcet’s Paradox

4. Decision Theory and the Principle of Rational Choice (Math needed: basic probability theory)

- Tadelis: Chapters 1-2.
- Fearon, James D. 1995. “Rationalist Explanations for War.” *International Organization* 49(3):379-414. Focus on pp.386-390.
- Harsanyi, John. 1975. “Can the Maximin Principle Serve as a Basis for Morality? A Critique of John Rawls’s Theory.” *American Political Science Review* 69(2):594-606.

Cognate:

- Osborne: Chapter 1, pp.146-150.

5. SUBGAME PERFECT EQUILIBRIUM IN EXTENSIVE FORM GAMES (Math needed: greater than, less than)

- Tadelis: Chapters 7-9.

Cognate:

- Osborne: Chapter 5.
- Watson: Chapters 14, 15, 17-20, 22.
- Gibbons: Chapter 2. Sections 1a, 1d, 2a, 2b, 3a, 4.
- Morrow: Chapter 5, pp.121-138.

6. NASH EQUILIBRIUM IN NORMAL FORM GAMES - I (finite strategy, Math needed: algebra “solve for p”)

- Tadelis: Chapters 3, 5, & 6.

Cognate:

- Osborne: Chapter 2 & 4.
- Watson: Chapters 2-7, 9 & 11.

4.4 Continuous Strategies

Application: Political Advertising in a Two Party System

7. NASH EQUILIBRIUM IN NORMAL FORM GAMES - II (continuous strategies, Math needed: the derivative, optimization)

- Tadelis: Chapters 5 & 6.

Cognate:

- Osborne: Chapter 3, 6 & 7.
- Gibbons: Chapters 1.1, 1.3, & 1.4.
- Morrow: Chapter 3 & 4 (pages 73-88).

4.5 Limited Information Game Theory

Application: Crisis Bargaining

8. BAYESIAN NASH EQUILIBRIUM IN STATIC GAMES OF INCOMPLETE INFORMATION (Math needed: probability theory)

- Tadelis: Chapters 12-13.

Cognate:

- Osborne: Chapter 9.
- Watson: Chapters 24 & 26.
- Gibbons: Chapter 3.1, 3.2.A.

9. PERFECT BAYESIAN EQUILIBRIUM IN DYNAMIC GAMES OF INCOMPLETE INFORMATION (Math needed: probability theory)

- Tadelis: Chapters 15-16.

Cognate:

- Osborne: Chapter 10.
- Gibbons: Chapter 4.
- Watson: Chapter 28 & 29.
- Morrow: Chapter 6 & 8 (pages 219-227).

4.6 Repeated Play Games

Application: International Cooperation, Retrospective Voting

10. REPEATED GAMES (Math needed: Summation of Infinite Series and Discounting)

- Tadelis: Chapter 10.

Cognate:

- Osborne: Chapter 14 & 15.

- Gibbons: pp.82-115.
- Watson: Chapters 22 & 23.
- Morrow: Chapter 9.

4.7 Bargaining

11. THE RUBINSTEIN BARGAINING MODEL

- Tadelis: Chapter 11.

Cognate:

- Osborne: Chapter 26.
- Morrow: pp. 145-155.
- Osborne & Rubinstein: Chapter 7.
- Watson: Chapters 18 & 19.

4.8 Summer Math Camp Revisited (or Visited)

12. Real Analysis

- Limits, Sequences, Cauchy and Convergence (Gill 178-82; S and B 253-60)
- Sequences m -dimensional space (S and B 260-4)
- Open, Closed, Bounded, and Compact Sets (S and B: 260-272)
- Brouwer's and Kakutani's Fixed Point Theorems
- Balzano-Weierstrass Theorem
- Proof of Nash's Theorem

4.9 Optimization Revisited

13. Multivariable Calculus

- Partial Derivatives (Gill: 335-41; S and B: 300-12, 328-333)
- First-Order Conditions (S and B: 375-9 and 396-403)
- Second-Order Conditions (Gill 167-68; 398-401 (through Theorem 17.6))
- Equality Constraints and Lagrange Multipliers (S and B: 411-23 (skip remarks on pages 416-17), 448-50)
- Inequality Constraints (S and B: 424-35)