Polisci 153Z – Strategy: Intro to Game Theory

Avidit Acharya

Professor of Political Science and, by courtesy, in the GSB, Stanford University

Email: avidit@stanford.edu

Course description: This is an introduction to basic concepts in game theory and strategic reasoning. We discuss ideas such as commitment, credibility, adverse selection, moral hazard, signaling and reputation. Concepts are developed through games played in class, as well as through applications to politics, business, and everyday life.

Aims: Taking game theory might help you make better life decisions, but this would be an *unintended* consequence of this course. My aim is to provide you with some tools to analyze situations where you might expect firms, countries, political parties, and regular people to behave "strategically."

The point of this course is to get in depth about what game theorists mean when they say that the players of a game behave "strategically." In addition to providing the tools for you to better analyze strategic situations, another important aim of the course is to expose you to the limitations of strategic reasoning as well.

Requirements: There are no requirements for this course, but we will use high school level algebra and geometry regularly. We will also use concepts like probability and expected value. If you have already taken a game theory course in the economics department (like Econ 160 or 180 at Stanford or a similar course elsewhere), then you should not take this course. This is a course meant for students who have never taken game theory before. Students with a strong math background (calculus and more) and an interest in political science applications of game theory should consider taking the more advanced courses, Polisci 356a/b, if those are being offered.

Books: I will not follow a textbook for this course. Instead, I will post handouts as we go along. But if you would like to follow a game theory text book, I recommend Osborne (see below). Dixit and Nalebuff is a fun read, but is also not required.

- Martin Osborne. *Introduction to Game Theory*, Oxford 2003.
- Avinash Dixit and Barry Nalebuff. *Thinking Strategically*, Norton 1991.

Grading: I don't accept late homework, except with a valid excuse (e.g., doctor's note). You may work with others on the homework, but you must submit your own answers. There will be a total of six to eight problem sets, depending on how we progress.

- Six problem sets. (50%)
- One in-class midterm. (20%)
- Final exam. Time and Location Determined by Registrar's Office. (30%)

Course Outline: Here is a list of topics that we'll cover. We will go roughly in order. We may not have time to cover all the topics.

I. Games, Strategies, and Bad Strategies
Osborne Ch. 1.
Topics: 2x2 games (prisoners dilemma, stag hunt, matching pennies, etc.). Iterated elimination of strictly dominated actions. Rationality, rationalizability and Nash equilibrium. Common knowledge assumptions in game theory.

II. Cooperation, Competition and Coordination
Selections from Osborne Ch. 2, 3, 4.
Topics: Zero sum games, strategic substitutes and complements, equilibrium multiplicity. The Downs model of political competition. Policy motivated parties. Tragedy of the commons.

III. Credibility and Commitment
Selections from Osborne Ch. 5, 6, 7.
Topics: subgame perfect Nash equilibrium, backward induction, Zermelo's theorem, Kuhn's theorem. The peasant-dictator game and other examples.

IV. Bargaining
Selections from Osborne Ch. 16.
Topics: Sequential bargaining theory: the Stahl-Rubinstein model.

V. Long Term Relationships: Cheating and Punishing
Selections from Osborne Ch. 14, 15
Topics: The one-stage deviation principle (Blackwell's theorem), repeated games. Grim trigger; tit for tat. The folk theorem.

VI. Uncertain Motivations
Selections from Osborne Ch. 9.
Topics: Bayes rule. Bayesian Nash equilibrium. Agency models. The inspection game with uncertainty. The security dilemma model. Jury voting. The role of information in a strategic setting. The Rubinstein email game.

VII. Moral Hazard and Adverse Selection
Selections from Osborne Ch. 10
Topics: Imperfect information. Incomplete information, perfect Bayesian equilibrium. War with crazy types. The principal-agent model.

VIII. Deception
Selections from Osborne Ch. 10
Topics: Cheap talk.

IX. Signaling and Reputation
Selections from Osborne Ch. 10
Topics: The beer-quiche game. Rational cooperation in the finitely repeated prisoner's dilemma.