

Game Theory and Politics

G53.2108

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Wednesday 10-12noon

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Office Hours: Monday 9-12

Prerequisite: Students need to have a familiarity with maths to take this class. Ideally students should have taken G53.1110 Mathematics for Political Scientists or an equivalent class. Those students without a strong maths background should obtain permission from the instructor.

This course is designed with two aims in mind: First, to introduce students to the basic concepts and tools of game theory. Second, to demonstrate how formal models can be used in social science. Emphasis is placed on understanding the intuition and logic of game theory and its application in the social sciences. Students finishing this course should be in a position to read and evaluate the current game theoretic literature in political science.

The course starts with basic utility theory. From this platform, classical game theoretic ideas are developed. Having established the rudimentary concepts, these principals are applied in political science settings. I intend to develop the game theory and its substantive applications side by side. Different substantive areas are used to motivate different game theoretic concepts. The course covers many, although not all, of the recent development in non-cooperative game theory.

The course consists of a combination of lectures, and problem solving sessions. In addition to class problems, regular homework problems will be assigned. These problems will typically relate to the current topic and so need to be completed in a timely fashion. These problem sets make up 50% of the final grade. There will be a final take home exam and a mid term.

The course concentrates on the intuition behind game theoretic models. Despite this emphasis, some mathematics is required. Students contemplating this class should, at a minimum, be comfortable with linear algebra and elementary statistics. A knowledge of basic calculus is helpful but not essential.

Textbooks: I am hoping to use McCathy and Meirowitz's "Political Game Theory." Unfortunately the release date of this text has been put back. Hopefully we will be able to use it for some of the later material. I will also use Martin J. Osborne's "An Introduction to Game Theory" (2003, Oxford University Press).

Course Outline.

Utility Theory

The properties of ordinal and cardinal preferences. Lotteries and expected utility. Risk aversion and risk acceptance. Decision theory. (Readings: Morrow Chpt. 1+2).

Introduction to Extensive Form and Normal Form Games:

Classic examples of normal form and extensive form games: prisoner's dilemma, chicken, battle of the sexes, deterrence game, Cournot and Stackelberg games.

Components of Games:

What are the components of a game? How are these components represented mathematically? Integrating ideas into models: gameform, players, states, action sets, strategy sets, payoffs, informational assumptions. (Readings: Morrow Chpt. 3)

Nash Equilibria.

Nash equilibria in normal form games. Mixed strategy Nash equilibria. The existence of Nash equilibria. (Readings: Morrow Chpt. 4)

Alternative Solution Concepts.

Iterative dominance-rationalizability, Minimax, Cooperative game theory: Nash bargaining solution (Readings: Morrow Chpt. 4; Fudenberg and Tirole Chpt. 2; Osborne and Rubinstein 53-64.)

Extensive Form Games.

Examples of common extensive form games. The credibility of Nash Equilibria and an introduction to sub-game perfection. Backwards induction. "Trembling-hand" perfect equilibrium. (Readings: Morrow Chpt. 5; Osborne and Rubinstein Chpt. 6)

Correlated Equilibria.

(Readings: Osborne and Rubinstein p.44-48; Fudenberg and Tirole p. 53-59)

Legislative Voting Theory.

The median voter theorem. Sincere vs. sophisticated voting. Agenda control and structure induced equilibria to overcome the chaos problem. (Readings: Morrow p133-145.)

Bargaining theory.

Rubinstein's bargaining solution. Pork barrel model of legislatures. Two-level games as models of international negotiations. (Readings: Morrow p. 145- 156; Osborne and Rubinstein Chpt. 7)

Modeling Incomplete and Imperfect Information.

Introduction: Stochastic rather than deterministic outcomes. Private information modelled as type. Bayesian updating. (Readings: Morrow Chpt. 6; Fudenberg and Tirole p. 209-215)

Solution Concepts:

Bayesian equilibrium, perfect Bayesian equilibrium, and sequential equilibrium. The Beer-Quiche game. Burning money and deterrence games. (Readings: Morrow chpt.7, 8)

Principal-Agent problems

Incentive compatibility.

Out-of-equilibrium beliefs: defining beliefs that are unspecified by Bayes Rule. (Readings: Banks p. 13-16; Morrow p.241-250).

Costly Signaling Games.

Information transmission in legislatures. (readings: Morrow p. 227-237; Banks Chpt. 3).

Cheap Talk Signalling Games.

The threat of Presidential veto in bargaining. (Readings: Banks p. 50-53)

Timing games.

For example, wars of attrition (Readings: Fudenberg and Tirole p.117-126, 216-219)

Repeated Games

(Readings: Morrow Chpt. 9; Fudenberg and Tirole Chpt. 5+ 9; Osborne and Rubinstein Chpt. 8)

Finitely repeated games: 3 period chicken. The chain store paradox.

Infinitely Repeated Games and the Folk Theorem. The possibility of cooperation in the prisoner's dilemma through the formation of institutions.