Formal Models in International Relations

POLI 247B

Syllabus, with links to readings and summaries.

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Office: SSB 387
Hours: by appointment

Winter 2011
Thu 9:00a—11:50a
SSB 104

Description

This course is intended for advanced graduate students who are interested in the formal analysis of international relations. The goal is to familiarize students with the practical aspects of modeling various substantive ideas by exposing the advantages and limitations of mathematical formalization. To accomplish this, students will (i) derive or prove results from the selected readings, (ii) identify the contributions of their authors, and (iii) find ways to improve the research or extend the insights. This course concentrates on the theoretical aspects of formal research and complements POLI 247A: Quantitative Approaches to IR, where students investigate statistical modeling and empirical testing, and POLI 247C: History of International Relations, where students explore diplomatic and military history of Europe from 1618 to 1945. Students are expected to have taken courses in international relations (e.g. the core seminar), and game theory (e.g. POLI 204C).

Requirements

There are three requirements for this course:

1. Formal presentation of one of the papers to the class (35%). Each student will be responsible for presenting and critiquing one of the articles he or she will be assigned during our organizational meeting. The presentation will consist of: (i) a summary of the article's main points, (ii) a careful exposition of the proofs and the intuition behind them, (iii) an evaluation of the substantive importance of the contribution, (iv) a critique of the paper, and (v) questions for discussion. Presenters must be prepared to lead discussion, which means that they should identify the broad themes underlying the reading, establish links to other literatures, suggest improvements for flaws in modeling or research design, derive testable hypotheses, and have ideas about their empirical testing.

2. Written referee report (45%). Students will select one paper from the list of recommended/background readings (i.e., not a paper that will be discussed in class), and write a formal referee report. The paper must be cleared with me first. It is best to select one as early as possible because I will not allow more than one student to write on the same paper. Come with one or two alternative choices. The report must summarize (in one paragraph) the contributions of the paper, discuss their importance, and then provide a critique/discussion, in which the referee must analyze deficiencies in the model,
possible extensions and improvements, and perhaps outline alternative approaches to the problem. Students must be aware that every model is deficient in some ways, and must not fall back on common, but vacuous criticisms of formal models. Instead, students must approach this task as if they are writing suggestions for a colleague or even for themselves (possible venues for research). The reports must be at least three single-spaced pages long (at 11pt font size). These are due to me by noon on Friday of finals week. You can read about writing a referee report from the excellent book by William Thomson. I have scanned the relevant chapter, but I highly recommend you buy this slim volume for reference.

3. Participation in class discussions (20%). Everyone will be expected to have read the articles before coming to class. Presenters will provide the starting point for class discussion and other students will be expected to contribute actively.

Guidelines

Modern research in international relations tends to be methodologically sophisticated, and even though the formal models are not quite up there with the bleeding edge of the area, they are far from the toy examples of Prisoner's Dilemma and Chicken games that used to dominate the field. This means that you should expect to spend quite a bit of time reading each article, which is why we shall rarely discuss more than a handful each week. There is no set way to approach reading formal papers, but I strongly suggest you utilize the following strategy:

1. Begin by reading the introduction and conclusion (and perhaps the literature review). What is the article about? What is its central point? Write down a list of claims (propositions) that you would like to see and that you would need to see to be persuaded of the validity of the article's argument. (And I mean, write these down!)

2. Read the description of the formal model. Construct a dictionary for the notation: that is, write down a table with the symbols and their meanings. (As you will quickly see, there is no standard notation in game theory and that results in a lot of notational clutter, so keeping it straight is always a challenge.) Identify the players, their strategies, their payoffs, and the sequence of moves. Is this a game of complete, perfect, and symmetric information? If not, what is it? Why has the author chosen to model it that way? How closely does the formalization match the substantive motivation for the model? What are some of the simplifying assumptions that might be distorting? Why? What solution concept will the author use? Is it appropriate? Recall now your answers to the previous step: do you think this model will be able to address the puzzle adequately?

3. Read the analysis. What propositions does the author present? How do they correspond to your wishlist? Are they stronger, deeper, more satisfying? Or trivial and disappointing? How do they correspond to the author's own claims? Does the author "stretch" their interpretation? How general are these results? Can you recall similar claims from different models? Or contradictory claims from similar models? Do you think there is a general underlying dynamic common to this and other models?

4. (Difficult step.) Satisfy yourself that the claims are valid and the proofs work. Due to journal space constraints, many editors have now taken to insisting that authors leave out parts of (or sometimes even entire) proofs. This is most unfortunate and shows deep misunderstanding about what the value is of a formal article. The whole point of using
mathematics is to verify the validity of conclusions and internal consistency, but without the proofs, one must essentially rely on the author to have done it correctly (bad idea, we all make mistakes, and not rarely either) or reconstruct the proofs themselves (a very time-consuming and often non-trivial task). If the article includes the proofs, then make sure you understand them fully. What is each step designed to accomplish? What is the intuition behind the sequence of steps taken? Are you satisfied that they produce the desired result? Draw pictures to illustrate claims, or to attempt to disprove them. Solve a simple case by assigning numbers to the parameters. If the article does not include the proofs, try to locate a working paper version online (sometimes these have all the math in them). If that fails, try to think of a strategy for a proof of the claim. Think of counterexamples, can you find one? Draw pictures! Look at similar models and observe how the authors have solved them.

5. Evaluate the generalizability of the results. Which assumptions do you think are crucial for the results? Do you think the results are likely to extend if we relax them? Why or why not? Which part(s) of proofs will no longer hold? What do you think would happen instead? Are the implications serious for our substantive interpretations? What are some of the questions and new puzzles that this article raises (perhaps the author mentions some, but most often these will arise from your own reading). What type of article do you think would best handle these questions? Is it on the syllabus or does it need to be written? How does this model fit in the modeling enterprise?

6. Step back and look at the conclusions: what have we learned that we did not know before? How does this relate to the other readings, both formal and non-formal that you have seen? Does it contradict some "received wisdom," modify and limit general claims, or support and extend others? What is the general abstract idea to take away? Is it applicable in other contexts, not necessarily IR-related? Which ones and how? If it needs slight modifications to be applicable, what would these be?

7. What are some empirical hypotheses that this model suggests? Are they testable or is the model at such a high level of abstraction that it is difficult to see how to apply it? If they are testable, what sort of research design would you adopt? What variables would you need? Do the hypotheses differ from ones used in previous empirical studies? Do they suggest that the previous research design was flawed? In what ways? How would you improve upon it?

One thing I should make abundantly clear is that this course will deal with game-theoretic formal models. There are many other mathematical formalizations (differential equations, agent-based models, general equilibrium models) but they are not as useful for most of the topics we shall be dealing with because they are unable to account for strategic interdependence of decision-making.

**Presentation Schedule**

The schedule of presentations for Winter 2010 is [here](#).

**Readings**
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<td>2.</td>
<td>Bargaining and the Inefficient Use of Power</td>
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<td>7.</td>
<td>Diplomacy, Cheap Talk, and Mediation</td>
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<td>Domestic Politics: Constraints, Signaling, Guns versus Butter</td>
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**Rational Choice, Game Theory, and International Relations**

- **Rigor or Rigor Mortis? Rational Choice and Security Studies**  
- **The Modeling Enterprise and Security Studies**  
- **How Not To Criticize Rational Choice Theory: The Pathologies of Commonsense**  
- **What Rationality Assumption? Or, How "Positive Political Theory" Rests on a Mistake**  
- **Useful Fiction or Miracle Maker: The Competing Epistemological Foundations of Rational Choice Theory**  
- **Rational Choice Theory and Explanation**  
- **Modernizing Political Science: A Model-Based Approach**  
- **Comments on the Interpretation of Game Theory**  
- **Rational Choice and Interpretive Evidence: Caught between a Rock and a Hard Place?**  

Recommended and Background Readings
On the Value of Game Theory in Social Science

An Introduction to Applicable Game Theory

International Relations: A Strategic Choice Approach

Rationality and the Foundations of Positive Political Theory

Rationalizing Politics: The Emerging Synthesis of International, American, and Comparative Politics

The Role of Formal Models

Bargaining and the Inefficient Use of Power

Bargaining in the Shadow of Power
If you do not have the book, you can read the following two articles instead:


Does Private Information Lead to Delay or War in Crisis Bargaining?
(This version includes the technical supplement.)

The Principle of Convergence in Wartime Negotiations
Corrected proof.

Fighting Rather Than Bargaining

Uncertainty and Incentives in Crisis Bargaining: Game-Free Analysis of International Conflict

The Inefficient Use of Power: Costly Conflict with Complete Information

War as a Commitment Problem
Bargaining over Objects that Influence Future Bargaining Power
James D. Fearon. Working paper, Stanford University, 1996. Figures 1 and 2 missing from this paper.

The Armed Peace: A Punctuated Equilibrium Theory of War

The Power to Hurt: Costly Conflict with Completely Informed States

Recommended and Background Readings

War is in the Error Term

Rationalist Explanations for War

Bargaining Theory and International Conflict

Bargaining and Learning While Fighting

Conflict without Misperceptions or Incomplete Information: How the Future Matters

Bargaining and War

How War Ends: A Rational Model Approach

Crisis Bargaining and Escalation

Equilibrium Behavior in Crisis Bargaining Games

Capabilities, Perception, and Escalation

Domestic Political Audiences and the Escalation of International Disputes

Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs

**Capabilities, Uncertainty, and Resolve: A Limited Information Model of Crisis Bargaining**

**Military Coercion in Interstate Crises**

**Military Threats: The Costs of Coercion and the Price of Peace**

**Feigning Weakness**

**Game Theory and the Spiral Model**

**Mutual Optimism and War**


**Strategic Uncertainty as a Cause of War**

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**Recommended and Background Readings**

**A Theory of Escalation and International Conflict**

**Rational Appeasement**

**A Theory of Brinkmanship, Conflicts, and Commitments**

**Conventional and Nuclear Deterrence**

**Selection Effects and Deterrence**

**Credibility, Uncertainty, and Deterrence**

**Rational Deterrence in an Imperfect World**

**Crisis Bargaining, Escalation, and MAD**

**Nuclear Deterrence and the Strategy of Limited Retaliation**

**Nuclear Brinkmanship with Two-Sided Incomplete Information**
Nuclear Deterrence Theory, Nuclear Proliferation, and National Missile Defense

Asymmetric Deterrence

Recommended and Background Readings

Rational Deterrence Theory and Comparative Case Studies

Nuclear Weapons, Deterrence and Crisis Escalation

Deterrence and Foreign Policy

Deterrence and International Conflict

Rational Deterrence: Theory and Evidence

Rational Deterrence and Crisis Stability

Modeling Deterrence and International Crises

Minimal Nuclear Deterrence

Deterrence and Bargaining

The Nuclear Revolution and the Problem of Credibility

Arms Races and Power Transition

Conflict, War, and Redistribution

Can Arms Races Lead to the Outbreak of War?

Arms Races and Arms Control: Modeling the Hawk Perspective

A Twist of Truth: A Reexamination of the Effects of Arms Races on the Occurrence of War

Uncertainty, Shifting Power, and Appeasement

**Arms Races and Negotiations**

**Free Trade and Arms Races**

**Recommended and Background Readings**

**Messenger or Message?: Military Buildups and the Initiation of Conflict**

**Reconfiguring the Arms Race-War Debate**

An Introduction to Lewis Fry Richardson and His Mathematical Theory of War and Peace

**Arming as a Strategic Investment in a Cooperative Equilibrium**

**Cooperation, Conflict, and Power in the Absence of Property Rights**

**Alliances, Balance of Power, and Intervention**

**Stable Alliance Formation in Distributitional Conflict**

**Alliances and Asymmetry: An Alternative to the Capability Aggregation Model of Alliances**

**Alliances, Credibility, and Peacetime Costs**

**Alignment Decisions in the Shadow of Power**

**Alliance Formation and War**

**To Intervene or Not to Intervene: A Biased Decision**

**Alliance Formation and General Deterrence**

**Recommended and Background Readings**

**The Dynamics of Alliances in Anarchy**
Instability, Intervention, and Inter-Power Politics

An Economic Theory of Alliances

Alliances: Why Write Them Down?

The Theory of Games and the Balance of Power

Diplomacy, Reputation, and Mediation

Which Side Are You On? Bias, Credibility and Mediation

Honest Threats: The Interaction of Reputation and Political Institutions in International Crises

Politics at the Water's Edge: Crisis Bargaining and Electoral Competition

The Might of the Pen: A Reputational Theory of Communication in International Disputes

Recommended and Background Readings

Cheap Talk Can Matter in Bargaining

Cheap Talk

Cheap Talk with Two Audiences

Predation, Reputation, and Entry Deterrence

Reputation and Imperfect Information

Is Talk Really Cheap? Prompting Conversation Between Critical Theory and Rational Choice

Domestic Politics: Constraints, Signaling, Guns versus Butter

An Institutional Explanation of the Democratic Peace
Conflict, Agency, and Gambling for Resurrection: The Principal-Agent Problem Goes to War  

When and How Do Domestic Constraints Matter? Two-Level Games with Uncertainty  

Domestic Political Structure and War Behavior: A Game-Theoretic Approach  

Domestic Politics and International Trade Negotiations  

Domestic Institutions and International Bargaining: The Role of the Agent Veto in Two-Level Games  

Arms Versus Allies: Trade-Offs in the Search for Security  

Guns, Butter, and Anarchy  

Domestic Opposition and Signaling in International Crises  

International Crises and Domestic Politics  

Risky but Rational: War as an Institutionally Induced Gamble  

Efficient Secrecy: Public versus Private Threats in Crisis Diplomacy  

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<th>Recommended and Background Readings</th>
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| Domestic Politics, Foreign Policy, and Theories of International Relations  
| Pre-negotiation Public Commitment in Domestic and International Bargaining  
This version includes the technical supplement.  
Do Domestic Institutions Constrain or Inform?: Contrasting Two Institutional Perspectives on Democracy and War  
Looking for Audience Costs  
Politicians, the Media, and Domestic Audience Costs  

The Logic of Two-Level Games with Endogenous Domestic Coalitions  

International Bargaining with Two-Sided Domestic Constraints  

Domestic Politics and International Conflict  

**Civil Wars, Ethnic Conflict, and Terrorism**

Conciliation, Commitment, and Counterterrorism  

Why Do Some Civil Wars Last so Much Longer than Others?  

Vicious Cycles: Endogenous Political Extremism and Political Violence  

Sabotaging the Peace: The Politics of Extremist Violence  

Defending against Terrorist Attacks with Limited Resources  

Allocating Defensive Resources with Private Information about Vulnerability  

Sequential, Nonzero-Sum "Blotto": Allocating Defensive Resources Prior to Attack  

General Blotto: Games of Allocative Strategic Mismatch  

Economic Shocks and Civil War  

**Recommended and Background Readings**

Global Threats and the Domestic Struggle for Power  

How Civil Wars End: A Rational Choice Approach  

Sanctions, Enforcement, and Cooperation  
Ending Economic Sanctions: Audience Costs and Rent–Seeking as Commitment Strategies

**Bargaining, Enforcement and International Cooperation**

**The Theory of International Economic Sanctions: A Public Choice Approach**

**Trust, Reassurance, and Cooperation**

**Trust and Cooperation through Agent Specific Punishments**

**Modeling the Forms of International Cooperation: Distribution vs. Information**

**Are Sanctions Effective? A Game-Theoretic Analysis**

**Engineering Cooperation: A Game Theoretic Analysis of Phased International Agreements**

**Arms Control and Other Games Involving Imperfect Detection**

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**Recommended and Background Readings**

**Loosening the Ties that Bind: A Learning Model of Agreement Flexibility**

**Coordination, Commitment, and Enforcement: The Case of the Merchant Guild**

**Sanctions**

**Sanctions: Some Simple Analytics**

**Cooperation Under the Security Dilemma**

**Credibility, Costs, and Institutions: Cooperation on Economic Sanctions**

**Fools Suffer Gladly: The Use of Economic Sanctions in International Crises**

**Absolute and Relative Gains in International Relations Theory**
Relative Gains and the Pattern of International Cooperation

**International Institutions**

Reputation and Hegemonic Stability: A Game-Theoretic Analysis

Domestic Policies, National Sovereignty and International Economic Institutions

Managing the Evolution of Multilateralism

Is There a Broader-Deeper Trade-off in International Multilateral Agreements?

The Role of Multilateral Institutions in International Trade Cooperation

An Economic Theory of GATT

Recommended and Background Readings

The Rational Design of International Institutions

Bargaining and International Policy Cooperation


The Role of Institutions in the Revival of Trade

**Trade and Trade Agreements**

A Coalition Formation Approach to Equilibrium Federations and Trading Blocs

Retaliation, Bargaining, and the Pursuit of ‘Free and Fare’ Trade

Trade Wars and Trade Talks

The Value of Trade Agreements in the Presence of Political Pressures

**Endogenous Tariff Formation**


**Recommended and Background Readings**

**Free to Trade: Democracies, Autocracies, and International Trade**


**Political Regimes and International Trade: The Democratic Difference Revisited**


**Replication, Realism, and Robustness: Analyzing Political Regimes and International Trade**


**Why Democracies Cooperate More: Electoral Control and International Trade Agreements**


**Exchange Rates, Debt Crises, and Size of Nations**

**On the Number and Size of Nations**


**The Breakup of Nations: A Political Economy Analysis**


**A Constant Recontracting Model of Sovereign Debt**


The Political Choice of the Exchange Rate Regime


**Recommended and Background Readings**

**Economic Integration and Political Disintegration**


**The Wealth and Size of Nations**