PS 0700
Rational Choice and Formal Models in Political Science II

Political Science Research Methods

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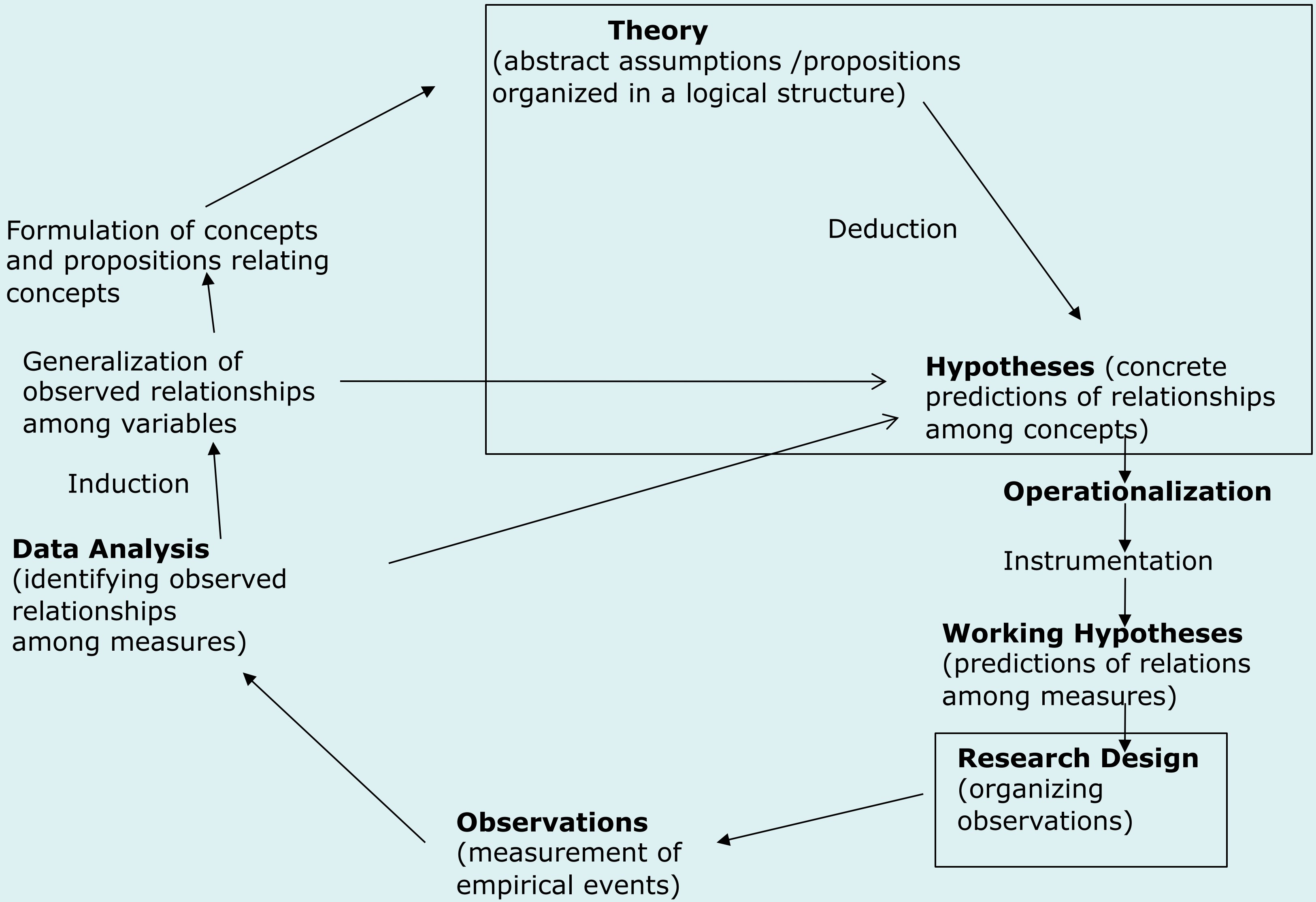
Fall Semester 2022

Week 7a

Goals for the Sessions

- Discuss the uses of "formal models" in political science research
- Discuss the relationship of formal models to "rational choice theory"
- Discuss and give examples of different aspects of rational choice and formal modeling in political science:
  - Decision theory
  - Social choice
  - Spatial models
  - Game theory and strategic interaction (time permitting)

A Model of the Research Process



Application of Formal Modeling: The Spatial Theory of Voting

- Given the distribution of public opinion on some dimension, where should rational parties and candidates place themselves in order to win a majority of the votes?
- Given the distribution of preferences among certain alternatives along a particular dimension within a congressional committee, which alternative is likely to prevail under majority rule or other voting systems?
- Let's keep things simple by considering only one dimension where preferences are arranged – call it "liberal-conservative", or "less money-more money" for a particular budget item
- **As we will see, in any one-dimensional "policy space", there is a clear *winner* in terms of which preference gets adopted, or where a rational party should locate itself**
- This result has *far-reaching implications* for elections, and for democracy more generally!

Example:
Where should Tom, John and Harry eat lunch?

- Assume a single dimension on which we order their preferences: money!
  - Tom: wants to spend $5.00 on a meal
  - John: wants to spend $10.00
  - Harry: wants to spend $20.00
- John is called the ***"median voter"*** because exactly the same number of people want to spend more money than him as want to spend less money than him. He is in the exact ***middle*** of the preference distribution in terms of the number of people above him and below him
- John is an *extremely* powerful person and his preferences will prevail in a number of very interesting ways!

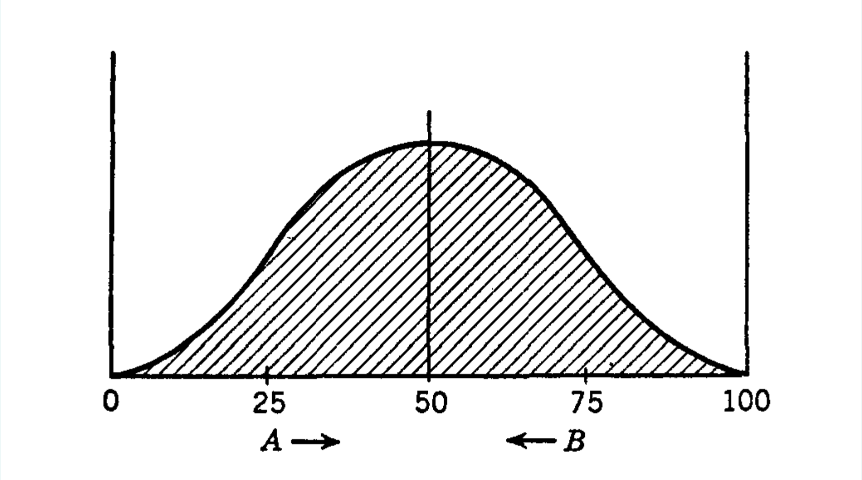
$5.00	$10.00	$20.00
Tom	John	Harry

- Imagine some hypothetical choices between restaurants of different prices:
  - $10 versus $20: $10 wins (Tom and John)
  - $5 versus $20: $5 wins (Tom and John)
  - $5 versus $16: $5 wins (Tom and John)
  - $5 versus $10: $10 wins (John and Harry)
  - $7 versus $12: $12 wins (John and Harry)
- Some implications (which can be proven mathematically):
  - The median voter (John) always votes for the winning choice
  - The median voter’s preference will defeat any other alternative (a $10 restaurant beats any other priced restaurant)
  - Once a group arrives at the median voter’s preference, it cannot be moved from it because no alternative is better
  - Strongest form: The median voter *always* gets his most preferred outcome!!!

Voters and Party Competition

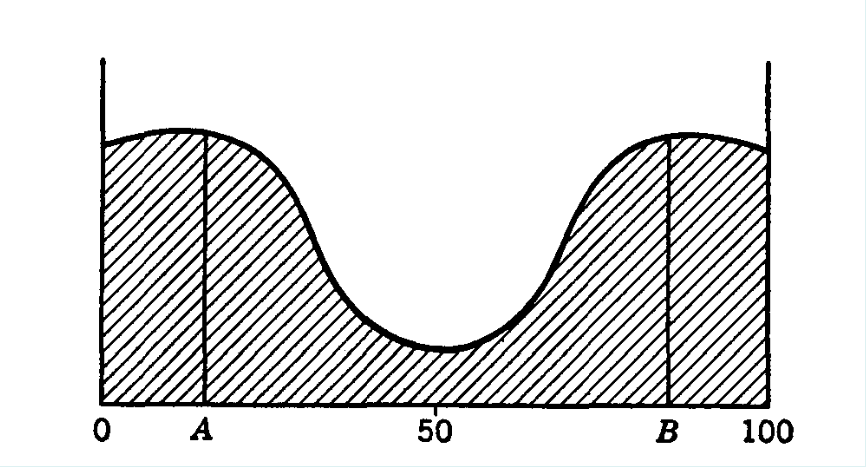
- We can apply these ideas to how parties/candidates should behave, that is, where they should stake their policy positions or ideologies in a one-dimensional policy space, given the position of the median voter and the overall distribution of voter preferences in that same space!
- Assume that we can array all the voters in the US electorate along the liberal-conservative dimension, with "ideal points" ranging from 0 (the most liberal) to 100 (the most conservative)
- Assume that parties stake out positions on the same dimension
- Assume that voters vote for the party/candidate whose position on the dimension is closest to their own
- Where should the rational party/candidate stake out its position?

Example 1: "Normal Distribution" of Voter Preferences



- Median voter is at 50 on this distribution. Leftist Party A is at 25, Rightist Party B is at 75. What should a rational Leftist Party A do to get more votes? What should a rational Rightist Party B do to get more votes?
- YES --- MOVE TO 50, where the Median Voter is!

Example 2: Bimodal Distribution of Voter Preferences



- Here the median voter is still at 50, but the preference distribution is much different. Party A is at the mid-point of its extreme leftist distribution, Party B is at the mid-point of its extreme rightist distribution
- What should the rational party do?
- SAME RESULT: GO TO THE MEDIAN VOTER!!!!! For example, if A moves right, it will keep all the votes on "its" side and gain voters just to the right of 50 who will be closer to party A now than party B
- CONCLUSION: In a two-party system with majority rule, there is *extreme* electoral pressure for parties to converge to the median voter!!

Should Parties *Always* Converge to the Median?

- Further research explores institutional, electoral, opinion determinants of *non-convergence*
  - In multi-party systems, it may not be rational to converge because the party might lose some of its votes to parties that "out-flank" them ideologically
  - In elections with abstentions, parties may not converge because voters will not see clear choices and hence abstain from voting altogether – so there is some incentive to have a "clear" position
  - **In elections with primaries, candidates may need to stake out more extreme positions to appeal to the median *primary* voter, and may find it difficult to move much in the general election without appearing to be inconsistent**
  - Candidates may need to stake out more extreme positions to appeal to activists or donors in their parties to keep their campaigns alive

Implications and Extensions

- The **median voter theorem** is one of the most powerful ideas in all of political science. Outcomes *should* normally match what the median voter prefers, given majority rule and a one-dimensional policy space
- Lots of outcomes in legislative settings can also be explained with this idea: look at debates in the US Senate, e.g., in 2009 and 2017 over Obamacare. Who were the median Senators? Republican moderates like Susan Collins and Olympia Snowe, and Democratic conservatives like Ben Nelson. They were promised the moon to entice them to vote. See http://www.politico.com/story/2013/01/nelson-from-60th-vote-to-acas-implementation-86646.html for a discussion of the "Cornhusker kickback"
- But outcomes don't always converge to the median, and much formal modeling is devoted to explaining those situations. For example, in two-dimensional policy space (e.g. Domestic *and* Military spending, Economics *and* Moral Values among voters), there is *NO* stable winner --- different outcomes can occur given agenda control, particular amendments that are proposed, institutional features of the system, etc.!!

Game Theory and Political Science

- Last aspect of Rational Choice/Formal Modeling we will discuss that has had *major* impact on political science: *game theory*
- Game theory is a way of analyzing *strategic interactions* between actors such as individuals, states, corporations, parties, insurgent groups, etc.
- Strategic interactions means: the outcomes associated with one actor's moves depend on the moves of other actors, so "games" involve each actor assessing what the other is likely to do and what one should do to pursue one's interests, given what the other actor is likely to do

Examples of Games in Politics

- During the Cold War, U.S. and Soviet Union engaged in a "game" of nuclear armament and disarmament
- Whenever the Congress and President are from different parties, a "game" of "cooperation-confrontation" is played (e.g. House Democrats and President Trump in 2018-2019; Republicans and President Obama pre-2016)
  - "Fund the wall" versus "Shut down the Government" in 2018-2019
- These last few weeks, a "game" of "accept Russian annexation of parts of Ukraine" versus "risk nuclear war if Russia is driven out of illegally annexed territories" – this game is complicated because it has multiple players (Russia, US and NATO, Ukraine)

- Games differ in many ways, including:
  - Whether they have "sequential" or "simultaneous" moves – that is, does one player go first, followed by the other, or do both players move at the same time?
  - Whether they are single-shot (one time) games or games that will be repeated more times in the future
  - Whether they are "zero-sum" or "non-zero-sum" games – that is, does a positive payoff for one player mean that the other *must* have a negative payoff, or can both players "win" (or lose)?
  - Whether players have full or limited or imperfect information
  - Whether there are mechanisms for enforcing agreements and punishing "cheaters"

The Classic Game of (non)-Cooperation: The Prisoner's Dilemma

- Two people are in custody on suspicion of having committed a serious crime. They are placed in different interrogation rooms at the police station. The police don't have enough evidence to convict. If they both remain silent, they will likely only be convicted of a minor offense and serve a ***short sentence*** in jail.
- The police offer each of them a deal: confess to the serious crime and implicate your partner. If he doesn't confess and you do, he will receive a ***severe sentence*** while ***you will go free***. However, if you both confess, you will both get a ***moderate sentence***.
- This sets up the classic problem: If they both *cooperate* and remain silent, they will collectively be better off than if they both defect and confess. But each one reasons that they are better off defecting, no matter what the other one does! This makes cooperation extremely difficult to achieve.

Here is the Payoff Matrix for the two Players: (Tom's payoff in dark, John's in red)

		John	
		Stay Silent (Cooperate)	Confess (Defect)
Tom	Stay Silent (Cooperate)	0 , 0	-100 , 100
	Confess (Defect)	100 , -100	-50 , -50

- Essential feature of the Prisoner's Dilemma game: Each player is better off confessing *no matter what the other one does*
  - If John stays silent, Tom gets a better deal by confessing (100 versus 0); if John confesses, Tom better confess too (-50 versus -100), and the same thing hold's for John's strategy
- In game theory terminology, "confess" is a ***dominant strategy*** for both players. When there is a dominant strategy, expect the rational individual to take it.
- In game theory terminology, the joint outcome of the players -- (Confess, Confess) -- is an ***equilibrium outcome.*** There is no incentive for anyone to move from it, once it is reached.
- Much game theory work is devoted to working out whether there are dominant strategies and equilibria, and what they are, given a particular configuration of payoffs and other features of the game

Application: US-USSR Nuclear Arms Race

		USSR	
		Disarm (Cooperate)	Maintain Nuclear Arms (Defect)
US	Disarm (Cooperate)	0 , 0	-100 , 100
	Maintain Nuclear Arms (Defect)	100 , -100	-50 , -50

Both countries might be better off collectively by disarming, but each country reasons that, whatever the other does, it is better off maintaining nuclear arms. Therefore an arms race is the equilibrium outcome!

How can Cooperation Be Achieved?

- Change the game from a single shot to a repeated interaction game: in that case some strategies (e.g. "tit for tat") can yield a cooperative equilibrium because both sides can see the future benefits adding up over time
- Establish a *social norm* of cooperation. Some social scientists think that collective action/cooperation problems are responsible for the *origins* of many social norms in the first place ("Live together or die alone" was a norm on *Lost* (Finkel's favorite TV show), for example)
- Establish a third party that will enforce cooperation by *punishing* defection. Example: The mythical "mafia" that demands silence ("*omerta*") in dealing with those outside the "family". If silence is broken, there are nasty consequences for the defector.

The "Chicken Game"
(Tom's payoff on left, John's on right in each cell)

	Swerve	Straight
Swerve	0, 0	-1, +1
Straight	+1, -1	-10, -10

Fig. 2: Chicken with numerical payoffs

Each players' best outcome is when they stay straight (+1) and the other swerves (-1). But if both follow this strategy this leads to the worst outcomes for each (-10). And if each thinks the other will swerve then he will stay straight, again leading to the worst outcome if both follow this reasoning.

Solution?