PS0700
Rational Choice and Formal Models in Political Science I

Political Science Research Methods

Professor Steven Finkel

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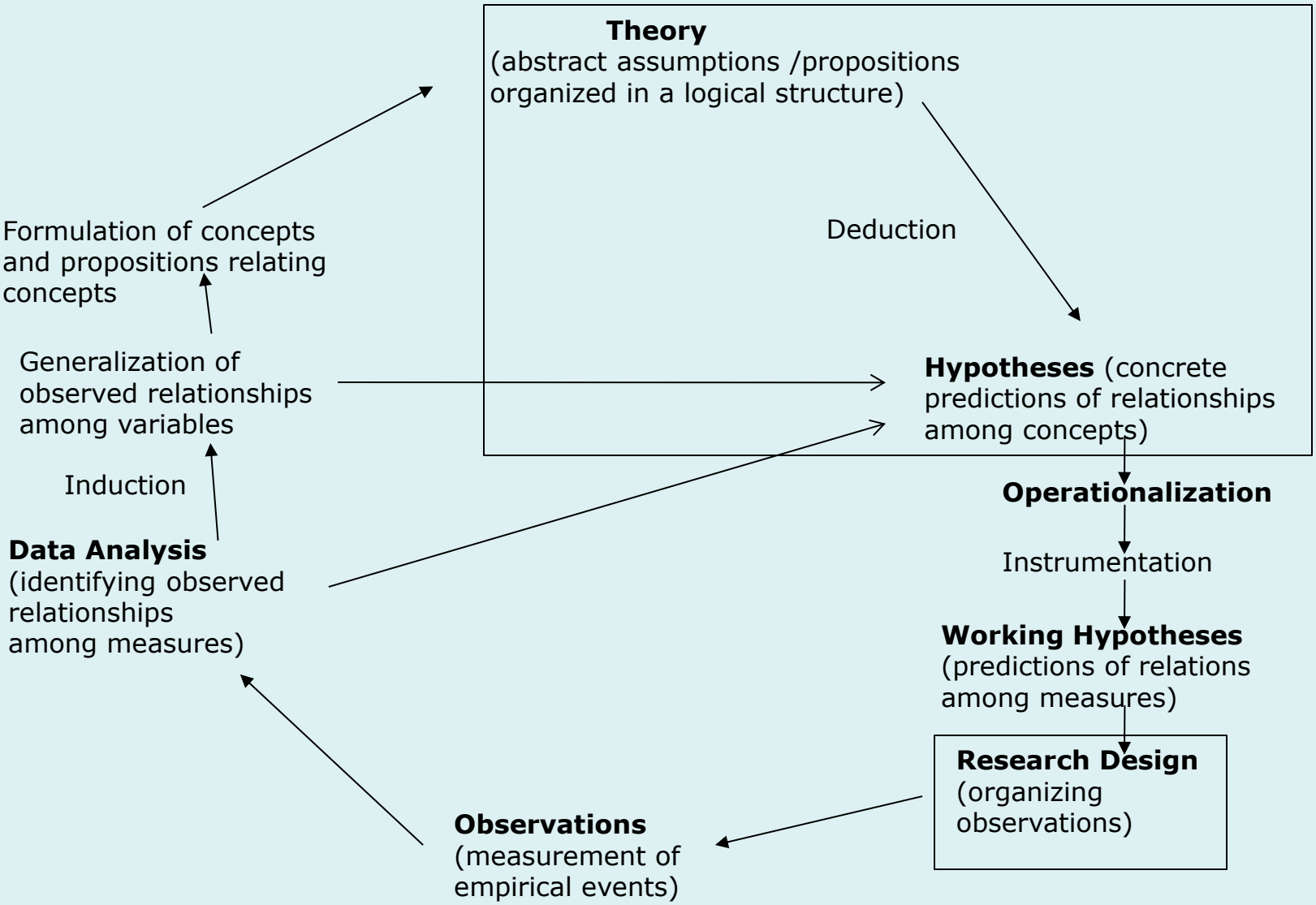
Week 6b

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



What is a "Formal Model"?

- "A formal model is a simplified and abstract representation of reality that can be expressed verbally, mathematically, or in some other symbolic system, and that purports to show how variables or parts of a system tie together" [Johnson and Reynolds, *Political Science Research Methods*]

- Models are structures in which outcomes/results are deduced logically from core assumptions and initial conditions. Given the initial conditions specified and the core assumptions, certain outcomes *must* follow, whether or not they actually follow in that way in the "real world"

Formal Modeling in Political Science

- Within political science, formal modeling is closely linked to "rational choice theory", which attempts to build explanations of political phenomena based on a few assumptions about "rational" behavior
- From these assumptions and a given set of initial conditions (e.g., committee or legislative structures, preference distributions, rules of voting), the formal theorist *deduces* outcomes that are the logical result of the model's structure and assumptions
- Whether or not the model is *empirically accurate* is a subsidiary question to the formal theorist, and one criticism of the approach is that too little attention has been paid to whether the outcomes are "true" in the real world.
- But this is changing as a result of "EITM" initiative: "**E**mpirical **I**mplications of **T**heoretical **M**odels" (http://eitminstitute.org)

- Nevertheless, the *theoretical rigor* of the formal modeling tradition is its greatest strength, and the one that its proponents say takes this kind of research beyond the "mindless empiricism" and statistical number-crunching of much contemporary political science, and indeed makes political science more of a real "science"
- Mr. Perestroika, however, does not like this very much!
- There are far-reaching (and growing) applications of formal modeling and rational choice theorizing in different areas of political science:
  - how individuals (masses, legislators, Presidents, judges) behave, given their preferences in politics and the constraints they face;
  - how collective choices (in elections or legislatures e.g.) result from the aggregation of individual preferences or individual choices;
  - How elites (candidates, committees, e.g.) behave and outcomes emerge, given the preferences of their constituents or members;
  - how individuals, organizations or countries behave in strategic interaction with other individuals, organizations, or countries

The Core Assumption: 'Rational' Individuals

- Individuals are "rational utility maximizers": they attempt to maximize their "self-interest"
  - They consider the benefits of particular actions as well as the costs
  - They choose the action with the greatest net "utility"; that is, the action which has the highest benefits, relative to its costs
  - IMPORTANT: "self-interest" in the universe of rational choice theory is not necessarily *"selfish"* egoistic or monetary interests; my "self-interest" could involve a desire for a clean environment, a desire for underprivileged youth to go to college; a preference for a military dictatorship in the U.S., as well as a desire to be a multi-millionaire

- Rational Choice Theory (RCT) says simply: maximize your self-interest, whatever it is, by choosing actions that have the greatest benefits. Choose those actions that further your preferences the most, subject to the costs or the constraints associated with that behavior

- However, individuals may not have complete information about all the benefits and costs associated with given actions
  - They don't know for sure that a given action will yield a particular benefit – they have to estimate the "probability" that it will
    - Should I go to law school or graduate school in political science? Benefits to law school: high salary, high prestige *if* I get into a good school and finish. Benefits to graduate school in political science? Rewarding career of research, long summer vacations *if* I get into a decent school and finish the PhD.
  - To arrive at "subjective utility" of an action, we discount the value of the benefits associated with the action by our estimate of the probability that the action will produce the benefits

Applications of RCT and Formal Modeling: The Decision to Vote

- The Model:
  - (Subjective) Expected Utility of Any Action = Potential Benefits from the Action * Probability that the Action will Bring About the Benefits, Minus the Costs of the Action

    $E(U) = pB - C$

  - Individuals choose the Action that Brings the Highest Subjective Expected Utility

- Downs' *Economic Theory of Democracy* (1957)
  Two Choices: Abstain or Vote

- $E(U, \text{Abstain}) = p_n * B$
  - where B are all the benefits you would receive from having your preferred candidate win the election, and p_n is the probability that your candidate will win if you do *not* vote
- $E(U, \text{Vote}) = (p_i + p_n) * B - C$
  - where p_i is the marginal difference in the probability that your preferred candidate will win the election if you *do* vote, C are all the costs (information, time, lost income) from voting, and the other terms are as before.

- So individuals vote if E(U,Vote)>E(U,Abstain), or
  $E(U, \text{Vote}) - E(U, \text{Abstain}) > 0$

  $(p_i + p_n) * B - C - p_n * B > 0,$
  or
  $p_i * B - C > 0$

Implications of the Model

- Individuals vote only if $\mathbf{p_i}$ is large enough in combination with Expected Benefits to outweigh the costs. And since in large electorates $\mathbf{p_i}$ is infinitesimal ("vanishingly small", according to the theory), and C is always non-negative and sometimes relatively high (e.g. when registration costs are high), the rational choice is to abstain

- This follows since C will always be > 0, hence

  $\mathbf{p_i * B - C > 0}$ will *never* be true, hence the rational individual will never choose "Vote"

- Therefore, it is not rational to vote!! The individual should "free ride," and get the benefits of his/her candidate being elected without incurring the costs of voting

  Right?

Proposed Solutions to the "Paradox of Voting"

- "Selective Incentives"
  - Riker and Ordeshook (1968): Add a term that captures the "sense of civic duty," or the good feelings that one gets by voting and fulfilling one's citizenship obligations
  - Add a term that captures social pressures, groups, social networks, social benefits from living up to others' expectations, from family and friends
  - These incentives are "payable" only if you participate, you cannot "free ride" and get them!
- Public Goods or Efficacy Incentives:
  - Relax the assumption that $\mathbf{p_i}$ is necessarily zero. People may *think* they are influential (efficacious) and they act on that belief.
  - If this is true, then $\mathbf{p_i}$*** B** can sometimes outweigh C and lead to "rational" participation

What do we learn from this Formal Model?

- It may be "substantively" irrational to vote without adding additional "benefit" terms to the model
- In less extreme terms, there is a pressure for rational individuals to abstain in any collection action situation where lots of other people may provide benefits to the individual, regardless of his/her contribution. This pressure needs to be overcome by other benefits
- Other predictions: people will contribute to collective actions like voting when it appears that their contribution can be decisive (high p), or when the costs are lower, or when selective incentives are higher. So we expect higher turnout, e.g., when elections are closer (high p), when registration costs are lower (low C), when parties provide more distinct programs (high B), when social pressure to vote is higher, etc.
- Similar models been developed to explain participation in protest, lobbying groups, community action, and the like – even donating to public radio!

Application: Social or Collective Choice

- Can we add up the individual preferences of members of some group and arrive at a "fair" or "rational" collective choice?
- Assumptions:
  - a legislature (or committee, or electorate) with 3 members
  - the *preference orderings* are **"transitive",** meaning that: if person X prefers alternative A over alternative B, and alterative B over alternative C, she also prefers alternative A over alternative C. This is a common assumption in formal modeling (and in real life!)
- Say the 3 members of the legislature (X, Y, Z) have preference orderings over alternatives A, B, and C as follows:

  Person X: ABC

  Person Y: BCA

  Person Z: CAB

- What preference does the *group* (legislature) prefer?

  - Person X: ABC
  - Person Y: BCA
  - Person Z: CAB
- Each alternative gets one first place vote, one second place, one third place, so it is unclear what the collective preference is
- More disturbing: the preferences in a two-alternative match-up would change, depending on which alternatives are pitted against which!
  - A versus B? A wins (X and Z against Y)
  - B versus C? B wins (X and Y against Z)
  - A versus C? C wins (Y and Z against X)
- Therefore, the *group's* preferences are "intransitive", even though the preferences of each member are "transitive"
- What happens? The group *cycles* through different outcomes and never arrives at a stable collective choice!!

Implications of the Model

- Strongest version:
  - Majority (or plurality) rule can yield irrational collective outcomes
  - **ARROW'S THEOREM**: There is *no* voting system that yields results that would satisfy a broad set of "fairness" criteria
  - "Rule by the people" is a problematic criteria for a voting system. If public opinion is characterized by such a set of preferences, how should a representative take it into account and vote to "represent" it?
- Somewhat weaker but still very interesting
  - *Agenda control* is crucial for understanding legislative (or any democratic outcomes). If, for example, X gets to decide the order in which alternatives are considered, she would structure it as:
    - First round: B versus C
    - Second round: First round winner versus A
    - Y and Z would make respective sequencing decisions that would result in their first preference being selecting too, if they had agenda control

- More generally, *institutions* exist to provide agenda control and structure collective choice – e.g., the US House Ways and Means Committee controls the form of bills that get sent to the full floor of the House
- Voting systems and primary elections are other kinds of "institution" because the outcomes will be different depending on whether it mandates simple majority rule or proportional representation or some other kind of aggregation system, and how the elections are sequenced

- This kind of analysis is an example of what is called the **"new institutionalism"** in political science. Proponents say it is a necessary extension and corrective to "behavioralism" in political science, which tends to look mainly at the preferences and attitudes of masses and elites to predict behavior and ignore the institutional context

- **OUTCOMES= PREFERENCES X INSTITUTIONS!**

X: ABC Y: BCA Z: CAB

- One additional complication in the pair-wise sequencing example earlier, where X (with agenda control) structures the vote as:
  - First round: B versus C, Second round: Winner versus A
- She did this to get "A" to prevail. But presumably Y knows this and doesn't want A at all – it is his third choice outcome. So what should Y do? He should vote *strategically* – that is, not in line with his *"sincere preference"* in round 1 in order to prevent his least preferred outcome from prevailing
- So Y votes strategically for C in round 1, which defeats B, and he votes sincerely in round 2, so that C beats A. Therefore Y at least got his second choice, while X (the agenda controller) got his least preferred outcome!
- Strategic voting is an ever-present issue in formal modeling; when should voters be *sincere* and when should they be *strategic*?