

Lecture #3
11 January 2011
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- I. Introduction
 - A. Lecture on causality, causal thinking, and theory testing.
 - B. MAJOR POINT OF TODAY'S LECTURE AND OF REST OF COURSE:
 - 1. We have confidence that "X" caused something in the world if we can find evidence and build a compelling argument that things in the world turned out differently with X in the world than they would have otherwise.
 - 2. E.g., we have confidence that a treaty caused environmental improvement if we find evidence and a compelling argument that the environment was better off than it would have been without the treaty.
 - 3. Difficult concept to grasp but taking time to really figure out what this means will help you understand the course and its major points much better.
 - C. How to get ideas for your research paper
 - 1. Find THEORETICAL and CAUSAL questions that are of interest to the field, not just to you. Remember, goal is to produce new knowledge rather than regurgitate existing knowledge
 - 2. Questions would be not only "did this treaty work?" but what aspect of the treaty explains why it worked. This is best addressed by such strategies as:
 - a) comparing one treaty with some feature and one without it,
 - b) examining a treaty that adopted a feature (sanctions, rewards) after the treaty had been around a while, or
 - c) comparing how two different types of countries responded to a treaty - this would go to whether developed countries are more (or less) responsive to the rules of a treaty, perhaps shedding light on issues of capacity as a prerequisite for compliance.
 - d) Many other options we can discuss
 - 3. Data will be available soon
 - 4. Will be doing Excel sessions to help with analysis
 - D. Readings for today
 - 1. Do NOT think about issues or environmental problems that interest you as the place to start – that is not likely to be a successful strategy. Re-read the Mitchell/Bernauer piece and think about it.
 - 2. Jacobson and Brown Weiss readings are perfect places from which to identify questions worthy of investigation and evaluation. NUMEROUS other readings are on reserve too. Make sure to take advantage of them.

Julia Butterfly Hill discussion

- II. Causality
 - A. Why causal questions matter.
 - 1. Here is an example from the NYTimes (8/31/2004) of "when good intentions (but no causal analysis) goes wrong":
 - a) "Monkey Preserve Backfires: How do you protect a critically endangered species? A common way is to create reserves that are off limits to development or hunting. But in northern Vietnam, efforts to protect a rare monkey species, Delacour's langur, from poachers by creating reserves have backfired. The problem, says the group Conservation International, is that the reserves are more densely forested than nonreserve areas. Poachers favor the reserves because they can go undetected. As a result, the group reported at a meeting of the International Primatological Society in Italy last week, the monkeys are nearing extinction. Their numbers have declined about 50 percent during the past decade, to 300. Efforts to save about 120 of these are being stepped up"
<http://query.nytimes.com/gst/fullpage.html?res=9804E5DC1731F932A0575BC0A9629C8B63>
 - 2. Food aid to Sudan causes continuation of the war
 - 3. Common theme: how to propose policies on some basis other than "lets hope that it works"
 - B. All theories are explanations of causal relationships.
 - 1. Ask WHY questions so can repeat success or avoid repeating failure.
 - 2. Have all sorts of theories floating around in our heads, even when we don't think we do.
 - 3. Basic goal: test theories against facts to increase accuracy of theories to better reflect real causal relationships in world.
 - 4. Theories that we will be interested in are causal theories of the form X causes Y.

- a) "X causes Y" implies that we should observe BOTH
 - (1) When X occurred, Y also occurred
 - AND
 - (2) If X had NOT occurred, Y would not have occurred (either through evidence or plausible counterfactual arguments)
 - b) To evaluate theories of this form need to meet four criteria
 - (1) Observe values of independent variable and dependent variable
 - (2) Observe covariation, i.e., variation in dependent variable associated with variation in independent variable
 - (3) Observe proper causal direction, i.e., independent variable occurs first ("free trade promotes peace" case)
 - (4) Exclude other variables as explanations (eliminate "rival hypotheses")
- C. Improvement of Human Health chart (from end of lecture)
- 1. There are a number of diseases that historically had been endemic to our populations that dropped off significantly beginning in the mid- to late- 1800's. What is striking about these declines in disease rates is that they occurred largely BEFORE vaccine programs, antibiotics and the big advances in modern medicine of the 20th century.
 - 2. Nothing, not even the miraculous scientific achievements of the 20th century combined, nothing has affected human health as profoundly as the ready availability of clean water.
 - 3. If drinking water is free of germs as well as chemicals, we can hydrate safely. If water is available for sanitation: sewer system, hygiene, it reduces the transmission of dz. If there is abundant access to water, we can irrigate crops and have good nutrition so our bodies can be strong and fight off dz more easily.
- D. To say X caused Y is, more accurately, to say:
- 1. The presence or occurrence of X caused the difference between outcome O+Y (an outcome in which Y was present or occurred) and some specified alternative outcome O (an outcome in which Y was not present or did not occur) if, under a set of conditions which were similar in all other respects, X had not been present or occurred, outcome O would have occurred but Y would not have been present or occurred.
 - 2. Can think of this in probabilistic terms: The presence or occurrence of X can be said to have increased the likelihood of a difference between outcome O+Y (an outcome in which Y was present or occurred) and some specified alternative outcome O (an outcome in which Y was not present or did not occur) if, under a set of conditions which were similar in all other respects, X had not been present or occurred, outcome O would have occurred but Y would have been less likely to have been present or occurred.
 - 3. Several key distinctions
 - a) Whenever we say X is a cause of Y, we are really only ever explaining *the causes of difference between outcomes in two specified sets of circumstances, not the whole outcome in a particular circumstance*: X is not a cause of the whole outcome but only the difference between the observed outcome and some specified alternative outcome. The alternative outcome is often implicit and underspecified.
 - b) Very few causes are sufficient causes: X is almost never the cause of Y under all conditions but only under a set of specific conditions (i.e., when a set of control variables take on a particular set of values). Thus, "reducing temperature to 0o C causes water to freeze" is true only under condition that water is pure and at sea level. Many conditions under which "0o C causes water to freeze" is not true (e.g., salt water, water under pressure).
 - c) Very few causes are necessary causes: To say X is a cause of Y does not imply that B cannot also be a cause of Y. That is, if B is also a potential cause of Y, then under identical conditions to those specified above, had B (which was not present in the original case) actually been present and X had not been present, outcome O+Y would have occurred.
- E. Three types of causal questions we tend to ask: Why does a given thing vary? What are effects of variation in one thing? What are effects of one thing on another?
- 1. What is a variable? What is a dependent variable? What is a value of a dependent variable?
 - a) Variable is some thing that we are interested in which can vary. That is, some thing which can have at least two values.

- b) Dependent variable = effect. Its what comes second or after. Sun comes up and then earth gets warm, not the other way around.
 - c) Independent variable = cause. It comes first and causes variation in dependent variable.
 - d) Sometimes not always clear which direction causality runs. Does economic growth encourage environmental degradation or does environmental degradation lead to economic growth or both?
2. Focus on specific DV: What causes something to vary? What are the causes of a given phenomena?
 - a) Some environmental problems are addressed, others are not. Why?
 - b) Some nations treat environment better than others. Why?
 - c) Seeking to explain causes of a dependent variable. I.e., interested in any independent variables responsible for value of specified dependent variable.
 3. Focus on specific IV: What are effects of variation in something?
 - a) What are effects of international regimes? On action, policy, knowledge, views.
 - b) What are effects of NGOs? On beliefs, policy, environmental protection, media?
 - c) Particular cause but not clear about what effects are or want to investigate all?
 4. Focus on specific IV and specific DV: What are the effects of variation in one thing on another?
 - a) Do international treaties effect state behavior?
 - b) Does a country's type of government effect its treatment of the environment?
 - c) Does free trade help or harm the environment?
 - d) Particular causes and their effects. Independent variables of interest and trying to identify how they effect certain dependent variables.
- F. Simple, one IV version of theory
1. Theoretical claim: Free trade ("more open economies") harms the environment.
 2. Counterfactual component of theoretical claim: Protectionism ("more closed economies") helps the environment. (the counterfactual is often only an *implicit* part of the theoretical claim)
 3. One observable implication of theoretical claim (there could be others): Since the implementation of NAFTA (or EU or Mercosur), the environment of the US, Canada, and Mexico have all been degraded more quickly than they would have been if NAFTA had not been implemented.
 - a) What are other observable implications of this theory?
 4. Counterfactual observable implication: Had NAFTA (or EU or Mercosur) not been implemented, the environment of the US, Canada, and Mexico would have been in better shape than it has been with NAFTA implemented.

	Cases providing evidence	Independent Variable	Dependent Variable
Theoretical claim		<u>Ind Var (X)</u> Low tariff levels	<u>Dep Var (Y)</u> Environment badly degraded
Counterfactual element of claim		<u>Ind Var (not X)</u> Higher tariff levels	<u>Dep Var (not Y)</u> Environment less degraded

5. CRUCIAL POINT: Note that the comparison is between the world after 1993 with NAFTA (signing of NAFTA) and the world after 1993 without NAFTA, as opposed to the world pre-1993 without NAFTA, although we may use the latter to estimate the former.

G. More complex, two IV version, in which both must have specific values

Reducing int'l	IV = Treaty	IV = Coordinated	Predicted DV= If Treaty Theory	Predicted DV= If NGO Theory	Observed DV= Based on evidence
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whaling		NGO efforts	correct	correct	from cases
??	Negotiated	Coordinated	Big behavior change	Big behavior change	??
??	Negotiated	NOT Coordinated	Big behavior change	No behavior change	??
??	NOT Negotiated	Coordinated	No behavior change	Big behavior change	??
??	NOT Negotiated	NOT Coordinated	No behavior change	No behavior change	??

III. Steps to a convincing causal argument (see Mitchell and Bernauer, *Jnl of Environment and Dev* 7:1 March 1998 for details)

- A. Identify important theoretical question
- B. Develop hypotheses and identifying variables
- C. Select cases to control variables (and thereby exclude rival hypotheses as explanations)
- D. Link data to propositions
- E. Examine correlations and causal pathways
- F. Generalize to other cases

IV. Completing causal theory

- A. All theory involves “radical simplifications” of the real world (69) as a way to sort through the complexities of the world to come up with a causal understanding of what we observe. Theory seeks to identify which factors are more important than others, to distinguish general from unique causes.
- B. Make sure you can distinguish: variables from values, IVs from DVs, good cases from bad cases
- C. General rules:
 1. DV and IV must covary, otherwise IV cannot have caused variation in DV in these cases. Though IV could still generally cause variation in DV.
 2. IV must change *before* DV changes.
 3. If DV varies while IV is constant, then IV can’t be a real cause (though may be permissive cause). Example: theory that corporate greed (IV) prevents international agreement (DV), but corporate greed is unlikely to vary, but agreements get signed. Lack of greed may make agreement easier but doesn’t explain why were able to get agreement in this case, since greed didn’t change.
 4. If DV is constant but IV varies, then IV is not a real cause. Example: theory that better knowledge about environmental harm (IV) reduces polluting behavior (DV), but if comparison of two cases shows new information but no difference in behavior, then information not a cause in this case.

V. Class summary

- A. What is causation?
- B. What are variables, IVs, DVs, CVs?
- C. How do you test theories?