Political Science 104

Lecture 4:
Determining Causality

Types of Causality

- **Deterministic Causality**: A change in the independent variable *always* causes a change in the dependent variable.
- **Probabilistic Causality**: A change in the independent variable *usually* causes a change in the dependent variable.
- In the social sciences we usually assume probabilistic causality.

How do we know A → B?

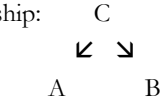
- Suppose we see a relationship between the independent and dependent variables in our hypothesis.
- Does this mean A → B, or is there an alternative explanation?
- Unless we can re-run history, we can always come up with an alternative explanation for what we observe.

The Fundamental Problem of Causal Inference

It is impossible to observe two different values of the independent variable simultaneously – thus, we can never know with certainty if the independent variable caused changes in the dependent variable.

Observed relationships between A and B

- Causality: A → B
- Reversed causality: A ← B
- Simultaneity (endogeneity): A ⇆ B
- Spurious relationship:



- *Selection effects* are a common cause of spurious relationships. Possible examples: "gateway drugs," school vouchers, IMF loans.

Four Strategies for Determining Causality

- **Correlation** between the independent and dependent variables.
- **Temporal ordering** – the independent variable changes before the dependent variable changes.
- **Controlling for alternative explanations** – showing other variables can't account for what we observe.
- **A plausible causal mechanism** – a logical story for why the independent variable causes the dependent variable to change.

Correlation

- If we believe that A→B, then we should see a relationship between A and B.
- Positive correlation: larger values of A are associated with larger values of B.
- Negative correlation: larger values of A are associated with smaller values of B.
- Correlation does not prove causality. "Correlation is not causation."

Temporal Ordering

- If we believe that A→B, then we should see a change in A first, and then a responding change in B.
- Again, this does not prove causality. Making this mistake is the *post hoc* fallacy.
- *Regression to the mean*. Statistically, extreme values on a variable tend to be followed by less extreme values.

Controlling for alternative explanations

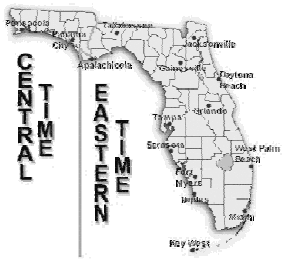
- We think higher income increases voter turnout, but could education be the real explanation?

	High education	Low education
High income	70% vote	50% vote
Low income	60% vote	30% vote

Plausible Causal Mechanism

- If we believe that A→B, then we should have a plausible explanation for why this is so.
- Could be guided by theory (deductive approach) or simply a logical explanation (inductive approach).
- Can sometimes rule out competing explanations by pointing out they are not plausible.

Example: The Florida Panhandle in 2000



- Claim that early call of Florida for Gore in 2000 cost the Republicans 10,000 votes in the Florida panhandle. But …
- Call was 10 minutes before polls closed.
- Only 300,000 total voters in the panhandle.
- How many Republican voters plausibly heard call and didn't vote?

Research Designs

- **Experiments**: The researcher randomly assigns observations to treatment and control groups.
- **Natural or quasi-experiments**: The researcher finds groups that are almost identical except on one independent variable.
- **Observational studies**: The researcher observes the independent and dependent variables, and attempts to control for alternative explanations.