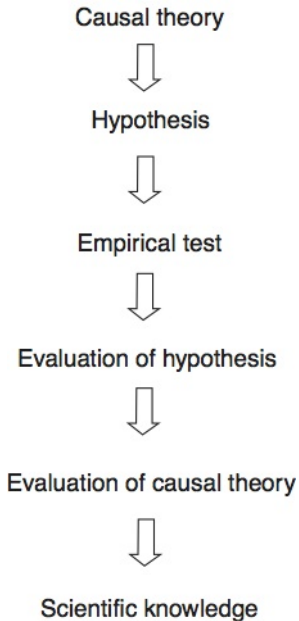


# Theory Building and Hypothesis Testing

POLI 205 Doing Research in Politics

Fall 2015

# The Road to Scientific Knowledge



# Rules of the Road

## Make your Theories Causal

- Think in terms of causality
- *X causes Y*
- Basis of causality
  - *Time Ordering*: The cause precedes the effect
  - *Co-Variation*: Changes in *X* are associated with changes in *Y*
  - *Non-Spuriousness*: There is not a variable *Z* that causes both *X* and *Y*

# Rules of the Road

## Don't let data alone drive your theories

- Correlation *does not equal* causation
- Theory is *prior to* analysis
- Examples
  - Ice cream sales and crime
  - Fire trucks and fire deaths
  - [tylervigen.com](http://tylervigen.com)

# Rules of the Road

Consider only empirical evidence and avoid normative statements

- Anecdotes *are not* evidence
- Formal theories need empirical testing
- Normative statements *are not* evidence

# Rules of the Road

## Pursue both generality and parsimony

- Generalizable (*External Validity*)
  - Knowledge can be applied to many cases or events (present and future) not explicitly covered by the study
  - Research applicable to many cases is often considered better than research applicable to one or a few cases

# Rules of the Road

## Pursue both generality and parsimony

- Parsimony
  - Parsimony literally means “to spare.” Generally, the simplest causal statement is considered “the best” all else equal
    - The key is “all else equal.” A complex theory that better explains/predicts phenomena than a simple theory is still usually “best.”

# Theories and Functions

- When we say  $X$  causes  $Y$  we mean  $Y$  is a *function* of  $X$
- Linear function

$$y = f(x) = 5 + x$$

- Examples
  - Opinion on climate change =  $f(\text{ideology})$
  - Employment =  $f(\text{education})$
  - Grade =  $f(\text{studying})$



# Building Good Theories

- A good theory is one that changes the way that we think about some aspect of the political world
- No easy or single answer on how to do this, but there are a set of strategies
  - Interesting research questions
  - Identifying interesting variation
  - Learning to use your knowledge
  - Examine previous research
  - Think formally

# Building Good Theories

## Interesting research questions

- Two criteria for identifying a worthy research question
  - It should be relevant for the “real world”
    - That is, important for social, political and economic life
  - The answer to the question should improve our understanding of the topic
    - Academic knowledge

# Building Good Theories

## Interesting research questions

Article	Research Question
1) Bachrach & Baratz 1962	How is political power created?
2) Hibbs 1977	How do the interests of their core supporters effect governments' economic policies?
3) Walker 1969	How do innovations in governance spread across US states?
4) Kramer 1971	How do economic conditions impact US national elections?
5) Miller & Stokes 1963	How do constituent attitudes influence the votes of US representatives?
6) March & Olsen 1984	How do institutions shape politics?
7) Lipset 1959	What are the necessary conditions for stable democratic politics?
8) Beck & Katz 1995	What models should researchers use when they have pooled time series data?
9) Cameron 1978	Why has the government share of economic activity increased in some nations?
10) Deutsch 1961	How does social mobilization shape politics in developing nations?

Figure: Table 2.1 from Kellstedt and Whitten pg. 26

# Building Good Theories

## Identifying interesting variation

- Because theories are designed to explain variation in the dependent variable, identifying some variation that is of interest to you is a good jumping-off point
- When we think about measuring our dependent variable, the first things that we need to identify are the time and spatial dimensions over which we would like to measure this variable
  - The time dimension identifies the point or points in time at which we would like to measure our variable
  - The spatial dimension identifies the physical units that we want to measure

## Time-Series

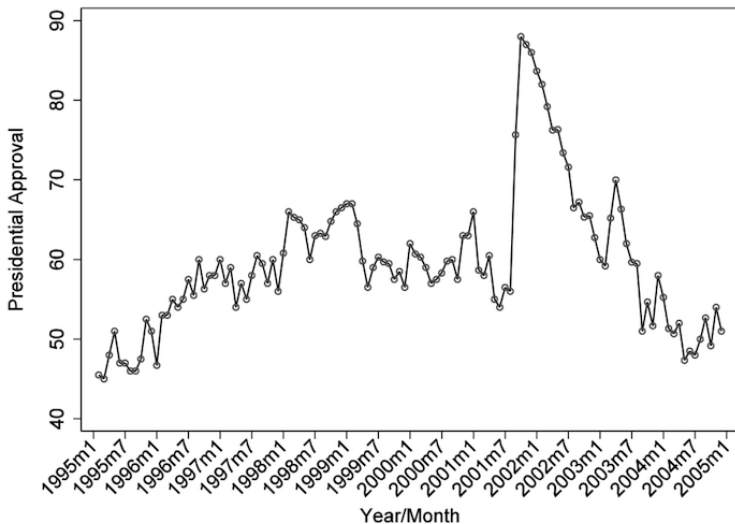


Figure: Time-Series: Presidential Approval, 1995-2005

## Cross-Sectional

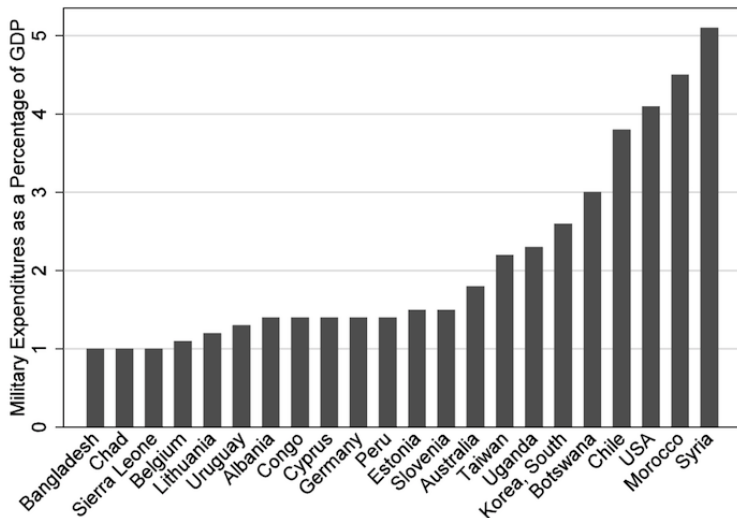


Figure: Cross-Sectional: Military Spending in 2005

# Building Good Theories

## Learning to use your knowledge

- It is helpful to know some specifics about politics, but it is also important to be able to distance yourself from the specifics of one case and to think more broadly about the underlying causal process.
  - Moving from a specific event to more general theories
  - Know local, think global: can you drop the proper nouns?

# Building Good Theories

## Examine Previous Research

- As you examine previous research, keep the following list of questions in mind:
  - What (if any) other causes of the dependent variable did the previous researchers miss?
  - Can their theory be applied elsewhere?
  - If we believe their findings, are there further implications?
  - How might this theory work at different levels of aggregation (micro vs. macro)?



# Building Good Theories

## Formal theory

- A *deductive* approach
- This approach to social science phenomena starts out with a fairly basic set of assumptions about human behavior and then uses game theory and other mathematical tools to build models of phenomena of interest
- We can summarize these assumptions about human behavior by saying that formal theorists assume that all individuals are rational utility maximizers – that they attempt to maximize their self-interest

## Formal Theory Example: Why do people vote?

$$R_i = (B_i P_i) - C_i$$

- $R$ : is the reward someone receives from voting
- $B$ : benefit received if preferred candidate wins
- $P$ : probability that voter will cast deciding vote
- $C$ : is the sum of the costs incurred from voting

## Formal Theory Example: Why do people vote?

$$R_i = (B_i P_i) - C_i + D_i$$

- $R$ : is the reward someone receives from voting
- $B$ : benefit received if preferred candidate wins
- $P$ : probability that voter will cast deciding vote
- $C$ : is the sum of the costs incurred from voting
- $D$ : is the satisfaction from participating in the democratic process

# Do I have a good theory?

- Does your theory offer an answer to an interesting research question?
- Is your theory causal?
- Can you test your theory on data that you have not yet observed?
- How general is your theory?
- How parsimonious is your theory?
- How new is your theory?
- How non-obvious is your theory?

# Theory and Hypotheses

- Causal Theory
  - **Theory:** A tentative conjecture about the *causes* of some phenomenon of interest
- Theories Generate Testable Hypotheses
  - **Hypothesis:** A theory-based statement about a relationship that we expect to *observe*
    - Null hypothesis: *No relationship between variables*
    - Working hypothesis
- Many hypotheses (if confirmed) make up a theory

# Formulating Hypotheses

- *Developing good hypotheses is a mix of intuition, imagination, inductive reasoning and careful consideration of existing research*
- Characteristics of a good hypotheses
  - Empirical statement
  - Generality
  - Plausibility
  - Specificity
  - Corresponds to the measurement of variables
  - Testability

# Formulating Hypotheses

## Empirical statement

- Educated guesses about relationships that exist in the real world
- Proposes an explanation for a phenomenon that can be observed empirically

# Formulating Hypotheses

## Generality

- Explains a *general* phenomenon rather than one particular occurrence
- *Joe is a liberal because his mother is one, too* vs. *People tend to adopt political viewpoints similar to those of their parents*



# Formulating Hypotheses

## Plausibility

- There should be some logical reason for thinking that it might be confirmed
- Literature reviews help to formulate plausible hypotheses

# Formulating Hypotheses

## Specificity

- Should be specific and state the *direction* of the relationship between the variables
- **Positive relationship:** increase in size together or decrease in size together; *move in the same direction*
- **Negative relationship:** one concept increases (or decreases) in size the other decreases (or increases); *move in the opposite direction*

# Formulating Hypotheses

## Corresponds to the measurement of variables

- Stated in a way that is consistent with the data
- If you posit a changing relationship over time, you should have time-series data.
- If you posit a relationship across different units, you should have cross-sectional data

# Formulating Hypotheses

## Testability

- It must be possible and feasible to obtain data that will indicate whether the hypothesis can be confirmed
  - Can the concepts be measured?
- The concepts should be distinct