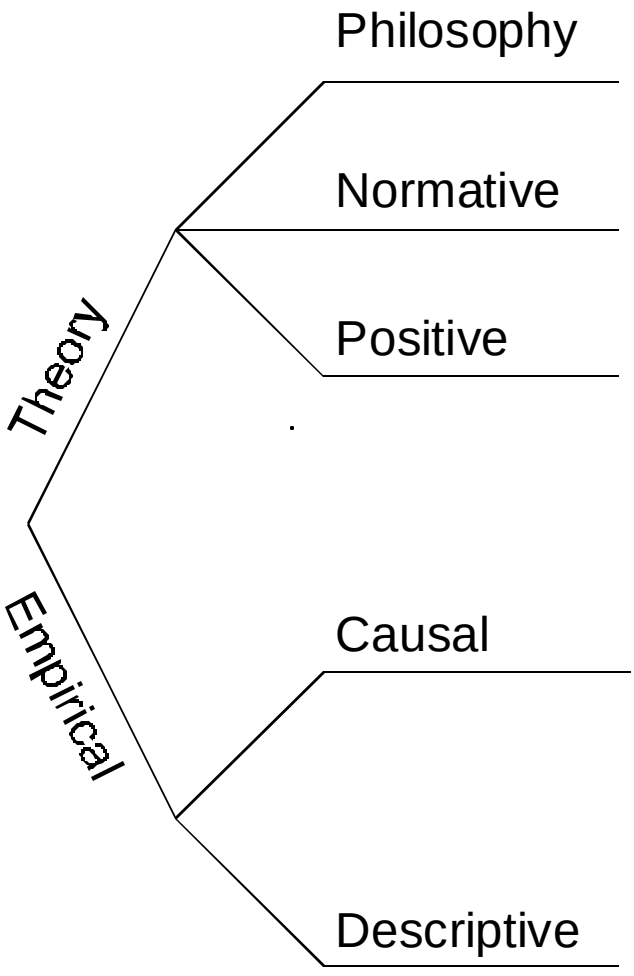
Research Design & Variable Measurement

- General comments
  - Different ways of doing p.s. research
  - Social science *vs.* Natural science/engineering
  - Basic laws for doing research
- How to
  - Components of research design
    - Side trip to measurement
  - Causality
    - Side trip to types of research designs
  - Seven things to avoid

The Road Map


Philosophy
Normative
Positive
Theory
Causal
Empirical
Descriptive

Different Ways of Doing Empirical Research

- Interpretive
  - *Verstehen*
- Small-*N* case study
  - Haphazard
  - Structured
- Large-*N* statistical analysis

- Interactions among these ways

Social *Vs.* Natural Science & Engineering

- Reductionism
- Degree of reductionism
- Implications
  - Measures of association weak
  - Aggregates often better predictors
- Why we have statistics
  - Probabilities
  - Expected values

Basic Laws of Doing Empirical Social Science Research I

- No clear path between interesting & researchable questions
- Path paved with observable implications
- Any research work doing contributes to a body of knowledge
- Most of the low-hanging fruit has been picked

Basic Laws of Doing Empirical Social Science Research II

- But there are other orchards
- Never under-estimate the ease of replication
- Build upon scalable ambitions

Major Components of Research Design

- Research question
- Theory
- Data

Research Question

- Importance
  - Not too general
  - Not too specific
  - Just right
- Contribute to literature
  - Social Sciences Citation Index (Web of Science)
    - wos.isiglobalnet2.com
    - Thomas, Norman. 1968. “Voting Machines and Voter Participation in Four Michigan Constitutional Revision Referenda.” Western Political Quarterly 21:409–19.

Theory

- Def: A general statement of a proposition that argues *why* events occur as they do and/or predicts future outcomes as a f(prior conditions).

- General/concrete trade-off
- Observable implications

- Falsification
  - Karl popper
- Parsimony
  - Occam's razor

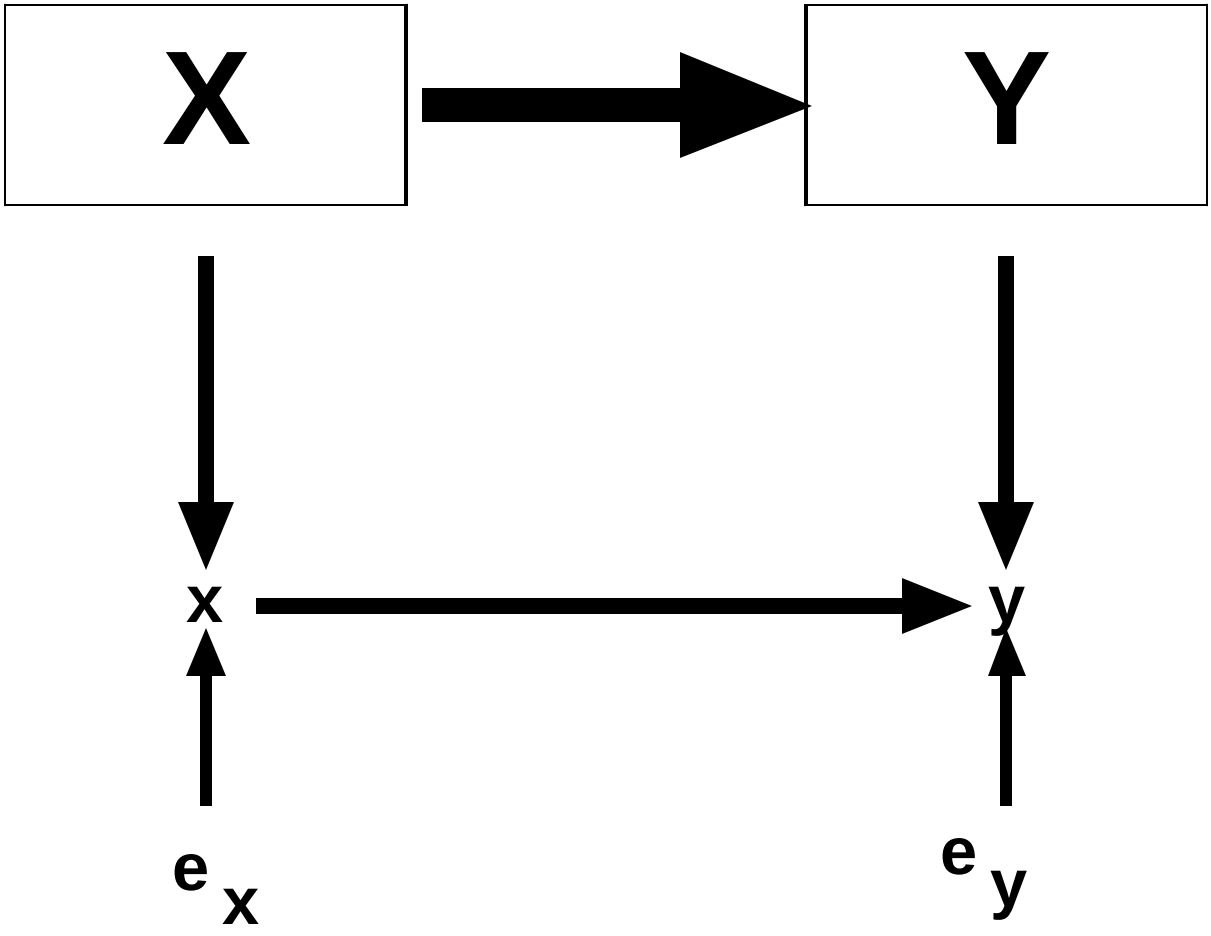
Data

- Terms
  - Cases
  - Observations
  - Variables
  - Units of analysis
- Mapping between the abstract and concrete
  - Measures
  - Indicators

Side Trip to Measurement

- From abstraction to measure
- Sources of error
- What to do about error

The Mapping



Mapping from Abstraction to Measure

- Very abstract
  - Alienation and suicide
  - Moral decay and crime
- Less abstract
  - Democracy and peace
  - Party identification and voting
  - Fear of defeat and fundraising
  - Polarization and responsiveness
  - Voting equipment and voter error

Sources of Error (Mosteller)

- Conceptual or design error
- Bad breaks in random sampling
- Survey question wording
- Non-random out-selection
- Transcription errors
- Calculation & mechanization errors

What to Do About Error

- Practice safe data
  - Know where your data come from
  - Watch for anomalies
  - Use multiple measurement techniques
  - Collect as much data as possible and disaggregate

Causality

- Definitions of causality
- Problems in causal research
- Side trip to Campbell and Stanley

Definitions of Causality

- Mechanical
- Logical
- Statistical
  - Experimental paradigm
  - Expected values

Problems in Causal Research

- Theory
  - Confounding effects
- Design
  - Experimentalism is an ideal
  - Observationalism
    - “natural experiments”
    - Control variables

Side trip to…

Donald Campbell and Julian Stanley

Experimental and Quasi-Experimental Designs for Research (1963)

Research design types

- One-shot case study
- One-group pre-test/post-test
- Static group comparison
- Pre-test/post-test with control group
- Solomon four-group design
- Post-test only experiment

One-shot Case Study

- Summary:

X O

- Journalism
- Common sense
- “of no scientific value”

One-group Pre-test/post-test

- Summary:

O X O

- Better than nothing
- Standard way of doing most research

Static group comparison

- Summary:

$$X \quad O_1$$

$$O_2$$

- Problems
  - Selection
  - Mutual causation
- This is most cross-sectional analysis

Pre-test/Post-test Control Group

- Summary:

$$R \quad O^1_T \quad X \quad O^2_T$$

$$\text{----------}$$

$$R \quad O^1_C \qquad O^2_C$$

- Effect of treatment:

$$[O^2_T - O^1_T] - [O^2_C - O^1_C]$$

Solomon Four-Group Design

- Summary:

R	O	X	O
R	O		O
R		X	O
R			O

- This allow you to control for the effect of the experiment itself

Post-test only experiment

- Summary:

R X O

R O

- No selection
- No prior observation
- Classical scientific and agricultural experimentalism

Last word: Things to Avoid

- Colinearity
- Sampling on the dependent variable
- Constant explanatory variables
- Constant dependent variables
- Measurement error
- Excluded variable bias
- Endogeneity