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
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:

\[
\begin{array}{cc}
\text{X} & \text{O}_1 \\
\hline
\text{O}_2
\end{array}
\]

• Problems
  – Selection
  – Mutual causation

• This is most cross-sectional analysis
Pre-test/Post-test Control Group

• Summary:

\[ R \ O^1_T \times O^2_T \]

\[ \overline{R \ O^1_C \ O^2_C} \]

• 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