

Workshop for teachers of quantitative methods for political science students

Paul M. Kellstedt

Texas A&M University

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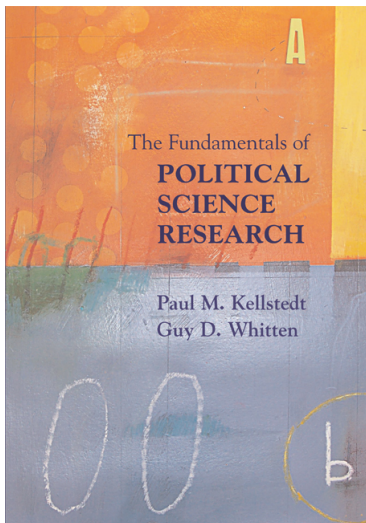
What we'll talk about today

- 1 Some preliminaries
- 2 The goals of a quantitative methods class
- 3 A proposed outline for a course in quantitative methodology
 - Thinking skills for assessing causal relationships
 - Statistical skills for assessing causal relationships
- 4 How to encourage our students to produce their own research
- 5 Final remarks

Preliminary questions

- Should we require quantitative methods classes for Political Science majors?
- But if departments require these classes, won't they hate the instructor?
- When should they be taught – i.e., for entering students, for those near the end of their degree programs, etc.?

A caveat



What do we want students to be able to do after successfully completing a course in quantitative methodology?

- To be critical consumers of information in the media.
- To be competent consumers of actual political science research.
- To perform basic statistical analyses using software packages.

We have to show students what researchers do

All scientists—including Political Scientists—are involved in two basic activities:

- ① We generate new causal theories.
- ② We test these new causal theories against evidence from the real world.

The key take-home point

We need to teach students both the thinking skills and then the associated statistical techniques involved in assessing causal relationships.

Where do theories come from?

- A recipe?
- An emphasis on the new.
- New theories can come from:
 - ① A focus on dependent variables
 - ② Moving from specific events to more generalizable phenomena
 - ③ Learning what the literature may have missed
 - ④ Formal theory

Thinking about causal relationships

Once we have a causal theory, how do we know whether the independent variable (X) causes the dependent variable (Y)?

Four causal hurdles

- 1 Is there a credible causal mechanism that connects X to Y ?
- 2 Can we rule out the possibility that Y could cause X ?
- 3 Is there covariation between X and Y ?
- 4 Have we controlled for all confounding variables (Z) that might make the association between X and Y spurious?

Research designs for assessing causal relationships

Given that our theories are (normally) bivariate, but we live in a multivariate world, how can we control for other possible causes of the dependent variable?

- Experiments
- Observational studies—cross-sectional and time-serial

The importance of measurement

Key idea

Many critical concepts in political science—like *democracy* or *prejudice*—are not easy to measure empirically. So how we go about it matters.

The basics: Variance and covariance

- Central tendency
- Variance: The foundation for *co*-variance

The logic of hypothesis testing

- The relationship between observations from a sample and the population about which we care
- Can undergraduates handle Bayesian thinking?
- The importance of teaching the Central Limit Theorem

Bivariate hypothesis testing (as a warm-up)

Which bivariate test to use depends on the variable types of independent and dependent variables

Table: Variable types and appropriate bivariate hypothesis tests

		Independent variable type	
		Categorical	Continuous
Dependent variable type	Categorical	Tabular analysis	Probit/logit
	Continuous	Difference of means	Correlation coefficient; bivariate regression

Bivariate regression

The emphasis

Teaching bivariate regression enables us to familiarize our students with the way that “rise over run” logic from algebra is relevant for social relationships.

- How much about OLS can/should we teach undergraduates?

Multiple regression as the key to assessing causal relationships in a multivariate world

- How does multiple regression pertain to the Four Causal Hurdles, especially the last?
- What happens in regression models when we fail to control for other possible causes of the dependent variable?

If a student wants to produce his or her own research what do they need to be able to do?

- To identify a new research question, likely through one of three techniques:
 - ① A new Y (and some X)
 - ② An existing Y and a new X
 - ③ An existing $X - Y$ relationship in a new context
- To capably evaluate both individual studies and the literature as a whole, with an emphasis on what we don't yet know
- To understand the strengths and weaknesses of various research designs
- To competently analyze data and draw appropriate conclusions
- To clearly present tables and figures, and to connect text to those tables and figures

Is this realistic?

Yes