

Political Science 610  
*Experimental Political Science:  
Causal Inference, Design and Analysis*  
Spring Semester, 2013

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## Particulars

**Course Meets:** Thursdays 10-1, SBS N702

## Short Course Description

The purpose of this course is give students a broad, yet deep understanding of the issues involved in the design and analysis of experiments in each of the major experimental traditions in the discipline, including experimental political economy, political psychology and survey experiments (we will also briefly touch on field experiments and “natural” experiments). After a brief review of the history of experimental research in political science, we will cover the (Neyman)-Rubin Causal Model (RCM, also known as the potential outcomes framework). This conceptual framework will serve as the basis for our understanding of all of our notions of causal inference in the course, and is also useful in thinking about the design of observational studies. The

second half of the continues with the RCM framework to cover with the statistical analysis of experimental data, and with quasi-experiments (statistical techniques meant to transform observational data into something akin to experimental data).

## Learning Outcomes

At the end of the course, students will be expected to:

- have a command of the key issues involved in the design of experiments, especially those related to randomization, internal and external validity;
- have mastered basic statistical techniques and their appropriate application to particular experimental designs;
- understand the interrelatedness of experimental design and statistical analysis;
- to have an experimental design proposal and (ideally) software implementation of the design

## Required Texts

Most of the readings from the course will be drawn from the following texts. Other readings are available through JSTOR or will be posted on Blackboard:

- *Experimental Political Science and the Study of Causality: From Nature to the Lab*. Rebecca Morton and Kenneth Williams, CUP 2010.
- Druckman, James et al. Eds. (2011) *Cambridge Handbook of Experimental Political Science* Cambridge Univ Press
- Winship, Christopher and Stephen Morgan (2007) *Counterfactuals and Causal Inference: Methods and Principles for Social Research* Cambridge Univ Press
- Shadish, Cook and Campbell (2002) *Experimental and Quasi-Experimental Designs for Generalize Causal Inference* Houghton Mifflin.

Other books that may be useful as further reading on specific topics include:

- Experimental Design:
  - Cox, D.R. and N. Reid (2000) *The Theory of the Design of Experiments* Chapman & Hall
  - Montgomery, Douglas (2008) *Design and Analysis of Experiments, 7th Ed.* John Wiley & Sons
- Causal Inference:
  - Pearl, Judea (2009) *emphCausality: Models, Reasoning and Inference*, 2nd ed. Cambridge Univ Press
- R Analysis of Experimental Data
  - Lalanne, Christopher (2006) *R Companion to Montgomerys Design and Analysis of Experiments (2005)* <http://www.aliquote.org/articles/tech/dae/dae.pdf>
  - Baron, Jonathan and Yuelin Li (2003) *Notes on the use of R for psychology experiments and questionnaires* [cran.r-project.org/doc/contrib/Baron-rpsych.pdf](http://cran.r-project.org/doc/contrib/Baron-rpsych.pdf)

## Course Requirements

As the course focuses on practical issues of experimental design and analysis, evaluation will be based on several factors, all meant to be of practical use for the students and culminating in a research proposal including an experimental design and corresponding implementation with the appropriate software. Specifically, students will be evaluated on the following criteria:

1. Experimental Design (30%)  
Each student is required to submit a novel experimental *design*. If you can have it implemented in the appropriate software, then all the better, but that is not required.
2. Problem sets (30%): There will be 3 problem sets/homeworks, each worth 10% of the grade.

3. Presentations and Peer Review (20%): each student is required to give two presentations:
  - *Presentation of Experimental Design Proposal* (10%): In the final week of the course, each student will give a short presentation of their experimental proposal.
  - *Peer reviews* (10%): Each student will be tasked with anonymously reviewing a classmate's research proposal, and will also be required to peer review a published article that uses an experiment.
4. Final Exam (20%): the final exam will be take-home. It will be distributed in the final week and due on the date of the scheduled final exam.

## Course Outline

### ***Part 1* Experimental Political Science: History, Paradigms and Validity**

#### **Week 1 (January 25th) History and Pluralism of Experimental Methods in Political Science**

This week's readings provide an introduction to the diverse and pluralistic nature of experimentation in political science, its history and traditions. This is a history, by the way, in which our Department has played a significant role. In addition, we will begin to discuss what the basic intuitions of experimental design and causal inference, including what exactly we mean when we call something an "experiment."

- Morton and Williams (M&W) chapter 1
- McDermott, Rose (2002) "Experimental Methods in Political Science." *Annual Review of Political Science*
- Druckman, James et al. (2006) "The Growth and Development of Experimental Research in Political Science." *American Political Science Review*

## Week 2 Introduction to Experimental Practice in Political Science

Here we will first discuss some general principles common to all experimental practice; we will then discuss the particular differences between economic and psychological traditions of experimentation in experimental political science.

- General Principles of Experimentation (you will be provided with copies of all of the book chapters)
  - Note: for all of the following you will be provided with copies:
  - SCC chapter 1
  - *Handbook* chapter 2, Druckman et al *Experiments: Introduction to Core Concepts* (the appendix to the chapter will be useful to have reviewed for later weeks).
- Debates on the Practice and Methodology of Laboratory Experiments
  - Hertwig, Ralph and Andreas Ortmann (2001) “Experimental Practices in Economics: A Methodological Challenge for Psychologists?” *Behavioral and Brain Sciences*
  - *Handbook* chapter 5, Dickson *Economics versus Psychology Experiments: Stylization, Incentives and Deception*

## Week 3: Internal Validity, Efficiency and Randomization

Experiments inevitably involve a trade-off between internal and external validity, and in this week we will focus on the former type, which also includes construct validity. Because experiments are costly and time-consuming to conduct, it is very important that their design is clear and concise, or else no amount of fancy statistical methods can rescue the study. Internal validity is an epistemological notion that captures all facets of the inferences we can make about the population studied with a particular research design. Therefore, sampling and randomization (including such “pseudo-randomization” techniques as blocking and matched pairs) are fundamental for internal validity, as are all other decisions regarding the experimental design, such as whether to employ a within- or between-subjects approach.

- M&W chapter 5, chapter 7 pp. 253-64

- SCC, chapters 2, 8
- Guala chapter 4

#### **Week 4: External Validity and Construct Validity**

External Validity is another epistemological concept which concerns making more general inferences about a *population* of interest based on the sample of subject in the study. Due to the routine use of “WEIRD” (Western, Educated, Industrialized, Rich and Democratic) subjects, some researchers have raised concerns about the validity of inferences about other populations based on such subjects. Another important issue related to external validity involves the artificiality of the experimental design which, while essential for internal validity, can decrease the external validity of an experiment. Field experiments are generally thought to have a greater degree of external validity, but they are expensive and infeasible for many research questions. We will discuss all of the major aspects of external validity, including whether it is even an issue at all.

##### **Homework 1 assigned**

- M&W chapter 7, pp. 264-76
- SCC chapter 3
- *Handbook* chapter 4 Druckman and Kam “Students as Experimental Participants: A Defense of the ‘Narrow Data Base’”
- Henrich, Joseph et al (2010) “The Weirdest People in the World?” *Behavioral and Brain Sciences*
- Mook, Douglas (1983) “In defense of external invalidity.” *American Psychologist*

#### **Part 2 Causal Inference**

##### **Weeks 5 & 6: Introduction to Causal Inference Potential Outcomes and Graphical approaches**

Political scientists are increasingly interested in *causal inference* and we see more and more often that the leading journals are publishing research that

emphasizes such inference. We will begin with a brief introduction to causal inference offered by Holland's (1986) classic piece, and his claim of "no causation without manipulation." We will then move on to the two most pervasive and useful frameworks for causal modeling in the social science: the Rubin Causal Model and the graphical approach to causation (mostly due to Pearl). We will use the conceptual apparatus and the notations developed in this week throughout the course. The RCM is perhaps the most important conceptual framework in the social sciences in that it provides a researcher with the tools necessary to think deeply, critically and generally about research designs utilizing experimental *and* observational data.

- Holland, Paul (1986) "Statistics and Causal Inference (with discussion)." *Journal of the American Statistical Association*
- Morgan & Winship, chapters 1, 2 and 3
- Morton & Williams, chapters 2 and 3
- Rubin, Donald (2005) "Causal Inference Using Potential Outcomes" *Journal of the American Statistical Association*
- Pearl (2009) "Causal Inference and Statistics" *Statistical Surveys*

## **Week 7: Randomization and Treatment Effects**

### **Homework 1 due**

- *Handbook* chapter 31, Gaines and Kuklinski "Treatment Effects"
- Morton & Williams, chapters 4 and 5
- Schulz and Grimes (2002) "Generation of Allocation Sequences in Randomized Trials: Chance, not Choice" *The Lancet*

## **Weeks 8 & 9: Causal Inference and Mediation**

### **Homework 2 assigned**

- Baron, Reuben and David Kenny (1986) "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations." *Journal of Personality and Social Psychology*

- Zhao, Xinshu et al (2010) “Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis.” *Journal of Consumer Research*
- Imai, Kosuke et al (2011) “Unpacking the Black Box of Causality: Learning about Causal Mechanisms from Experimental and Observational Studies.” *American Political Science Review*
- Brader, Valentino and Suhay (2008) “What Triggers Public Opposition to Immigration: Anxiety, Group Cues and Immigration Threat” *American Journal of Political Science*

### **Week 10 Inference from Randomization**

- Keele et al (2012) “Strengthening the Experimenter’s Toolbox: Statistical Estimation of Internal Validity” *American Journal of Political Science*
- Handbook chapter 32, Bowers “Making Effects Manifest in Randomized Experiments”
- Horiuchi, Yusaku et al (2007) “Designing and Analyzing Randomized Experiments: Application to a Japanese Election Survey Experiment.” *American Journal of Political Science*

### ***Part 3: Quasi-Experimental Designs***

Often experimental approaches to certain questions are not feasible because of practical or ethical considerations. As a result, political scientists are increasingly turning to statistical methods which transform observational data in such a way to render it amenable to analysis as if it were experimental data. Such methods include propensity score (and other types of) matching, regression discontinuity design, and instrumental variables estimation. We will discuss these methods and their limitations as well as compare them to the true experimental methods they are meant to approximate. In keeping with the rest of the course, we will discuss these techniques within the RCM and graphical frameworks.



## **Week 11 Instrumental Variables**

- Sovey & Green (2011) “Instrumental Variables Estimation in Political Science: a Readers’ Guide.” *American Journal of Political Science*
- Gerber, Alan (1998) “Estimating the Effect of Campaign Spending on Senate Election Outcomes Using Instrumental Variables.” *American Political Science Review*
- Bartels, Larry (1991) “Instrumental and Quasi-Instrumental Variables.” *American Journal of Political Science*

## **Week 12: Matching Methods**

### **Homework 3 due**

- Sekhon, Jasjeet (2009) “Opiates for the Matches: Matching Methods for Causal Inference.” *Annual Review of Political Science*
- Arceneaux, Kevin (2006) “Comparing Experimental and Matching Methods Using a Large-Scale Voter Mobilization Experiment.” *Political Analysis*
- Mayer, Alexander (2011) “Does Education Increase Political Participation?” *Journal of Politics*

## **Week 13 Regression Discontinuity**

- Green, Donald et al (2009) “Testing the Accuracy of Regression Discontinuity Analysis Using Experimental Benchmarks.” *Political Analysis*
- Kline “Representation, what is is good for? Estimating the Effect of Representation on Voters’ Attitudes using Regression Discontinuity Design.”
- Other readings TBA.

### **Week 14: Presentations of Research Proposals**

In this final week, each student will give a brief (15 minutes) presentation of the research proposal they have put together for the course. The time for each presentation will depend on the final number of students in the course, but we will be sure to leave time for questions and discussion of each of the proposals.

**Final Exam assigned**