

17.802 Quantitative Research Methods II

Spring 2015

Instructor: Teppei Yamamoto
TAs: Daniel de Kadt, James Dunham

Time & Room

Class: Tuesdays and Thursdays, 3:00 – 4:30pm, Room 66–144

Recitation: Fridays, 9:30 – 10:30am, Room E53–438

Office

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Overview and Class Goals

This is the second course in the quantitative research methods sequence at the MIT political science department. The goal of the four-course sequence is to teach you how to understand and confidently apply a variety of statistical methods and research designs that are essential for political science research.

Building on the first course (17.800) which covered probability, statistics, and linear regression analysis, this second class provides a survey of more advanced empirical tools, with a particular focus on causal inference. We cover a variety of research designs and statistical methods for causal inference, including experiments, matching, regression, panel methods, difference-in-differences, synthetic control methods, instrumental variable estimation, regression discontinuity designs, causal mediation analysis, nonparametric bounds, and sensitivity analysis. We will analyze the strengths and weaknesses of these methods. Applications are drawn from various fields including political science, public policy, economics, and sociology.

The class is open to qualified students from other departments and undergraduates. However, the enrollment will be capped at 30 and priority will be given to graduate students in the political science department in the event of excess demand.

Prerequisites

There are three prerequisites for this course:

1. Mathematics: Basic college-level calculus and linear algebra.
2. Probability and statistics covered in 17.800 or an equivalent graduate-level course.
3. Computing: familiarity with at least one statistical software. We will use R in this course (more on this below).

For 1 and 3, we expect the level of background knowledge and skills equivalent to what is covered in the department's Math Camp and 17.800. For more information about the Math Camp see:

<https://stellar.mit.edu/S/project/mathprefresher/index.html>

Course Requirements

The final grades are based on the following items:

- **Problem sets (40%):** You can only learn statistics by doing statistics. Therefore, the homework for this course is extensive, including weekly homework assignments. The assignments consist of analytical, computational, and data analysis questions. They will usually be assigned on Tuesday night and due the following Tuesday, prior to lecture. Each problem set will be counted equally toward the calculation of the final grade. All sufficiently attempted assignments (i.e. a typed and well organized write-up with all problems attempted) will be graded on a three-point scale (\checkmark^+ , \checkmark , \checkmark^-). The following additional notes will apply to all problem sets unless otherwise noted.
 - No late submission will be accepted, unless you ask for special permission from the instructor in advance of the deadline. (Permission may be granted or not granted, with or without penalty, depending on the specific circumstances.)
 - We encourage students to work together on the assignments, but you always need to write your own solutions, and we ask that you make a solo effort at all the problems before consulting others. In particular, you must not simply copy and paste someone else's answers or computer code. *Violation of this policy will be considered an academic integrity issue and processed accordingly to MIT's rules and procedures for such violations.* We also ask that you write the names of your co-workers on your assignments.
 - For analytical questions, you should include your intermediate steps, as well as comments on those steps when appropriate. For data analysis questions, include annotated code as part of your answers. All results should be presented so that they can be easily understood.
- **Quizzes (15%):** Three in-class, closed-book quizzes will take place on Thursdays (March 5, April 2 and April 30) during the regular class time.
- **Project (35%):** The final project will be a short research paper which typically applies a method learned in this course to an empirical problem of your substantive interest. The paper should be 5-10 pages in length and focus on the research question, data, empirical strategy, results, and conclusions. Literature reviews, background, lengthy theoretical motivations, etc. should be omitted or may be included as an appendix. You also need to submit a copy of your analysis code. Students are free to choose any topic they want, as long as they have a clear research question that concerns causality. Projects co-authored with another student are *very strongly encouraged* (learning to co-author is essential because nowadays most articles in political science are co-authored). Replication papers are accepted as long as they go beyond the original analysis in some significant way by applying techniques learned in the course.

Students need to meet the following milestones for their project:

- February to early March: **Start** thinking about possible topics, exploring data sources, and running simple analyses on acquired data sets. Run your ideas by the TAs and instructor during their office hours and after classes/recitations and obtain their reactions.
- March 12: Turn in a **brief description of your proposed project**. By this date you need to have found your coauthor, acquired the data you plan to use, and completed a descriptive analysis of the data (e.g. simple summary statistics, crosstabs and plots). Schedule a brief meeting with the instructor to discuss your proposal during office hours. You may be asked to revise and resubmit the proposal.
- May 7 and 12: Students will give **presentations** during the regular class time. Presentations should be approximately 10 minutes in length (determined based on the class size, but time limits will be strictly enforced) and will be oral accompanied by electronic slides, much like presentations at major academic conferences such as APSA and MPSA. Performance will be counted toward the class participation grade (see below).

– May 14: **Paper due.** Turn in the final version of your paper by the end of the day.

- **Participation and presentation** (10%): Students are strongly encouraged to ask questions and actively participate in discussions during lectures and recitation sessions.

In addition, the syllabus lists **required readings** for every week. This required reading should be completed prior to lecture in a given week. Students are expected to read the material very carefully. You may even find it helpful to read the material multiple times. The syllabus also lists suggested reading; once you have decided on a focus for your project, you should consider the relevant suggested readings very closely.

Recitation Sections

Weekly recitation sections will be held on Fridays, 9:30-10:30am. The section will cover a review of the theoretical material and also provide help with computing issues. The TAs will run the sections and can give more detail.

Computation

We teach the course in [R](#), which is an open-source statistical computing environment that is very widely used in statistics and political science. You can download it for free from www.r-project.org. The web provides many great tutorials and resources to learn R. A list of these is provided [here](#). A nice way to start you off are the two video tutorials provided by Dan Goldstein [here](#) and [also here](#). Another good resource is the set of tutorials provided by [DataCamp](#).

If you are very familiar with another statistical software package you may use that for the course at your own risk. We can only support R.

Course Website

The course website is located at:

<http://stellar.mit.edu/S/course/17/sp15/17.802/>.

It provides homework assignments, datasets, and supplementary materials.

Course Forums

Throughout this class we will use the Piazza online discussion board. This is a question-and-answer platform that is easy to use and designed to get you answers to questions quickly. It supports L^AT_EX, code formatting, embedding of images, and attaching of files. We encourage you to ask questions on the Piazza forum for clarifications, questions about concepts, or about your projects in addition to attending recitation sessions and office hours. You can sign up to the Piazza course page either directly from the below address or the link posted on the Stellar course website (there are also free Piazza apps for the iPhone and iPad):

<https://piazza.com/mit/spring2015/17802/home>

Using Piazza will allow students to see and learn from other students' questions. Both the TA and the instructor will regularly check the board and answer questions posted, although everyone else is also encouraged to contribute to the discussion. A student's respectful and constructive participation on the forum will count toward his/her class participation grade. *Do not email your questions directly to the instructors or TAs* (unless they are of personal nature) — we will not answer them!

Schedule

Please note the following scheduling issues:

- No class on February 17 (Monday schedule).
- No class on March 24 and 26 (Spring Break).
- No class on April 21 (Patriots Day).

Books

Main Books: We will read chapters from the following textbooks.

- Angrist, Joshua D. and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.
- Morgan, Stephen L. and Christopher Winship. 2014. *Counterfactuals and Causal Inference: Methods and Principles for Social Research*, 2nd ed. Cambridge University Press.

Optional Books and Summary Articles: The following books and review articles are optional but may prove useful for additional coverage of some of the course topics. We read selected chapters from some of these books, but you need not purchase them.

- Guido W. Imbens and Jeffrey Wooldridge. 2009. [Recent Developments in the Econometrics of Program Evaluation](#). *Journal of Economic Literature*, 47(1): 5–86.
- Joshua D. Angrist and Alan B. Krueger. 1999. [Empirical Strategies in Labor Economics](#). In *Handbook of Labor Economics*, ed. O. Ashenfelter and D. Card: Elsevier Science.
- Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*. MIT Press.
- Gerber, Alan S., and Donald P. Green. 2012. *Field Experiments*. W. W. Norton.
- Rosenbaum, Paul R. 2009. *Design of Observational Studies*. Springer Series in Statistics.
- Rosenbaum, Paul R. 2002. *Observational Studies*. Springer-Verlag. 2nd edition.
- Pearl, Judea. 2009. *Causality: Models, Reasoning, and Inference*. New York: Cambridge University Press. 2nd edition.
- Manski, Charles F. 1995. *Identification Problems in the Social Sciences*. Cambridge: Harvard University Press.
- Rubin, Donald. 2006. *Matched Sampling for Causal Effects*. Cambridge University Press.

Course Schedule

Required readings are marked with a (★) and are in **bold**.

1 Introduction

- Overview, course requirements, course outline

2 Statistical Models for Causal Analysis

- Causality as counterfactuals
- Potential outcomes
- The Fundamental Problem of Causal Inference
- Identification and estimation
- Causal estimands
- Interference
- Causal graphs and other causal models

- Sufficient component causes

Readings: Basics

- **Morgan and Winship: Chapters 1, 2 and 3.** (★)
- **Angrist and Pischke: Chapter 1.** (★)
- Sekhon, Jasjeet S. 2004. “[Quality Meets Quantity: Case Studies, Conditional Probability and Counterfactuals.](#)” *Perspectives on Politics* 2(2): 281-293.

Readings: Potential Outcomes

- Holland, Paul W. 1986. “[Statistics and Causal Inference.](#)” *Journal of the American Statistical Association* 81(396): 945-960.

Readings: Causal Graphs

- Pearl, Judea. 1995. “[Causal Diagrams for Empirical Research.](#)” *Biometrika*, 82(4): 779-710.
- Pearl, Judea. 2009. “[Causal Inference in Statistics: An Overview.](#)” *Statistics Surveys*, 3: 96-146.

Readings: Alternative Causal Models

- Dawid, A. P. 2000. “[Causal Inference Without Counterfactuals \(with discussion\).](#)” *Journal of the American Statistical Association*, 95(450): 407-424.

3 Randomized Experiments

3.1 Identification and Estimation

- Identification of Causal Effects under Randomization
- Covariate adjustment
- Blocking
- Practical considerations

Readings: Theory

- **Angrist and Pischke: Chapter 2.** (★)
- **Gerber and Green: Chapters 2, 3 and 4.** (★)
- Neyman, Jerzy. 1923 [1990]. “[On the Application of Probability Theory to Agricultural Experiments. Essay on Principles. Section 9.](#)” *Statistical Science* 5(4): 465-472. Trans. Dorota M. Dabrowska and Terence P. Speed.
- Freedman, D. A. 2008. “[On Regression Adjustments to Experimental Data.](#)” *Advances in Applied Mathematics*, 40: 180-193.
- Lin, Winston. 2013. “[Agnostic Notes on Regression Adjustments to Experimental Data: Reexamining Freedman’s Critique.](#)” *Annals of Applied Statistics*. 7(5): 295-318.

Readings: Field Experiments

- **Gerber, Alan S., Donald P. Green and Christopher W. Larimer. 2008. “[Social Pressure and Voter Turnout: Evidence from a Large Scale Field Experiment.](#)” *American Political Science Review* 102(1): 1-48.** (★)

- Olken, Benjamin. 2007. “[Monitoring Corruption: Evidence from a Field Experiment in Indonesia.](#)” *Journal of Political Economy* 115(2): 200-249.
- Wantchekon, Leonard. 2003. “[Clientelism and Voting Behavior: Evidence from a Field Experiment in Benin.](#)” *World Politics* 55(3), April: 399-422.
- Chattopadhyay, Raghabendra and Esther Duflo. 2004. “[Women as Policy Makers: Evidence from a Randomized Policy Experiment in India.](#)” *Econometrica*, 72(5): 1409-1443.

Readings: Natural Experiments

- Hyde, Susan D. 2007. “[The Observer Effect in International Politics: Evidence from a Natural Experiment.](#)” *World Politics* 60(1): 37-63.
- Ferraz, Claudio, and Federico Finan. 2008. “[Exposing Corrupt Politicians: The Effects of Brazil’s Publicly Released Audits on Electoral Outcomes.](#)” *Quarterly Journal of Economics* 123(2): 703-45.
- Washington, Ebonya L. (2008). “[Female Socialization: How Daughters Affect Their Legislator Fathers’ Voting on Women’s Issues.](#)” *The American Economic Review*, 98(1), 311-332.
- Dunning, Thad. 2012. *Natural Experiments in the Social Sciences: A Design-Based Approach*. New York: Cambridge University Press.

Readings: Non-technical Overviews

- Palfrey, Thomas. 2009. “[Laboratory Experiments in Political Economy.](#)” *Annual Review of Political Science* 12: 379-388.
- Druckman, James N., Donald P. Green, James H. Kuklinski, and Arthur Lupia. 2006. “[The Growth and Development of Experimental Research in Political Science.](#)” *American Political Science Review* 100(4): 627-635.
- Green, Donald P., Peter M. Aronow, and Mary C. McGrath. 2012. “[Field Experiments and the Study of Voter Turnout.](#)” *Journal of Elections, Public Opinion & Parties*: 1-22.
- Humphreys, Macartan, and Jeremy Weinstein. 2009. “[Field Experiments and the Political Economy of Development.](#)” *Annual Review of Political Science* 12: 367-378.
- Harrison, Glenn and John A. List. 2004. “[Field Experiments.](#)” *Journal of Economic Literature*, XLII: 1013-1059.
- Levitt, Steven D. and John A. List. 2006. “[What Do Laboratory Experiments Tell Us About the Real World?](#)” University of Chicago and NBER.
- Gaines, Brian J., and James H. Kuklinski. 2007. “[The Logic of the Survey Experiment Reexamined.](#)” *Political Analysis* 15: 1-20.

Readings: Implementation and Practical Guides

- Duflo, Esther, Abhijit Banerjee, Rachel Glennerster, and Michael Kremer. 2006. “[Using Randomization in Development Economics: A Toolkit.](#)” *Handbook of Development Economics*.
- Bloom, Howard S. 2008. “The Core Analytics of Randomized Experiments for Social Research.” In *The SAGE Handbook of Social Research Methods*, eds. Pertti Alasuutar, Leonard Bickman, and Julia Brannen. London: SAGE.
- Bruhn, Miriam, and David McKenzie. 2009. “[In Pursuit of Balance: Randomization in Practice in Development Field Experiments.](#)” *American Economic Journal: Applied Economics* 1(4): 200-232.
- Glennerster, Rachel and Kudzai Takavarasha. 2013. *Running Randomized Experiments: A Practical Guide*. Princeton University Press.
- MIT Committee on the Use of Humans as Experimental Subjects (COUHES)
<http://web.mit.edu/committees/couhes/>.

3.2 Inference

- Variance estimation under the Neyman model
- Clustered designs
- Randomization inference
- Bootstrap
- Power analysis

Readings: Theory

- **Angrist and Pischke: Chapter 8.1** (★)
- **Fisher, Ronald Aylmer. 1966 [1935]. *The Design of Experiments*. Edinburgh; London: Oliver and Boyd. Part II.** (★)
- **Efron, Bradley, and R. J. Tibshirani. 1993. *An Introduction to the Bootstrap*. New York: Chapman and Hall/CRC. Chapters 2 and 6.** (★)
- Rosenbaum, Paul R. 2010. *Design of Observational Studies*. Springer. Chapter 2.

Readings: Application

- Ho, D. E. and K. Imai. 2006. “[Randomization Inference with Natural Experiments: An Analysis of Ballot Effects in the 2003 California Recall Election](#).” *Journal of the American Statistical Association*, 101(475): 888-900.

4 Observational Studies

4.1 Identification

- Selection on observables
- Post-treatment bias
- Subclassification

Readings

- **Morgan and Winship: Chapter 4.** (★)
- Rubin, Donald B. 2008. “For Objective Causal Inference, Design Trumps Analysis.” *Annals of Applied Statistics* 2(3): 808-840.
- Rosenbaum, Paul R. 2002. *Observational Studies*. Springer-Verlag. 2nd edition. Chapter 3.
- Rosenbaum, Paul R. 1984. “[The Consequences of Adjustment for a Concomitant Variable That Has Been Affected by the Treatment](#).” *Journal of the Royal Statistical Society. Series a (General)*, 147(5), 656-666.

4.2 Matching and Weighting

- Covariate matching
- Balance checking
- Propensity scores

Readings: Theory

- **Morgan and Winship: Chapter 5. (★)**
- Ho, Daniel E., Kosuke Imai, Gary King, and Elizabeth A. Stuart. 2007. “[Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference.](#)” *Political Analysis* 15: 199-236.
- Imbens, Guido W. 2004. [Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review.](#) *Review of Economics and Statistics* 86 (1): 4-29.
- Abadie, Alberto and Guido W. Imbens. 2006. [Large Sample Properties of Matching Estimators for Average Treatment Effects,](#) *Econometrica* 74: 235-267.
- Abadie, Alberto, and Guido W. Imbens. 2011. “[Bias-Corrected Matching Estimators for Average Treatment Effects.](#)” *Journal of Business & Economic Statistics* 29(1): 1-11.
- Imai, K., and D. A. van Dyk. 2004. [Causal Inference With General Treatment Regimes.](#) *Journal of the American Statistical Association*, 99(467), 854–866.
- Rubin, Donald. 2006. *Matched Sampling for Causal Effects.* Cambridge University Press. Chapters 3, 4, 5, 10, 11 and 14.
- Hirano, K., Imbens, G. W., and Ridder, G. 2003. [Efficient Estimation of Average Treatment Effects Using the Estimated Propensity Score.](#) *Econometrica*, 71(4), 1161-1189.
- Hainmueller, Jens. 2012. [Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies.](#) *Political Analysis* 20 (1): 25-46.
- Glynn, Adam, and Kevin Quinn. 2010. [An Introduction to the Augmented Inverse Propensity Weighted Estimator.](#) *Political Analysis* 18(1): 36-56.

Readings: Applications

- **Lyall, Jason. 2010. [Are Co-Ethnics More Effective Counter-Insurgents? Evidence from the Second Chechen War.](#) *American Political Science Review*, 104:1 (February 2010): 1-20. (★)**
- Gordon, Sanford and Gregory Huber. 2007. [The Effect of Electoral Competitiveness on Incumbent Behavior.](#) *Quarterly Journal of Political Science* 2(2): 107-138.
- Eggers, Andrew and Jens Hainmueller. 2009. [MPs for Sale? Estimating Returns to Office in Post-War British Politics.](#) *American Political Science Review*. 103 (4): 513-533.
- Gilligan, Michael J. and Ernest J. Sergenti. 2008. [Do UN Interventions Cause Peace? Using Matching to Improve Causal Inference.](#) *Quarterly Journal of Political Science* 3 (2): 89-122.
- Sekhon, Jasjeet, and Roco Titunik. 2012. [When Natural Experiments Are Neither Natural nor Experiments.](#) *American Political Science Review* 106(1): 35-57.
- Rubin, Donald B. 2001. [Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation.](#) *Health Services and Outcomes Research Methodology* 2 (3-4): 169-188.
- Blattman, Christopher. 2009. [From Violence to Voting: War and Political Participation in Uganda.](#) *American Political Science Review* 103 (2): 231-247.

4.3 Regression

- OLS as an estimator of causal effects

Readings

- **Angrist and Pischke: Chapter 3. (★)**
- **Morgan and Winship: Chapters 6 and 7. (★)**
- Härdle, W and Linton, O. 1994. [Applied Nonparametric Methods](#), in R. F. Engle and D. L. McFadden eds. *Handbook of Econometrics*, vol. 4. New York: Elsevier Science.
- White, H. 1980. [Using Least Squares to Approximate Unknown Regression Functions](#). *International Economic Review* 21: 149-170.

4.4 Partial Identification and Sensitivity Analysis

- Nonparametric bounds
- Sensitivity analysis

Readings: Theory

- **Morgan and Winship: Chapter 12 (★)**
- Guido W. Imbens. 2003. [Sensitivity to Exogeneity Assumptions in Program Evaluation](#). *The American Economic Review* 93 (2): 126-32.
- Rosenbaum, Paul R. 2002. *Observational Studies*. Springer-Verlag. 2nd edition. Chapter 4.
- Manski, Charles F. 1995. *Identification Problems in the Social Sciences*. Cambridge: Harvard University Press. Chapter 2.
- Joseph Altonji, Todd E. Elder, and Christopher Taber. 2005. [Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools](#). *Journal of Political Economy* Vol. 113: 151-184.
- VanderWeele, Tyler J. , and Onyebuchi A. Arah. 2011. [Bias Formulas for Sensitivity Analysis of Unmeasured Confounding for General Outcomes, Treatments, and Confounders](#). *Epidemiology* 22 (1): 42.
- Rosenbaum, Paul R. 2009. [Amplification of Sensitivity Analysis in Matched Observational Studies](#). *Journal of the American Statistical Association* 104 (488): 1398-1405.

Readings: Applications

- **Blattman, Christopher and Jeannie Annan. 2010. [The Consequences of Child Soldiering](#). *Review of Economics and Statistics*, 42(4): 882-898. (★)**

Readings: Comparison of Experimental and Observational Studies

- Shadish, William R., M.H. Clark, and Peter M. Steiner. 2008. [Can Nonrandomized Experiments Yield Accurate Answers? A Randomized Experiment Comparing Random and Nonrandom Assignments](#). *Journal of the American Statistical Association* 103 (484): 1334-1344.
- Dehejia, Rajeev H. and Sadek Wahba. 1999. [Causal Effects in Non-Experimental Studies: Re-Evaluating the Evaluation of Training Programs](#), *Journal of the American Statistical Association* 94 (448): 1053-1062.
- Heckman, James J., Hidehiko Ichimura and Petra Todd. 1998. [Matching as an Econometric Evaluation Estimator](#), *Review of Economic Studies* 65: 261-294.

- Heckman, J., Ichimura, H., Smith, J., and Todd, P. 1998. [Characterizing Selection Bias Using Experimental Data](#). *Econometrica*, 66(5), 1017-1098.
- Arceneaux, Kevin, Alan S. Gerber, and Donald P. Green. 2006. [Comparing Experimental and Matching Methods using a Large-Scale Voter Mobilization Experiment](#). *Political Analysis* 14 (1): 1-36.

5 Instrumental Variables

- Structural equation models
- Two-stage least squares
- Treatment noncompliance
- Principal stratification
- Local average treatment effects

Readings: Theory

- **Angrist and Pischke: Chapter 4 (★)**
- **Morgan and Winship: Chapter 9 (★)**
- Angrist, Joshua D., Guido W. Imbens, and Donald B. Rubin. 1996. [Identification of Causal Effects Using Instrumental Variables](#). *Journal of the American Statistical Association* 91(434): 444-455.
- Balke, Alexander and Judea Pearl. 1997. [Bounds on Treatment Effects from Studies with Imperfect Compliance](#). *Journal of the American Statistical Association*, 92: 1171–1176.

Readings: Critiques

- Deaton, Angus. 2010. [Instruments, Randomization, and Learning About Development](#). *Journal of Economic Literature* 48(2): 424-455.
- Hernan, Miguel A., and James M. Robins. 2006. [Instruments for Causal Inference: An Epidemiologist's Dream?](#) *Epidemiology* 17(4): 360-72.
- Imbens, Guido W. 2010. [Better LATE Than Nothing: Some Comments on Deaton \(2009\) and Heckman and Urzua \(2009\)](#). *Journal of Economic Literature* 48(2): 399-423.

Readings: Applications

- **Ananat, Elizabeth Oltmans, and Ebonya Washington. 2009. [Segregation and Black Political Efficacy](#). *Journal of Public Economics* 93(5-6): 807-22. (★)**
- Iyer, L. (2010). [Direct versus Indirect Colonial Rule in India: Long-Term Consequences](#). *The Review of Economics and Statistics*, 92(4), 693-713.
- Angrist and Krueger. 2001 [Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments](#)
- Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2001. [The Colonial Origins of Comparative Development: An Empirical Investigation](#). *American Economic Review* 91(5): 1369-1401.
- Clingingsmith, David, Asim Ijaz Khwaja, and Michael Kremer. 2009. [Estimating the Impact of the Hajj: Religion and Tolerance in Islam's Global Gathering](#). *Quarterly Journal of Economics* 124(3): 1133-1170.
- Hidalgo, F. Daniel, Suresh Naidu, Simeon Nichter, and Neal Richardson. 2010. [Economic Determinants of Land Invasions](#). *Review of Economics and Statistics* 92(3): 505-523.
- Angrist, Joshua D. 1990. [Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records](#). *American Economic Review* 80(3): 313-336.

6 Regression Discontinuity

- Sharp and Fuzzy Designs, Identification, Estimation, Falsification Checks

Readings: Theory

- **Angrist and Pischke: Chapter 6** (★)
- **Imbens, Guido W., and Thomas Lemieux. 2008. Regression Discontinuity Designs: A Guide to Practice. *Journal of Econometrics* 142 (2): 615-35.** (★)
- Hahn, Jinyong, Petra Todd and Wilbert Van der Klaauw. 2001. Identification and Estimation of Treatment Effects with a Regression Discontinuity Design, *Econometrica* 69 (1): 201-209.
- Keele, Luke and Rocio Titunik. Geographic Boundaries as Regression Discontinuities. *Political Analysis*, forthcoming.

Readings: Applications

- **Lee, David S. 2008. Randomized Experiments from Non-random Selection in U.S. House Elections. *Journal of Econometrics* 142 (2): 675-697.** (★)
- Hidalgo, F. Daniel. 2010. Digital Democratization: Expanding the Electorate Through Voting Technology. *Working Paper*.
- Caughey, Devin, and Jasjeet Sekhon. 2011. Elections and the Regression Discontinuity Design: Lessons From Close U.S. House Races, 1942-2008. *Political Analysis* 19 (4): 385-408.
- Eggers, Andrew, Olle Folke, Anthony Fowler, Jens Hainmueller, Andrew Hall, and James Snyder. On the Validity of the Regression Discontinuity Design for Estimating Electoral Effects: New Evidence from Over 40,000 Close Races. *Working Paper*.

7 Fixed Effects and Difference in Differences

- Selection on time-invariant unobservables

Readings: Theory

- **Angrist and Pischke: Chapter 5** (★)
- Kim, In Song and Kosuke Imai. On the Use of Linear Fixed Effects Regression Estimators for Causal Inference. *Working Paper*.
- Bertrand, Marianne, Esther Dufo, and Sendhil Mullainathan. 2004. How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics* 119 (1): 249-275.

Readings: Fixed Effects Applications

- **Acemoglu, Daron, Simon Johnson, James A. Robinson, and Pierre Yared. 2008. Income and Democracy. *American Economic Review* 98 (3): 808-842.** (★)
- La Ferrara, Eliana, Albert Chong, and Suzanne Duryea. 2012. Soap Operas and Fertility: Evidence from Brazil. *American Economic Journal: Applied Econometrics* 4(4): 10-1.
- Ladd, Jonathan McDonald, and Gabriel S. Lenz. 2009. Exploiting a Rare Communication Shift to Document the Persuasive Power of the News Media. *American Journal of Political Science* 53 (2): 394-410.
- Berrebi, Claude. and Esteban F. Klor. 2008. Are Voters Sensitive to Terrorism? Direct Evidence from the Israeli Electorate. *American Political Science Review* 102 (3): 279-301.

Readings: Difference in Differences Applications

- Sances, Michael. 2014. [Who Benefits from Direct Elections? A Quasi-Experiment Involving New York Towns](#). *Working Paper*. (★)
- Lyall, Jason. 2009. [Does Indiscriminate Violence Incite Insurgent Attacks? Evidence from Chechnya](#). *Journal of Conflict Resolution* 53 (3): 331-62.
- Card, David. and Alan B. Krueger. 1994. [Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania](#),” *American Economic Review* 84 (4): 772-793.

8 Synthetic Control Methods

Readings

- Abadie, A., A. Diamond, and J. Hainmueller. 2010. [Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program](#). *Journal of the American Statistical Association*, 105: 493–505. (★)
- Bohn, S., M. Lofstrom and S. Raphael. [Did the 2007 Legal Arizona Workers Act Reduce the State’s Unauthorized Immigrant Population?](#) *Review of Economics and Statistics*. Forthcoming.
- Acemoglu, D., Simon, J., Kermani, A, Kwak, J. and T. Mitton. 2013. [The Value of Connections In Turbulent Times: Evidence from the United States](#). NBER Working Paper.

9 Causal Mechanisms

- Direct and indirect effects
- Sequential ignorability
- Sensitivity analysis and research designs

Readings

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