Syllabus
17.802 Quantitative Research Methods II

Professor: Jens Hainmueller
TA: Chad Hazlett
Spring Semester 2012

Time & Room
Class: T & Th 9:30-11 E53-438
Recitation: F 11-12 E53-438

Office
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Overview and Class Goals
This is the second course in a three-course sequence on quantitative political methodology, by which we mean the application of statistical methods to problems in political science and public policy. The goal of the three-course sequence is to teach you (1) to understand and (2) to confidently apply a variety of statistical methods and research designs that are essential for political science and public policy research.

Building on the first course (17.800) which covered regression models, this second class provides a survey of more advanced empirical tools for political science and public policy research. The focus is on statistical methods for causal inference, i.e. methods designed to address research questions that concern the impact of some potential cause (e.g., an intervention, a change in institutions, economic conditions, or policies) on some outcome (e.g., vote choice, income, election results, levels of violence).

We cover a variety of causal inference designs, including experiments, matching, regression, panel methods, difference-in-differences, synthetic control methods, instrumental variable estimation, regression discontinuity designs, quantile regressions, and bounds. 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.

Prerequisites
A willingness to work hard on possibly unfamiliar material. In addition to introductory statistics and probability, the course assumes a good knowledge of linear regression meaning that you should have taken at least one graduate class on this subject (such as 17.800). Students are also expected to be reasonably proficient in the statistical software `R` (you may use other software packages that you are very familiar with, but we can only support `R`).

Class Requirements
Reading
The syllabus lists the 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.

Homework
This is a methodological course, developing skills in understanding and applying statistical methods. You can only learn statistics by doing statistics and therefore the homework for this course is extensive, including weekly homework assignments. The assignments consist of analytical problems, computer simulations, and data analysis. They will usually be assigned on Tuesday night and due the following Tuesday, prior to lecture. No late homework will be accepted. All sufficiently attempted homework (ie. a typed and well organized write-up with all problems attempted) will be graded on a (+,✓,-) scale. 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. We also ask that you write the names of your co-workers on your assignments.

Student Project
Students are expected to write a short empirical paper that applies methods learned in this class to a research question of their choice. The paper should be 5-15 pages in length and focus on the research question, data, empirical strategy, results, and conclusions. Literature reviews, background, lengthy 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 the causal effect of some institution, intervention, policy, or event on some outcome, result, or performance. Co-authored projects are very strongly encouraged (learning to co-author is essential because nowadays most articles in political science are co-authored).

Students need to meet the following milestones for their project:

- By 3/15: Email the instructor and TA a short description of your proposed project (i.e. half a page). Students are encouraged to meet with the instructor and TA during office hours to discuss their project and progress.
- By 4/12: Email the instructor and TA a 2-3 page description of progress, analysis, and preliminary results.
- By 5/8: Email the instructor, TA, and the entire class the first draft of your project. Everyone is expected to read all these submissions prior to the student presentations that follow.
- On 5/10 and 5/15: Students will present their projects to the class. Presentations will be no more than 5-10 minutes in length, and will be oral with the aid of 2-5 slides that summarize the main results.
- By 5/17: Email the instructor and TA the final version of your project.

Grading
Grades will be based on

- weekly homework assignments (65% of final grade)
- student project (30% of final grade)
- participation and presentation (5 % of final grade).

Recitation Sections
Weekly recitation sections will be held on Friday. The section will cover a review of the theoretical material and also provide help with computing issues. The TA will run the sections and can give more detail.

Computation
We teach the course in `R`, which is an open-source computing language that is very widely used in statistics. 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 at http://wiki.math.yorku.ca/index.php/R:_Getting_started. A nice way to start you off are the two video tutorials provided by Dan Goldstein here and also here. `R` runs on a wide variety of UNIX platforms, Windows and MacOS. `R` makes programming very easy, has strong graphical

capabilities, and also contains canned functions for most commonly used estimators.

To refresh your `R` you are expected to work through one of the following free tutorials unless you are well familiar with this material. All three tutorials cover similar material, just pick the one you like best:
Owen. *The R Guide.* At: http://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf
Venables and Smith. *An Introduction to R.* At: http://cran.r-project.org/doc/manuals/R-intro.pdf
Verzani. *Simple R.* At: http://cran.r-project.org/doc/contrib/Verzani-SimpleR.pdf

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/sp12/17.802/`. It provides homework assignments, datasets, and supplementary materials.

Course Forums
The course website has a discussion board in the "forum" section. This discussion board provides an opportunity to post questions regarding the course material and/or computing. In addition to precepts and office hours, please use this Forum on the Stellar course website when asking questions about lectures, problem sets, and other course materials. This will allow students to see other students' questions and learn from them. 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. You can also sign up to receive notifications for posted questions and answers. A student's respectful and constructive participation on the forum will count toward his/her class participation grade. Do not email your statistical questions directly to the instructor (unless they are of personal nature) — we will not answer them!

Schedule
Please notice the following scheduling issues:

- No class on 2/21 (Due to Presidents Day on Monday, Tues 2/21 will have a Monday schedule),
- No class on 3/27 and 3/29 (Spring Break).
- No class on 4/17 (Patriots Day).

Books
Main Books

- *We will read chapters from the following textbooks which are available at the COOP and also on reserve in the library.*
  - Angrist, Joshua D. and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton University Press.
  - Morgan, Stephen L. and Christopher Winship. 2007. *Counterfactuals and Causal Inference: Methods and Principles for Social Research.* Cambridge University Press.

Useful Summary Articles

- *The following papers summarize the main methods learned in this course. They are dense and detailed and you might not understand all of the details the first time you read through them. However, if you plan to conduct applied empirical work that involves causal inference, you should revisit these again and again as reference.*
  - Guido W. Imbens and Jeffrey Wooldridge. 2008. Recent Developments in the Econometrics of Program Evaluation. NBER Working Paper No. 14251.
  - 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.

Optional Books

- *The following books are optional but may prove useful for additional coverage of some of the course topics.*
- *Reference Book for Panel Methods*
  - Wooldridge, Jeffrey M. 2002. Econometric Analysis of Cross Section and Panel Data. MIT Press.
- *Causal Inference*
  - Rosenbaum, Paul R. 2009. Design of Observational Studies. Springer Series in Statistics.
  - Rosenbaum, Paul R. 2002. Observational Studies. Springer-Verlag. 2nd edition.
  - Pearl, Judea. 2000. Causality: Models, Reasoning, and Inference New York: Cambridge University Press.
  - Manski, Charles F. 1995. Identification Problems in the Social Sciences. Cambridge: Harvard University Press.
- *Matching*
  - Rubin, Donald. 2006. Matched Sampling for Causal Effects. Cambridge University Press.

Preliminary Schedule

The following is a preliminary schedule of course topics. Notice that required readings are marked with a ($\star$).

1 Introduction

- Overview, Course Requirements, Course Outline

2 Review of Statistical Concepts Useful for Causal Inference

- Random Variables, Measures of Location and Dispersion
- Inference and Properties of Estimators
- Conditional mean function

3 The Potential Outcome Model

- Counterfactual Responses and the Fundamental Identification Problem
- Estimands and Assignment Mechanisms
- Heterogeneity and Selection

Readings

- Morgan and Winship: Chapter 1-2. ($\star$)
- Angrist and Pischke: Chapter 1. ($\star$)
- Holland, P. W. 1986. Statistics and Causal Inference. Journal of the American Statistical Association, Vol. 81, No. 396: 945-960.
- Sekhon, J.S. 2004. Quality Meets Quantity: Case Studies, Conditional Probability and Counterfactuals. Perspectives on Politics, Vol. 2: 281-293. ($\star$)

4 Randomized Experiments

- Identification of Causal Effects under Randomization
- Implementation, Estimation, Diagnostics, Blocking
- Treads Validity

Readings: Theory of Experiments

- Angrist and Pischke: Chapter 2. ($\star$)
- Rosenbaum, Paul R. 2002. Observational Studies. Springer-Verlag. 2nd edition. Chapter 2.

Readings: Application of Experiments

- Olken, Benjamin. 2007. Monitoring corruption : Evidence from a field experiment in Indonesia. Journal of Political Economy. 2007, vol. 115, No 2: 200-249. ($\star$)
- Gerber, A., Green, D., Larimer, C. 2008. Social Pressure and Voter Turnout: Evidence from a Largescale Field Experiment. American Political Science Review. Vol. 102, No. 1: 1-48. ($\star$)
- Wantchekon, Leonard. 2003. Clientelism and Voting Behavior: Evidence from a Field Experiment in Benin World Politics. Volume 55, Number 3, April: 399-422. ($\star$)
- Chattopadhyay, R. and Duflo, E. 2004. Women as Policy Makers: Evidence from a Randomized Policy Experiment in India. Econometrica, Vol. 72, No. 5: 14091443.
- Mutz, Diana C. and Byron Reeves. 2005. The New Video Malaise: Effects of Televised Incivility on Political Trust. American Political Science Review 99 (February): 1-15.
- Gartner, Scott. 2008. The Multiple Effects of Casualties on Public Support for War: An Experimental Approach. American Political Science Review 102(1): 95-106.

Readings: Application of Natural Experiments

- DellaVigna, Stefano, and Ethan Kaplan. 2007. The Fox News Effect: Media Bias and Voting. Quarterly Journal of Economics 122(3): 1187-1234.
- Hyde, Susan D. 2007. The Observer Effect in International Politics: Evidence from a Natural Experiment. World Politics 60(1): 37-63. ($\star$)
- 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.
- Ho, Daniel E., and Kosuke Imai. 2008. Estimating Causal Effects of Ballot Order from a Randomized Natural Experiment: The California Alphabet Lottery, 1978-2002. Public Opinion Quarterly 72(2): 216-40.

Readings: Experiments Review Articles

- Palfrey, Thomas. 2009. Laboratory Experiments in Political Economy. Annual Review of Political Science 12: 379-88.
- 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): 627-35.
- de Rooij, Eline A., Donald P. Green, and Alan S. Gerber. 2009. Field Experiments on Political Behavior and Collective Action. Annual Review of Political Science 12: 389-95. ($\star$)

- Humphreys, Macartan, and Jeremy Weinstein. 2009. Field Experiments and the Political Economy of Development. Annual Review of Political Science 12: 367-78.
- Harrison, Glenn and John A. List. 2004. Field Experiments. Journal of Economic Literature, XLII: 1013-1059.
- List, John A., and Steven Levitt. 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: Useful Methodological Guides for Experiments

- Duflo, Esther, Abhijit Banerjee, Rachel Glennerster, and Michael Kremer. 2006. Using Randomization in Development Economics: A Toolkit. Handbook of Development Economics.
- Howard S. Bloom. 2006. The Core Analytics of Randomized Experiments for Social Research. MDRC Working Papers on Research Methodology.
- Bruhn, Miriam and David McKenzie. 2008. In Pursuit of Balance. The World Bank Policy Research Working Paper 4752.
- Gary King, et.al. 2007. A Politically Robust Experimental Design for Public Policy Evaluation, with Application to the Mexican Universal Health Insurance Program. Journal of Policy Analysis and Management 26, 3, 479506.
- MIT Committee on the Use of Humans as Experimental Subjects (COUHES) http://web.mit.edu/committees/couhes/

5 Causal Effects under Selection on Observables

5.1 Selection on Observables

- Identification under Selection on Observables
- Subclassification

Readings

- Morgan and Winship: Chapter 3. ($\star$)
- Rubin, Donald B. 2008. For Objective Causal Inference, Design Trumps Analysis. Annals of Applied Statistics 2(3): 808-840.($\star$)
- Rosenbaum, Paul R. 2002. Observational Studies. Springer-Verlag. 2nd edition. Chapter 3.
- Rosenbaum, P. R. 2005. Heterogeneity and Causality: Unit Heterogeneity and Design Sensitivity in Observational Studies. The American Statistician, Vol. 59: 147-152.
- Acemoglu, D. 2005. Constitutions, Politics, and Economics: A Review Essay on Persson and Tabellinis The Economic Effects of Constitutions. Journal of Economic Literature Vol. XLIII: 1025-1048. ($\star$)
- Cochran, W. G. 1968. The Effectiveness of Adjustment by Subclassification in Re-moving Bias in Observational Studies, Biometrics, vol. 24: 295-313.

5.2 Matching Methods

- Covariate Matching, Balance Checks, Properties of Matching Estimators

Readings: Matching Theory

- Morgan and Winship: Chapter 4. ($\star$)
- Morgan and Harding. 2006. Matching Estimators of Causal Effects: Prospects and Pitfalls in Theory and Practice.
- Sekhon, Jasjeet S. 2009. Opiates for the Matches: Matching Methods for Causal Inference. Annual Review of Political Science 12: 487-508.($\star$)
- Ho et. al. 2007. Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference. Political Analysis, Vol. 15: 199-236.
- Stuart. 2009. Matching methods for causal inference: A review and a look forward
- Rubin. 2006. Chapters 3 to 5.
- Rosenbaum, P. R., 1995. Observational Studies. New York: Springer-Verlag. Chapter 3.
- Abadie, A. and G. W. Imbens. 2006. Large Sample Properties of Matching Estimators for Average Treatment Effects, Econometrica, vol. 74, 235-267.
- Abadie, A. and G. W. Imbens. 2007. Bias Corrected Matching Estimators for Average Treatment Effects. (PDF) .

Readings: Matching Applications

- Jason Lyall. 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, S. and Huber, S. 2007. The Effect of Electoral Competitiveness on Incumbent Behavior. Quarterly Journal of Political Science, vol. 2: 107-138.
- Sekhon, J. 2004. The 2004 Florida Optical Voting Machine Controversy: A Causal Analysis Using Matching. Manuscript. UC Berkeley.
- Eggers, A. and Hainmueller, J. 2009. MPs for Sale? Estimating Returns to Office in Post-War British Politics. American Political Science Review. Vol. 103, No. 4 November 2009.
- Gilligan, M. and Sergenti, J. 2008. Do UN Interventions Cause Peace? Using Matching to Improve Causal Inference. Quarterly Journal of Political Science, vol. 3: 89122.
- Simmons, B. and Hopkins, D. 2005. The Constraining Power of International Treaties: Theory and Methods. American Political Science Review 99(4): 623-631.

5.3 Propensity Score Methods

- Identification, Propensity Score Estimation, Matching on the Propensity Score, Weighting on the Propensity Score, Reweighting methods

Readings: Propensity Score Methods Theory

- Morgan and Winship: Chapter 3. ($\star$)
- Rubin, D. 2006. Chapters 10, 11 and 14 (all with Paul R. Rosenbaum).
- Imbens, G. 2004. Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review. Review of Economics and Statistics 86 (1): 4-29.

- 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.

Readings: Propensity Score Methods Applications

- Rubin, D. 2001. Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation. Health Services and Outcomes Research Methodology. Volume 2, Numbers 3-4: 169-188. ($\star$)
- Blattman, C. and Annan, J. 2009. The Consequences of Child Soldiering. The Review of Economics and Statistics (Forthcoming). ($\star$)

5.4 Regression

- Non-parametric Regression, Identification with Regression

Readings

- Angrist and Pischke: Chapter 3. ($\star$)
- Morgan and Winship: Chapter 5. ($\star$)
- Chapter in Winship and Morgan on Matching vs Regression.
- 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, vol. 21: 149-170.

5.5 Conclusion: Selection on Observables

- Can Non-Experimental Method Recover Causal Effects?

Readings: Comparison of Experimental and Non-experimental Methods

- Dehejia, R. H. and Wahba, S. 1999. Causal Effects in Non-Experimental Studies: Re- Evaluating the Evaluation of Training Programs, Journal of the American Statistical Association, vol. 94: 1053-1062.($\star$)
- Heckman, J. J., H. Ichimura and P. E. Todd (1997), Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme, Review of Economic Studies, vol. 64, 605-654.
- Shadish, W. M. Clark, H., and Steiner, P. 2008. Can Nonrandomized Experiments Yield Accurate Answers? A Randomized Experiment Comparing Random and Nonrandom Assignments. Journal of the American Statistical Association, Vol. 103, No. 484: 1334-1344. ($\star$)
- Arceneaux, Kevin, Alan S. Gerber, and Donald P. Green. 2006. Comparing Experimental and Matching Methods using a LargeScale Voter Mobilization Experiment. Political Analysis 14: 1-36.
- John Concato, Nirav Shah, and Ralph Horwitz. 2000. Randomized, Controlled Trials, Observational Studies, and the Hierarchy of Research Designs. New England Journal of Medicine 342(25): 1887-92.
- Benson, Kjell and Arthur J. Hartz. 2000. A Comparison of Observational Studies and Randomized, Controlled Trials. New England Journal of Medicine 342(25): 1878-86.

6 Causal Effects under Selection on Time-Invariant Characteristics

6.1 Panel Data Methods

- Fixed Effects and Random Effects Estimation

Readings: Panel Methods Theory

- Angrist and Pischke: Chapter 5.1 ($\star$)
- Angrist and Pischke: Chapter 8 ($\star$)

Readings: Panel Methods Applications

- 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. ($\star$)
- Cox, Gary W., and William Terry. 2008. Legislative Productivity in the 93d-105th Congresses. Legislative Studies Quarterly 33(4): 603-16.
- Berrebi, C. and Klor, E. 2008. Are Voters Sensitive to Terrorism? Direct Evidence from the Israeli Electorate. American Political Science Review (2008), 102:279-301.

6.2 Difference-in-Differences Estimators

- Identification, Estimation, Falsification tests

Readings: DID Theory

- Angrist and Pischke: Chapter 5.2-5.4 ($\star$)
- Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. How Much Should We Trust Differences-in-Differences Estimates? Quarterly Journal of Economics 119(1): 249-75.

Readings: DID Applications

- Lyall, Jason. 2009. Does Indiscriminate Violence Incite Insurgent Attacks? Evidence from Chechnya. Journal of Conflict Resolution 53(3): 331-62.($\star$)
- Card, D. (1990), The Impact of the Mariel Boatlift on the Miami Labor Market, Industrial and Labor Relations Review, vol. 44, 245-257.
- Card, D. and A. B. Krueger (1994), Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania," American Economic Review, vol. 84, 772-793. ($\star$)
- Bechtel, M. and Hainmueller, J. 2011. How Lasting Is Voter Gratitude? An Analysis of the Short- and Long-Term Electoral Returns to Beneficial Policy. American Journal of Political Science, vol. 55 (4), 852-868.

6.3 Synthetic Control Methods

Readings

- Abadie, Diamond, and Hainmueller. 2010. Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. Journal of the American Statistical Association. ($\star$)
- Abadie, Alberto and Javier Gardeazabal. 2003. The Economic Costs of Conflict: a Case-Control Study for the Basque Country. American Economic Review 92 (1).

7 Causal Effects under Selection on Time-variant Characteristics

7.1 Instrumental Variables

- Identification: Using Exogenous Variation in Treatment Intake Given by Instruments
- Imperfect Compliance in Randomized Studies
- Wald Estimator, Local Average Treatment Effects, 2SLS

Readings: Instrumental Variable Theory

- Angrist and Pischke: Chapter 4 ($\star$)
- Morgan and Winship: Chapter 7
- Angrist, Joshua D., and Alan B. Krueger. 2001. Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments.
- Angrist, Imbens, and Rubin 1996. Identification of Causal Effects Using Instrumental Variables. Journal of Economics Perspectives 15(4): 69-85.
- Abadie, Alberto 2003. Semiparametric instrumental variable estimation of treatment response models. Journal of Econometrics 113 (2003) 231-263.

Readings: Instrumental Variable Critique

- Deaton, Angus. 2009. Instruments of Development: Randomization in the Tropics, and the Search for the Elusive Keys to Economic Development. Typescript. Princeton University. ($\star$)
- Hernan, Miguel A., and James M. Robins. 2006. Instruments for Causal Inference: An Epidemiologists Dream? Epidemiology 17(4): 360-72.
- Guido Imbens. Better LATE Than Nothing: Some Comments on Deaton (2009) and Heckman and Urzua (2009) ($\star$)

Readings: Instrumental Variable Applications

- Kern and Hainmueller Opium for the Masses: How Foreign Free Media Can Stabilize Authoritarian Regimes. Political Analysis (2009). ($\star$)
- 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.($\star$)
- Clingingsmith, David, Asim Ijaz Khwaja, and Michael Kremer. 2009. Estimating the Impact of the Hajj: Religion and Tolerance in Islams Global Gathering. Quarterly Journal of Economics 124(3): 1133-1170.
- Stromberg, David. 2004. Radios Impact on Public Spending. Quarterly Journal of Economics 119(1): 189-221.
- Angrist, Joshua D. 1990. Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records. American Economic Review 80(3): 313-36.

7.2 The Regression Discontinuity Design

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

Readings: RDD Theory

- Imbens, Guido W., and Thomas Lemieux. 2008. Regression Discontinuity Designs: A Guide to Practice. Journal of Econometrics 142: 615-35. (Part of special issue on RDD, all of which is of interest.) ($\star$)
- Angrist and Pischke: Chapter 6 ($\star$)
- Hahn, J., P. Todd and W. van der Klaauw (2001), Identification and Estimation of Treatment Effects with a Regression Discontinuity Design, Econometrica, vol. 69: 201-209.

Readings: RDD Applications

- Ferraz, C., and F. Finan. 2008. Motivating Politicians: The Impacts of Monetary Incentives on Quality and Performance. Mimeo. 2009 NBER Working paper w14906.
- Lee, David S. 2008. Randomized Experiments from Non-random Selection in U.S. House Elections. Journal of Econometrics. Volume 142, Issue 2, Pages 675-697. ($\star$)
- Butler, Daniel M., and Matthew J. Butler. 2006. Splitting the Difference? Causal Inference and Theories of Split-Party Delegations. Political Analysis 14(4): 439-55.
- Hainmueller, Jens, and Holger Lutz Kern. 2008. Incumbency as a Source of Spillover Effects in Mixed Electoral Systems: Evidence from a Regression- Discontinuity Design. Electoral Studies 27: 213-27.
- Caughey, Devin and Shekon, Jas. 2010. Regression-Discontinuity Designs and Popular Elections: Implications of Pro-Incumbent Bias in Close U.S. House Races.

7.3 Sensitivity Analysis

- Nonparametric Bounds
- Formal sensitivity tests

Readings

- Guido W. Imbens. 2003. Sensitivity to Exogeneity Assumptions in Program Evaluation. The American Economic Review 93(2): 126–32. ($\star$)
- Morgan and Winship: Chapter 6 ($\star$)
- Rosenbaum, Paul R. 2002. Observational Studies. Springer-Verlag. 2nd edition. Chapter 4.
- Manski, C. 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.
- Paul Rosenbaum and Donald Rubin. 1983. Assessing Sensitivity to an Unobserved Binary Covariate in an Observational Study with Binary Outcome. Journal of the Royal Statistical Society. Series B (Methodological) 45(2): 212-18.

8 Distributional Effects

8.1 Quantile Regression

Readings

- Angrist and Pischke: Chapter 7 ($\star$)
- Roger Koenker, Kevin F. Hallock, Quantile Regression, Journal of Economic Perspectives, Vol. 15, No. 4 (Fall 2001), pp. 143–156

8.2 Distributional Effects in Difference-in-Differences

Readings

- Athey, S. and Imbens, G. Identification and Inference in Nonlinear Difference-in-Differences Models. Econometrica, 74 (2), March 2006, pp. 431–497.