

Syllabus

PSC 504 - Causal Inference

Professor & Term: Anderson Frey, Spring Semester 2019

Room & Time: HARK 329, TR 1030-1200

Office & Hours: HARK 320B, W 1000-1200

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Overview The goal of this course is to give students a comprehensive toolbox for reading and producing cutting-edge applied empirical research, with focus on the theory and practice behind causal inference in social sciences. We will cover methods such as experiments, differences-in-differences, instrumental variables, regression discontinuity, matching and others. Students will read applied papers from both political science and economics, and write review reports examining research designs, identification strategies, and causal claims. They will also produce research proposals that will be presented in class.

Prerequisites In addition to introductory statistics and probability, the course assumes a good knowledge of linear regression. You should have taken at least one graduate class on this subject (such as PSC 404)

Computation I teach the course in R, which is an open-source computing language that is widely used, and easy to learn. The software can be downloaded for free from www.r-project.org. I also recommend downloading RStudio (www.rstudio.com), a very good (and free) user interface for R.

Grading

- Presentation of an unpublished article (15%)
- Homework assignments (35%)
- Final project (35%)
- Participation and presentation (15%)

Presentation of an Unpublished Article Students should find an unpublished empirical article that addresses a causal claim to present in class. The presentation should not only explain in detail the article's research design, but also present your assessment of the identification strategy.

Assignments The assignments consist of a mix of computer simulations, data analysis, and paper replications. All sufficiently attempted work will be graded on a (+,-) scale. Assignments should be typed on the computer. I strongly advise students to use Latex, as it has a much better handling of mathematical equations than the average word processor. Once during the course, students will present their homework results to the class.

Final 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 5-10 pages in length and focus on the research question, data, empirical strategy, results, and conclusions. You also need to submit a copy of your code, allowing me to replicate the main results. 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, policy, or event on some outcome of interest. If you decide write a replication paper, you should go beyond the original analysis in some significant way by applying the techniques learned in the course. Students will present their project to the class. Two days before the presentation, students should email the first draft of the project to the entire class. Everyone is expected to read all these submissions prior to the student presentations that follow. After the presentations, there will be time for questions and discussion.

Presentation and Participation In addition to presenting the unpublished article and their homework results, students will also present their final project. This is a brief ~15-20min presentation that will focus on the empirical methodology employed in the paper.

Books

- Angrist, Joshua D. and Jorn-Steen 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*. Cambridge University Press. 2nd Edition.

Other Useful Books and Summary Articles

- Imbens, Guido W. and Jeffrey Wooldridge. 2009. *Recent Developments in the Econometrics of Program Evaluation*. Journal of Economic Literature 47(1): 5-86.
- Imbens, Guido W. and Donald B. Rubin. 2015. *Causal Inference for Statistics, Social, and Biomedical Sciences An Introduction*. Cambridge University Press.
- Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross Section and Panel Data*. MIT Press.
- Cameron, A. Colin and Pravin K. Trivedi. 2005. *Microeconometrics Methods and Applications*. Cambridge University Press.

Preliminary Reading List

The Potential Outcome Model

- Angrist and Pischke: Chapter 1*
- Morgan and Winship: Chapter 1-2*
- 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.
- Heckman, James J. and Hidehiko Ichimura and Jeffrey Smith and Petra Todd. 1996. *Sources of Selection Bias in Evaluating Social Programs: An Interpretation of Conventional Measures and Evidence on the Effectiveness of Matching as a Program Evaluation Method*. Proceedings of the National Academy of Sciences 93(23): 13416-13420.
- Heckman, James and Justin L. Tobias and Edward Vytlacil. 2001. *Four parameters of interest in the evaluation of social programs*. Southern Economic Journal, Vol. 68, No. 2, pp. 210-223.

Regression and Bias

- Angrist and Pischke: Chapter 3*
- Morgan and Winship: Chapter 8*
- Aronow, P. M. and Cyrus Samii. 2015. *Does Regression Produce Representative Estimates of Causal Effects?*. American Journal of Political Science 60(1): 250-267.
- Samii, C. 2016. *Causal Empiricism in Quantitative Research*. The Journal of Politics, 78(3): 941-955.

Randomized Experiments

- Angrist and Pischke: Chapter 2*
- Imbens and Rubin: Chapters 4-5*
- Imbens, Guido. 2010. *Better LATE than nothing: some comments on Deaton (2009) and Heckman and Urzua (2009)*. Journal of Economic Literature 48(2): 399-423.*
- Deaton, Angus. 2010. *Instruments, Randomization, and Learning about Development*. Journal of Economic Literature 48(2): 424-455.

- Anderson, M. L. 2008. *Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool and Early Training projects*. Journal of the American Statistical Association 103(484): 1481–1495.
- List, John A. 2011. *Why economists should conduct field experiments and 14 tips for pulling one off*. Journal of Economic Perspectives 25(3): 3-16.
- Dunning, Thad. 2012. *Natural Experiments in the Social Sciences: A Design-Based Approach*. New York: Cambridge University Press.
- List, John A. and Steven Levitt. 2006. *What Do Laboratory Experiments Tell Us About the Real World?* University of Chicago and NBER.
- Bloom, Howard S. 2006. *The Core Analytics of Randomized Experiments for Social Research*. MDRC Working Papers on Research Methodology.
- Duflo, Esther and Abhijit Banerjee and Rachel Glennerster and Michael Kremer. 2006. *Using Randomization in Development Economics: A Toolkit*. Handbook of Development Economics.

Examples

- Wantchekon, Leonard. 2003. *Clientelism and Voting Behavior: Evidence from a Field Experiment in Benin* *World Politics*. 55 (3): 399-422. **
- 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.**
- Olken, Benjamin. 2007. *Monitoring corruption : Evidence from a field experiment in Indonesia*. *Journal of Political Economy* 115 (2): 200-249.
- Gerber, Alan S. and 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.

Matching and Propensity Score

- Morgan and Winship: Chapter 4-5 *
- Acemoglu, D. 2005. *Constitutions, Politics, and Economics: A Review Essay on Persson and Tabellini's The Economic Effects of Constitutions*. *Journal of Economic Literature* XLIII: 1025-1048*
- Sekhon, Jasjeet S. 2009. *Opiates for the Matches: Matching Methods for Causal Inference*. *Annual Review of Political Science* 12: 487-508. *
- Caliendo, Marco and Sabine Kopeinig. 2008. *Some practical guidance for the implementation of propensity score matching*. *Journal of Economic Surveys* 22(1): 31-72.

- Imbens, Guido. 2015. *Matching Methods in Practice: Three Examples*. Journal of Human Resources Spring 50(2): 373-419.
- Ho, Daniel E. and Kosuke Imai and 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.
- Heckman, James J., Hidehiko Ichimura, and Petra Todd. 1997. *Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme*. Review of Economic Studies 64(4): 605-654.
- Smith, Jeffrey A. and Petra E. Todd. 2001. *Reconciling conflicting evidence on the performance of propensity score matching methods*. American Economic Review Papers and Proceedings 91(2): 112-118.
- Morgan, Stephen and David Harding. 2006. *Matching Estimators of Causal Effects: Prospects and Pitfalls in Theory and Practice*. Sociological Methods Research 35(1): 3-60.

Examples

- Zucco, Cesar. 2013. *When Payouts Pay Off: Conditional Cash Transfers and Voting Behavior in Brazil 2002–10*. American Journal of Political Science 57(4): 810-822.**
- Blattman, C. and Annan, J. 2010. *The Consequences of Child Soldiering*. The Review of Economics and Statistics 92(4).**
- Lyall, Jason. 2010. *Are Co-Ethnics More Effective Counter-Insurgents? Evidence from the Second Chechen War*. American Political Science Review 104(1): 1-20.
- 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
- Blattman, Christopher. 2009. *From Violence to Voting: War and Political Participation in Uganda*. American Political Science Review 103 (2): 231-24.

Robust Inference

- Angrist and Pischke: Chapter 8 *
- Cameron and Trivedi: Chapter 11 **

Synthetic Controls

- Abadie, Alberto and Alexis Diamond and Jens Hainmueller. 2015. *Comparative Politics and the Synthetic Control Method*. American Journal of Political Science. 59(2): 495-510.*

- Abadie, Alberto and Alexis Diamond and Jens Hainmueller. 2009. *Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program*. Journal of the American Statistical Association

Examples

- Acemoglu, Daron and Simon Johnson and Amir Kermani and James Kwak and Todd Mitton. 2016. *The Value of Connections In Turbulent Times: Evidence from the United States*. Journal of Financial Economics 121(2): 368–391**
- Bohn, Sarah and Magnus Lofstrom and Steven Raphael. 2014. *Did the 2007 Legal Arizona Workers Act Reduce the State's Unauthorized Immigrant Population?* Review of Economics and Statistics 96(2): 258-269. **

Differences-in-Differences

- Angrist and Pischke: Chapter 5.2-5.4*
- Bertrand, Marianne and Esther Duflo and Sendhil Mullainathan. 2004. *How Much Should We Trust Differences-in-Differences Estimates?* Quarterly Journal of Economics 119(1): 249-75.
- Athey, Susan and Guido Imbens. 2006. *Identification and Inference in Nonlinear Difference-in-Differences Models*. Econometrica 74(2): 431-497.
- Donald, Stephen G. and Kevin Lang. 2007. *Inference with Difference in Differences and Other Panel Data*. The Review of Economics and Statistics 89(2).

Examples

- Lyall, Jason. 2009. *Does Indiscriminate Violence Incite Insurgent Attacks? Evidence from Chechnya*. Journal of Conflict Resolution 53 (3): 331-62. **
- Fujiwara, Thomas. 2015. *Voting Technology, Political Responsiveness, and Infant Health: Evidence from Brazil*. Econometrica 83(2): 423-464. **
- 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.
- Bundervoet, Tom and Richard Akresh and Philip Verwimp. 2009. *Health and Civil War in Rural Burundi*. Journal of Human Resources 44(2): 536-563.

Panel Data

- Angrist and Pischke: Chapter 5.1*
- Cameron and Trivedi: Chapter 21*
- Imbens and Wooldridge: Sections 1-4
- Kim, In Song and Kosuke Imai. *On the Use of Linear Fixed Effects Regression Estimators for Causal Inference*. Working Paper.

Examples

- La Ferrara, Eliana and 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.

Instrumental Variables

- Angrist and Pischke: Chapter 4*
- Morgan and Winship: Chapter 9*
- Angrist, Joshua D. and 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.
- Sovey, Allison J. and Donald P. Green. 2011. *Instrumental Variables Estimation in Political Science: A Readers Guide*. American Journal of Political Science 55(1): 188-200.
- Deaton, Angus. 2010. *Instruments, Randomization, and Learning About Development*. Journal of Economic Literature 48(2): 424-455.
- Heckman, James J. and Sergio Urzua. 2001. *Comparing IV with structural models: What simple IV can and cannot identify*. Journal of Econometrics 156(1): 27-37.
- Imbens, Guido. 2010. *Better LATE than nothing: some comments on Deaton (2009) and Heckman and Urzua (2009)*. Journal of Economic Literature, Vol. 48 (2): 424-455.
- Stock, James H. and Francesco Trebbi. 2003. *Retrospectives: Who invented Instrumental Variable Regression?* Journal of Economic Perspectives, Vol. 17 (3): 177-194.

Examples

- Acemoglu, Daron and Simon Johnson and James A. Robinson. 2001. *The Colonial Origins of Comparative Development: An Empirical Investigation*. American Economic Review 91(5): 1369-1401.**
- Miguel, Edward and Shanker Satyanath and Ernest Sergenti. 2004. *Economic shocks and civil conflict: an instrumental variables approach*. J. Polit. Econ. 112(4): 725–753.**
- 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.
- Angrist, Joshua D. and Alan B. Krueger. 2001. *Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments*. Journal of Economic Perspectives, 15(4): 69-85.
- Rogall, Thorsten. 2014. *Mobilizing the Masses for Genocide*. Working Paper.

Regression Discontinuity

- Mostly Harmless Econometrics: Chapter 6.*
- Imbens, Guido W. and Thomas Lemieux. 2008. *Regression Discontinuity Designs: A Guide to Practice*. Journal of Econometrics 142: 615-35.*
- Skovron, Christopher and Rocío Titiunik. 2015. *A Practical Guide to Regression Discontinuity Designs in Political Science*. Working Paper.*
- Lee, David S. and Thomas Lemieux. 2010. *Regression Discontinuity Designs in Economics*. Journal of Economic Literature 48 (2): 281-355.
- Hahn, J., P. Todd and W. van der Klaauw. 2001. *Identification and Estimation of Treatment Effects with a Regression Discontinuity Design*. Econometrica 69: 201-209.
- McCrary, Justin . 2008. *Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test*, Journal of Econometrics 142(2): 698-714.
- Calonico, Sebastián and Rocío Titiunik and Matías Cattaneo. 2014. *Robust Nonparametric Confidence Intervals for Regression-Discontinuity Designs*. Econometrica 82(6): 2295–2326.

Examples

- 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. 2015. *On the Validity of the Regression Discontinuity Design for Estimating Electoral Effects: New Evidence from Over 40,000 Close Races*. American Journal of Political Science 59(1): 259–274.**
- Lee, David S. 2008. *Randomized Experiments from Non-random Selection in U.S. House Elections*. Journal of Econometrics 142 (2): 675-697.

- Fujiwara, Thomas. 2015. *Voting Technology, Political Responsiveness, and Infant Health: Evidence from Brazil*. *Econometrica* 83(2): 423-464.

Multivariate RDD

- Zajonc, Tristan. 2012. *Essays on Causal Inference for Public Policy*. PhD Dissertation. Harvard University: 45-92*
- Frey, Anderson. 2015. *Cash Transfers, Clientelism, and Political Enfranchisement: Evidence from Brazil*. Working Paper.**
- Dell, Melissa. 2010. *The Persistent Effects of Peru's Mining Mita*. *Econometrica* 78 (6): 1863–1903.**
- Titiunik, Rocío and Luke Keele. 2015. *Geographic Boundaries as Regression Discontinuities*. *Political Analysis* 23(1): 127-155.

Mediation Analysis

- Imai, Kosuke and Luke Keele and Dustin Tingley and Teppei Yamamoto. 2011. *Unpacking the Black Box of Causality: Learning about Causal Mechanisms from Experimental and Observational Studies*. *American Political Science Review* 105 (4): 765-789.*
- Heckman, James J. and Rodrigo Pinto. 2015. *Econometric Mediation Analyses: Identifying the Sources of Treatment Effects from Experimentally Estimated Production Technologies with Unmeasured and Mismeasured Inputs*. *Econometric Reviews* 34 (1-2): 6-3*

Examples

- Heckman, James and Rodrigo Pinto and Peter Savelyev. 2013. *Understanding the Mechanisms through Which an Influential Early Childhood Program Boosted Adult Outcomes*. *American Economic Review* 103(6): 2052-86**

Sensitivity Analysis

- Morgan and Winship: Chapter 12*
- Blackwell, Matthew. 2013. *A Selection Bias Approach to Sensitivity Analysis for Causal Effects*. *Political Analysis*. *
- Imbens, Guido W. 2003. *Sensitivity to Exogeneity Assumptions in Program Evaluation*. *The American Economic Review* 93 (2): 126-32.

Examples

- Altonji, Joseph and Todd E. Elder and Christopher Taber. 2005. *Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools*. *Journal of Political Economy* 113: 151-184. **
- Rosenbaum, Paul R. 2009. *Application of Sensitivity Analysis in Matched Observational Studies*. *Journal of the American Statistical Association* 104 (488): 1398-1405.