

Mastering 'Metrics: An Empirical Strategies Workshop

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These lectures cover the empirical strategies discussed in Master Joshway Angrist and Master Steve Pischke's *Mostly Harmless Econometrics* (MHE) and especially the newly released *Mastering 'Metrics* (MM). Theoretical ideas are illustrated with examples. Topics to be covered include randomized trials, regression, instrumental variables, regression discontinuity designs, and differences-in-differences.

The atmosphere is informal, but I ask you to put laptops, phones, and iPads away. I encourage questions and discussion – I'll be asking you questions too!

Lecture 1-2: Random Assignment/Regression Review

Randomized Trials

Why randomize?

Examples: In sickness and in health (insurance)

Regression Mechanics

3 reasons to love

The long and short of regression anatomy
Omitted Variables Bias
Limited dependent variables and marginal effects

Causal Regression

Potential outcomes
Causal vs. casual

Lecture 3-4: Instrumental Variables in Constant Effects Models

IV and omitted variables bias: estimating a long regression without controls
Two-stage least squares (2SLS); 2SLS lingo and mistakes
The Wald estimator, grouped data, and two-sample IV
The bias of 2SLS

Lectures 5-6: Instrumental Variables with Heterogeneous Potential Outcomes

Basics

Local average treatment effects; understanding *compliers*
IV in randomized trials

Additional Topics

Average causal response in models with variable treatment intensity
External validity

Lecture 7: Regression Discontinuity Designs

RD Theory: Parametric and Non

RD bandwidth
RD problems

RD Applications

Birthdays and funerals
Exam time

Lecture 8: Parallel Worlds

Differences-in differences
DD spec checks and frontiers

READINGS

- J.D. Angrist and J.S. Pischke, *Mastering 'Metrics: The Path from Cause to Effect*, Princeton University Press, 2014 (MM)
J.D. Angrist and J.S. Pischke, *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, 2009 (MHE)

Texts can be purchased in paperback or for Kindle. Published journal articles should be available in JSTOR. Working papers are available from online sources.

RANDOMIZED TRIALS AND REGRESSION RECAP

MM Chapters 1-2; *MHE*, Chapters 1-2 and 3.1-3.2.

These chapters introduce our experimentalist perspective on applied econometrics. *MM* Chapter 2 covers regression basics. *MHE* Chapter 3 presents more advanced material related to regression and matching.

- A. Aron-Dine, L. Einav, and A. Finkelstein, "The RAND Health Insurance Experiment Three Decades Later," *J. of Economic Perspectives* 27 (Winter 2013), 197-222.
R.H. Brook, et al., "Does Free Care Improve Adults' Health?," *New England J. of Medicine* 309 (Dec. 8, 1983), 1426-1434.
S. Taubman, *et al.*, "Medicaid Increases Emergency-Department Use: Evidence from Oregon's Health Insurance Experiment," *Science*, Jan 2, 2014.
S.B. Dale and A.B. Krueger, "Estimating the Payoff to Attending a More Selective College: An Application of Selection on Observables and Unobservables," *The Quarterly Journal of Economics* 117, November 2002, 1491-1529.

Limited dependent variables and marginal effects

MHE 3.4.2

INSTRUMENTAL VARIABLES (Part 1)

MM, Chapter 3 and MHE, Section 4.1

- J. Angrist and A. Krueger, "Instrumental Variables and the Search for Identification," *Journal of Economic Perspectives*, Fall 2001.
- J. Angrist, "Grouped Data Estimation and Testing in Simple Labor Supply Models," *Journal of Econometrics*, February/March 1991.
- J. Angrist, "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records," *American Economic Review*, June 1990.
- J. Angrist and A. Krueger, "Split-Sample Instrumental Variables Estimates of the Returns to Schooling," *JBES*, April 1995.
- Inoue, Atsushi and G.Solon, "Two-Sample Instrumental Variables Estimators," *The Review of Economics and Statistics*, August 2010.

2SLS Mistakes: MHE, Section 4.6.1.

The bias of 2SLS

MHE, Section 4.6.4

- J. Angrist, G. Imbens, and A. Krueger, "Jackknife Instrumental Variables Estimation," *Journal of Applied Econometrics* 14(1), 57-67.
- Flores-Lagunes, Alfonso, "Finite-Sample Evidence on IV Estimators with Weak Instruments," *Journal of Applied Econometrics* 22, 2007, 677-694.
- J. Hausman, *et al.*, "Instrumental Variable Estimation with Heteroskedasticity and Many Instruments," *Quantitative Economics* 3(2), July 2012.

INSTRUMENTAL VARIABLES WITH HETEROGENEOUS POTENTIAL OUTCOMES

MHE, Section 4.4

- G. Imbens and J. Angrist, "Identification and Estimation of Local Average Treatment Effects," *Econometrica*, March 1994.
- J. Angrist, G. Imbens, and D. Rubin, "Identification of Causal effects Using Instrumental Variables," with comments and rejoinder, *JASA*, 1996.
- J. Angrist and A. Krueger, "Does Compulsory Schooling Attendance Affect Schooling and Earnings?," *Quarterly Journal of Economics* 106, November 1991, 979-1014.
- J. Angrist, "Instrumental Variables in Experimental Criminological Research: What, Why, and How," *Journal of Experimental Criminological Research* 2, 2005, 1-22.
- J. Angrist, *et al.*, "Who benefits from KIPP?," *J. of Policy Analysis and Management*, Fall 2012.

Models with variable and continuous treatment intensity

MHE, Section 4.5.3

- J. Angrist and G. Imbens, "Two-Stage Least Squares Estimation of Average Causal Effects in Models with Variable Treatment Intensity," *JASA*, June 1995.
- J. Angrist, K. Graddy, and G. Imbens, "The Interpretation of instrumental Variables

Estimations in Simultaneous Equations Models with an Application to the Demand for Fish," *Rev. Ec. Studies* 67 (2000), 499-527.

External Validity

- J. Angrist, V. Lavy, and Analia Schlosser, "Multiple Experiments for the Causal Link Between the Quantity and Quality of Children," *The Journal of Labor Economics*, October 2010.
- J. Angrist and I. Fernandez-Val, "Extrapo-LATEing: External Validity and Overidentification in the LATE Framework," *Advances in Economics and Econometrics*, Volume III (Tenth World Congress), May 2013.

REGRESSION-DISCONTINUITY DESIGNS

MM, Chapter 4 and MHE, Chapter 6

- T. Cook, "Waiting for Life to Arrive: A History of the Regression-Discontinuity Design in Psychology, Statistics, and Economics," *Journal of Econometrics* 142 (2008), 636-654.
- G. Imbens and T. Lemieux, "Regression Discontinuity Designs: A Guide to Practice," *Journal of Econometrics* 142 (2008), 615-35.
- D. Lee, "Randomized Experiments from Non-Random Selection in U.S. House Elections," *Journal of Econometrics* 142, 2008.
- J. Hahn, P. Todd, and W. van der Klaauw, "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design," *Econometrica* 69 (2001), 201-209.
- J. Angrist and V. Lavy, "Using Maimonides Rule to Estimate the Effect of Class Size on Scholastic Achievement," *QJE*, May 1999

RD Problems and Frontiers: Sorting, Quantiles, Heaping, Inference

- J. McCrary, "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test," *Journal of Econometrics* 142 (February 2008).
- M. Urquiola and E. Verhoogen, "Class Size Caps, Sorting, and the Regression Discontinuity design," *The American Economic Review*, March 2009.
- B. Frandsen, M. Froelich, and B. Melly, "Quantile Treatment Effects in the RD Design," *Journal of Econometrics*, 168, 2012.
- D. Almond, J. Doyle, A. Kowalski, and H. Williams, "Estimating the Marginal Returns to Medical Care: Evidence from At-Risk Newborns," *QJE* 125 (2010).
- A. Barreca, M. Guildi, J. Lindo, and G. Waddell, "Saving Babies? Revisiting the Effect of Very Low Birthweight Classification," *QJE*, November 2011.
- D. Almond, *et al.*, "Reply to Barreca, *et al.*," Same issue.
- M. Cattaneo, B. Frandsen, and R. Titiunik, "Randomization Inference in the Regression Discontinuity Design: An Application to Party Advantages in the US Senate," *Journal of Causal Inference* 3(1), March 2015.

RD Bandwidth Selection

- J. Ludwig and D. Miller, "Does Head Start Improve Children's Life Chances? Evidence from a Regression Discontinuity Design," NBER Working Paper 11702, October 2005.
- G. Imbens and K. Kalyanaraman, "Optimal Bandwidth Choice for the Regression Discontinuity Estimator," *The ReStud* 2011.
- S. Calonico, M. Cattaneo, and R. Titiunik, "Robust Nonparametric Confidence Intervals for Regression Discontinuity Designs," *Econometrica* 82(6), November 2014.
- S. Calonico, M. Cattaneo, and R. Titiunik, "Optimal Data-driven Regression Discontinuity Plots," forthcoming, *JASA* 2015.

Killer Apps

- C. Carpenter and C. Doblin, "The Effect of Alcohol Consumption on Mortality: Regression Discontinuity Evidence from the Minimum Legal Drinking Age," *AEJ:AE* (January 2009), 164-82.
- C. Carpenter and C. Dobkin, "The Minimum Legal Drinking Age and Public Health," *JEP* 25 (Spring 2011), 133-156.
- D. Clark, "The Performance and Competitive Effects of School Autonomy," *JPE* 117 (Aug. 2009), 745-783.
- D. Almond and J. Doyle, "After Midnight: A Regression Discontinuity Design in the Length of Postpartum Hospital Stays," *AEJ: EP* 2 (2011), 1-34.
- A. Abdulkadiroglu, J. Angrist, and P. Pathak, "The Elite Illusion: Achievement Effects at Boston and New York Exam Schools," *Econometrica* 2014.

Extrapolation

- J. Angrist and M. Rokkanen, "Wanna get Away? RD identification Away from the Cutoff," NBER Working Paper 18662, December 2012 (forthcoming in *JASA*).
- M. Rokkanen, "Exam Schools, Ability, and the Effects of Affirmative Action: Latent Factor Extrapolation in the Regression Discontinuity Design," Columbia Department of Economics, mimeo, March 2015.
- Yingying Dong and Arthur Lewbel, "Identifying the Effect of Changing the Policy Threshold in Regression Discontinuity Models," forthcoming in *The Review of Economics and Statistics*, 2015.

DIFFERENCES-IN-DIFFERENCES

MM, Chapter 5 and *MHE*, Chapter 5

- C. Carpenter and C. Dobkin, "The Minimum Legal Drinking Age and Public Health," *The Journal of Economic Perspectives* 25 (2011), 133-156.
- A. Abadie, A. Diamond, and J. Hainmueller, "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *JASA* 105, June 2010.
- S. Athey and G. Imbens, "Identification and Inference in Nonlinear Differences-in-differences Models," *Econometrica* 74 (2006).