

HCMG 901: Applied Econometrics

Spring 2020

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Overview

This course introduces econometric methods widely used in applied economics research. The main goal of the class is for you to make significant progress in your ability to conduct high quality, econometrically sound empirical analysis. Concepts, applications, and practice are emphasized, as opposed to technical derivations of estimators and their properties. The focus is on linear (least squares) and non-linear (e.g. quantile, discrete, count, two-part, and duration) regression models. We cover several modern research designs in detail - difference-in-differences, triple differences, selection on observables (matching, propensity score), instrumental variables, synthetic controls, regression discontinuity, regression kink, and bunching.

Readings

The reading list comprises published articles and some working papers, which should be read *prior* to class. The papers have been chosen to illustrate the application, generally recent, of different empirical methods and strategies. While the reading list is extensive, I will typically ask students to read 2-3 papers (thoroughly) per class. The remaining papers are listed as useful references. I will post required papers on Canvas. While there is no assigned text book for the class, we will closely follow *Mostly Harmless Econometrics: An Empiricist's Companion* by Angrist and Pischke. In addition, you may refer to select chapters in Andrew Jones' primer, *Applied Econometrics for Health Economists: A Practical Guide* (OHE Research, 2nd ed., 2007) and J. Wooldridge, *Econometric Analysis of Cross Section and Panel Data*.

Logistics

The class will meet every Monday 3-6 pm, Colonial Penn Center. Chestnut Room.
Office hours by appointment.

Other Requirements and Grading

In addition to reading the assigned papers prior to class, you are required to:

- Complete 3-4 homework assignments. These will mainly involve hands-on data analysis using a supplied data set drawn from the Medical Expenditure Panel Survey or replicate existing papers.
- Attend selected research seminars as requested and possible.
- Data project - replicate analysis from a paper of your interest, or perform original analysis. Report your analysis and results in a 4-5 page write-up.
- Present to the class a paper from the reading list
- Final exam – this will draw on the class material and homework.

Grading: Project – 20%; participation and assignments – 40%; final – 40%

Course outline and Readings

* Indicates student presentation of a paper from the reading list for that class (45 min)

† Indicates papers to be read prior to the class

I. Jan 15 - Introduction and background [**Note: This is a Wednesday**]

- A. Course overview
- B. Potential outcomes and causal inference
- C. Recap of basic estimators (OLS, GLS, WLS) and inference

MHE Chapter 2

†Krueger, Alan B. "How computers have changed the wage structure: evidence from microdata, 1984–1989." *The Quarterly Journal of Economics* 108, no. 1 (1993): 33-60.

†DiNardo, John E., and Jörn-Steffen Pischke. "The returns to computer use revisited: Have pencils changed the wage structure too?" *The Quarterly Journal of Economics* 112, no. 1 (1997): 291-303.

Angrist, Joshua D., and Jörn-Steffen Pischke. "The credibility revolution in empirical economics: How better research design is taking the con out of econometrics." *Journal of economic perspectives* 24, no. 2 (2010): 3-30.

Jan 20 – No class, MLK Day

II. Jan 27 - Classical estimation and testing (Contd.)

- A. Recap of basic estimators (OLS, GLS, WLS) and inference
- B. Weighting

MHE Chapters 2, 3 (excl. 3.3)

Solon, Gary, Steven J. Haider, and Jeffrey M. Wooldridge. "What are we weighting for?" *Journal of Human resources* 50, no. 2 (2015): 301-316.

III. Feb 3 - Classical estimation and testing (contd.) and Matching

- A. Log transformation
- B. Matching / propensity score

MHE Chapter 3.3

Manning, Willard G. "The logged dependent variable, heteroscedasticity, and the retransformation problem." *Journal of health economics* 17, no. 3 (1998): 283-295.

†Manning, Willard G., and John Mullahy. "Estimating log models: to transform or not to transform?" *Journal of health economics* 20, no. 4 (2001): 461-494.

†LaLonde, Robert J. "Evaluating the econometric evaluations of training programs with experimental data." *The American economic review* (1986): 604-620.

Heckman, James J., Hidehiko Ichimura, and Petra E. Todd. "Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme." *The review of economic studies* 64, no. 4 (1997): 605-654.

Angrist, Joshua D. "Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicants." *Econometrica* (1998): 249-288.

†Dehejia, Rajeev H., and Sadek Wahba. "Propensity score-matching methods for nonexperimental causal studies." *Review of Economics and statistics* 84, no. 1 (2002): 151-161.

Imbens, Guido W. "Nonparametric estimation of average treatment effects under exogeneity: A review." *The review of Economics and Statistics* 86, no. 1 (2004): 4-29.

†Smith, Jeffrey A., and Petra E. Todd. "Does matching overcome LaLonde's critique of non-experimental estimators?" *Journal of econometrics* 125, no. 1-2 (2005): 305-353.

Blackwell, Matthew, Stefano Iacus, Gary King, and Giuseppe Porro. "cem: Coarsened exact matching in Stata." *The Stata Journal* 9, no. 4 (2009): 524-546.

*Sarsons, Heather. "Interpreting signals in the labor market: evidence from medical referrals." *Job Market Paper* (2017).

IV. Feb 10 - Instrumental variables (Part 1)

A. Basic concepts

MHE Chapter 4

†Angrist, Joshua D. "Lifetime earnings and the Vietnam era draft lottery: evidence from social security administrative records." *The American Economic Review* (1990): 313-336.

Angrist, Joshua D., and William N. Evans. "Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size." *American Economic Review* 88, no. 3 (1998): 450-477.

Angrist, Joshua D., and Alan B. Keueger. "Does compulsory school attendance affect schooling and earnings?" *The Quarterly Journal of Economics* 106, no. 4 (1991): 979-1014.

Imbens, Guido W., and Joshua D. Angrist. "Identification and Estimation of Local Average Treatment Effects." *Econometrica* 62, no. 2 (1994): 467-475.

†Angrist, Joshua D., Guido W. Imbens, and Donald B. Rubin. "Identification of Causal Effects Using Instrumental Variables." *Journal of the American Statistical Association* 91, no. 434 (1996): 444-55.

Angrist, Joshua D., and Alan B. Krueger. "Instrumental variables and the search for identification: From supply and demand to natural experiments." *Journal of Economic perspectives* 15, no. 4 (2001): 69-85.

Keane, Michael P. "Structural vs. atheoretic approaches to econometrics." *Journal of Econometrics* 156, no. 1 (2010): 3-20.

V. Feb 17 - Instrumental variables (Part 2)

A. LATE applications

Finkelstein, Amy, Sarah Taubman, Bill Wright, Mira Bernstein, Jonathan Gruber, Joseph P. Newhouse, Heidi Allen, Katherine Baicker, and Oregon Health Study Group. "The Oregon health insurance experiment: evidence from the first year." *The Quarterly journal of economics* 127, no. 3 (2012): 1057-1106.

†Maestas, Nicole, Kathleen J. Mullen, and Alexander Strand. "Does disability insurance receipt discourage work? Using examiner assignment to estimate causal effects of SSDI receipt." *American Economic Review* 103, no. 5 (2013): 1797-1829.

†Doyle Jr, Joseph J., John A. Graves, Jonathan Gruber, and Samuel A. Kleiner. "Measuring returns to hospital care: Evidence from ambulance referral patterns." *Journal of Political Economy* 123, no. 1 (2015): 170-214.

*Akerman, Anders, Ingvil Gaarder, and Magne Mogstad. "The skill complementarity of broadband internet." *The Quarterly Journal of Economics* 130, no. 4 (2015): 1781-1824.

Brinch, Christian N., Magne Mogstad, and Matthew Wiswall. "Beyond LATE with a discrete instrument." *Journal of Political Economy* 125, no. 4 (2017): 985-1039.

VI. Feb 24 - Instrumental variables (Part 3) and Student proposals

- A. Marginal Treatment Effects
- B. Proposal presentations (10-15 min each)

Heckman, James J., Sergio Urzua, and Edward Vytlacil. "Understanding instrumental variables in models with essential heterogeneity." *The Review of Economics and Statistics* 88, no. 3 (2006): 389-432.

†Doyle Jr, Joseph J. "Child protection and child outcomes: Measuring the effects of foster care." *American Economic Review* 97, no. 5 (2007): 1583-1610.

March 3 - Spring Break

VII. March 10 - Panel data approaches (Part 1)

- A. Fixed effects, Random effects
- B. Differences in differences, triple differences

MHE Chapter 5

†Card, David, and Alan B. Krueger. "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania." *The American Economic Review* 84, no. 4 (1994): 772-793.

†Gruber, Jonathan. "The Incidence of Mandated Maternity Benefits." *The American Economic Review*, vol. 84, no. 3, 1994, pp. 622–641.

Acemoglu, Daron, and Amy Finkelstein. "Input and technology choices in regulated industries: Evidence from the health care sector." *Journal of Political Economy* 116, no. 5 (2008): 837-880.

Finkelstein, Amy. "The aggregate effects of health insurance: Evidence from the introduction of Medicare." *The quarterly journal of economics* 122, no. 1 (2007): 1-37.

*Craig Garthwaite, Tal Gross, and Matthew Notowidigdo, Public Health Insurance, Labor Supply, and Employment Lock, *Quarterly Journal of Economics* (2014): 653-696.

VIII. March 17 - Panel data approaches (Part 2)

- A. Synthetic controls
- B. Clustering

†Abadie, Alberto, Alexis Diamond, and Jens Hainmueller. "Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program." *Journal of the American statistical Association* 105, no. 490 (2010): 493-505.

Moulton, Brent R. "Random group effects and the precision of regression estimates." *Journal of econometrics* 32, no. 3 (1986): 385-397.

†Moulton, Brent R. "An illustration of a pitfall in estimating the effects of aggregate variables on micro units." *The review of Economics and Statistics* (1990): 334-338.

Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. "Bootstrap-based improvements for inference with clustered errors." *The Review of Economics and Statistics* 90, no. 3 (2008): 414-427.

†Bertrand, M., E. Duflo, and S. Mullainathan, (2004): "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, Vol 119, 249-275.

Abadie, Alberto, Susan Athey, Guido W. Imbens, and Jeffrey Wooldridge. "When should you adjust standard errors for clustering?" No. w24003. National Bureau of Economic Research, 2017.

IX. March 24 – Density based designs

- A. RD, RD-DD
- B. RK

MHE Chapter 6

Imbens, Guido W., and Thomas Lemieux. "Regression discontinuity designs: A guide to practice." *Journal of econometrics* 142, no. 2 (2008): 615-635.

†Lee, David S., and Thomas Lemieux. "Regression discontinuity designs in economics." *Journal of economic literature* 48, no. 2 (2010): 281-355.

Lee, David S. "Randomized experiments from non-random selection in US House elections." *Journal of Econometrics* 142, no. 2 (2008): 675-697.

Hahn, J., P. Todd, and W. Van der Klaauw, (2001), "Identification and Estimation of Treatment Effects with a Regression Discontinuity Design", *Econometrica*, Vol 69, No. 1, 201-209.

Gelman, Andrew, and Guido Imbens. "Why high-order polynomials should not be used in regression discontinuity designs." *Journal of Business & Economic Statistics* (2018): 1-10.

Black, Sandra E. "Do better schools matter? Parental valuation of elementary education." *The Quarterly Journal of Economics* 114, no. 2 (1999): 577-599.

†Card, David, Carlos Dobkin, and Nicole Maestas. "Does Medicare save lives?" *The quarterly journal of economics* 124, no. 2 (2009): 597-636.

*Anderson, Michael, Carlos Dobkin, and Tal Gross. "The effect of health insurance coverage on the use of medical services." *American Economic Journal: Economic Policy* 4, no. 1 (2012): 1-27.

McCrary, Justin. "Manipulation of the running variable in the regression discontinuity design: A density test." *Journal of econometrics* 142, no. 2 (2008): 698-714.

Lalive, Rafael. "How do extended benefits affect unemployment duration? A regression discontinuity approach." *Journal of econometrics* 142, no. 2 (2008): 785-806.

Card, David, David S. Lee, Zhuan Pei, and Andrea Weber. *Regression Kink Design: Theory and Practice*. No. w22781. National Bureau of Economic Research, 2016.

Angrist, Joshua D., Victor Lavy, Jetson Leder-Luis, and Adi Shany. "Maimonides' Rule Redux." *American Economic Review: Insights* 1, no. 3 (2019): 309-24.

X. March 31 – Bunching and Quantile regression

- A. Bunching
- B. Quantile regression

MHE Chapter 7

Abadie, Alberto, Joshua Angrist, and Guido Imbens. "Instrumental variables estimates of the effect of subsidized training on the quantiles of trainee earnings." *Econometrica* 70, no. 1 (2002): 91-117.

Buchinsky, Moshe. "Changes in the US wage structure 1963-1987: Application of quantile regression." *Econometrica: Journal of the Econometric Society* (1994): 405-458.

Chernozhukov, Victor, and Christian Hansen. "An IV model of quantile treatment effects." *Econometrica* 73, no. 1 (2005): 245-261.

Chernozhukov, V., Fernández-Val, I., Kowalski, A.E. (2014), *Quantile Regression With*

Censoring and Endogeneity, *The Journal of Econometrics*, 186, 201--221.

†Goldberg, Pinelopi. "Dealer price discrimination in new car purchases: Evidence from the consumer expenditure survey." *Journal of Political Economy* 104, no. 3 (1996): 622-654.

†Gruber, Jonathan, Thomas P. Hoe, and George Stoye. Saving lives by tying hands: The unexpected effects of constraining health care providers. No. w24445. National Bureau of Economic Research, 2018.

Koenker, Roger, and Gilbert Bassett Jr. "Regression quantiles." *Econometrica: journal of the Econometric Society* (1978): 33-50.

Kowalski, Amanda. "Censored quantile instrumental variable estimates of the price elasticity of expenditure on medical care." *Journal of Business & Economic Statistics* 34, no. 1 (2016): 107-117.

Manoli, Day, and Andrea Weber. "Nonparametric evidence on the effects of financial incentives on retirement decisions." *American Economic Journal: Economic Policy* 8, no. 4 (2016): 160-182.

Persson, Petra. "Social insurance and the marriage market." *Journal of Political Economy* 128, no. 1 (2020): 000-000.

XI. April 7 – Limited dependent variables

A. Logit, Probit

B. Count data models

Jones Chapters 3-6, 9-10

Ethan Katz, Bias in Conditional and Unconditional Fixed Effects Logit Estimation, *Political Analysis* 9(2001): 379-384.

†Mullahy, John. "Heterogeneity, excess zeros, and the structure of count data models." *Journal of Applied Econometrics* 12, no. 3 (1997): 337-350.

†Mullahy, John. "Instrumental-variable estimation of count data models: Applications to models of cigarette smoking behavior." *Review of Economics and Statistics* 79, no. 4 (1997): 586-593.

Budish, Eric, Benjamin N. Roin, and Heidi Williams. "Do firms underinvest in long-term research? Evidence from cancer clinical trials." *American Economic Review* 105, no. 7 (2015): 2044-85.

XII. April 14 – Selection models and Duration models

A. Selection models

B. Duration models

†Wainer, Howard, Samuel Palmer, and Eric T. Bradlow. "A selection of selection anomalies." *Chance* 11, no. 2 (1998): 3-7.

Melinda Buntin and Alan Zaslavsky, Too Much Ado about Two-Part Models and Transformation? Comparing Methods of Modeling Medicare Expenditures, *Journal of Health Economics* 23 (2004): 525-542.

Heckman, James. "Shadow prices, market wages, and labor supply." *Econometrica: journal of the econometric society* (1974): 679-694.

Ronen Avraham and Max Schanzenbach, The Impact of Tort Reform on Intensity of Treatment: Evidence from Heart Patients, *Journal of Health Economics* 39(2015): 273-288.

*Mauro Laudicella, Paolo Li Donni, and Peter Smith, Hospital Readmission Rates: Signal of

Failure or Success, *Journal of Health Economics* 32(2013): 9-21.

Kiefer, Nicholas M. "Economic duration data and hazard functions." *Journal of economic literature* 26, no. 2 (1988): 646-679.

†Meyer, Bruce D. "Unemployment Insurance and Unemployment Spells." *Econometrica* 58, no. 4 (1990): 757-782.

Cutler, David M. "The Incidence of Adverse Medical Outcomes Under Prospective Payment." *Econometrica: Journal of the Econometric Society* (1995): 29-50.

XIII. April 21 - Field experiments

A. Guest lecture - Profs. David Abrams (Penn Law) and Mark Neuman (Penn Med)

Duflo, Esther, Rachel Glennerster, and Michael Kremer. "Using randomization in development economics research: A toolkit." *Handbook of development economics* 4 (2007): 3895-3962.

†Bertrand, Marianne, and Sendhil Mullainathan. "Are Emily and Greg more employable than Lakisha and Jamal? A field experiment on labor market discrimination." *American economic review* 94, no. 4 (2004): 991-1013.

*Bloom, Nicholas, Benn Eifert, Aprajit Mahajan, David McKenzie, and John Roberts. "Does management matter? Evidence from India." *The Quarterly Journal of Economics* 128, no. 1 (2013): 1-51.

XIV. April 28 - Student project presentations

Final Exam (May TBD)