HCMG 901: Applied Econometrics
Spring 2023

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Overview

This course covers econometric methods widely used in current applied economics research. The main goal of the class is to prepare you to conduct high quality, econometrically sound empirical analysis. Concepts, applications, and practice are emphasized, as opposed to technical derivations of estimators and their properties. We cover several modern research designs in detail – matching, instrumental variables (including marginal treatment effects and Bartik instruments), Difference-in-differences (trying to keep up), Synthetic controls, Regression discontinuity, and Bunching. We also cover non-linear approaches such as Poisson and Quantile regression models. Due to the large number of topics covered, the emphasis is on breadth, *not* depth.

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 or are classics that students should be familiar with. While the reading list is extensive, I will typically ask students to read only 2–3 papers per class (thoroughly). The remaining papers are listed as useful references for the future. I will post required papers on Canvas. While there is no assigned textbook 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 3.30 - 6.30 pm in Room 116 in SHDH.
Students can meet with me by appointment.
I will record the lectures and post on Canvas for future viewing but will not offer the option to attend class virtually via Zoom.

Other Requirements and Grading

You are required to:
- Complete 4 homework assignments. These will involve a mix of theory and data analysis. The problem sets will be graded by Mei-Lynn Hua, PhD student in HCMG.
- Data project - replicate analysis from a paper of your choice or perform original analysis. Present your analysis to the class and submit a brief report.
- Discuss an empirical paper in class (imagine you are a discussant at a conference)
- Read the assigned papers before class and participate actively in class discussions

Grading: Assignments – 30%, Project – 30%, paper presentation – 15%, class participation – 25%

* Indicates student discussion of a paper on a topic from a previous class (45 min)
† Indicates papers to be read prior to the class
Both are subject to change, and I will provide guidance in each class.

I.   **Jan 11 - Introduction and recap of classical estimation (Note:** Wednesday**)**
A.   Course overview
B.   Potential outcomes and causal inference
C.   Recap of basic estimators (OLS, GLS, WLS) and inference

MHE Chapter 2

Leamer, Edward E. "Let's take the con out of econometrics." The American Economic Review 73, no. 1 (1983): 31-43.

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

†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.

Imbens, Guido W., and Jeffrey M. Wooldridge. "Recent developments in the econometrics of program evaluation." Journal of Economic Literature 47, no. 1 (2009): 5-86.

Heckman, James J. "Building bridges between structural and program evaluation approaches to evaluating policy." Journal of Economic Literature 48, no. 2 (2010): 356-98.

† [*optional*] 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.

Athey, Susan, and Guido W. Imbens. "The state of applied econometrics: Causality and policy evaluation." Journal of Economic Perspectives 31, no. 2 (2017): 3-32.

Jan 16 – MLK Day holiday – no class

II.   **Jan 23 - Classical estimation and testing (Contd.)**
A.   Recap of basic estimators (OLS, GLS, WLS) and inference
B.   Weighting
C.   Log, Poisson transformation

MHE Chapters 2, 3 (excl. 3.3), 8.1 (standard errors)

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

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

†Mullahy, John, and Edward C. Norton. "Why Transform Y? A Critical Assessment of Dependent-Variable Transformations in Regression Models for Skewed and Sometimes-Zero Outcomes." No. w30735. National Bureau of Economic Research, 2022.

III. Jan 30 - Matching
  A. Propensity score matching
  B. Exact matching

MHE Chapter 3.3

†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.

†Dehejia, Rajeev H., and Sadek Wahba. "Causal effects in nonexperimental studies: Reevaluating the evaluation of training programs." Journal of the American Statistical Association 94, no. 448 (1999): 1053-1062.

Abadie, Alberto, David Drukker, Jane Leber Herr, and Guido W. Imbens. "Implementing matching estimators for average treatment effects in Stata." The Stata Journal 4, no. 3 (2004): 290-311.

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.

Abadie, Alberto, and Guido W. Imbens. "On the failure of the bootstrap for matching estimators." Econometrica 76, no. 6 (2008): 1537-1557.

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

Hainmueller, Jens. "Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies." Political analysis (2012): 25-46.

IV. Feb 6 - Instrumental variables (I)
  A. Presentation of Illing et al. 2021 (matching)
  B. Basic theory; 2SLS

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

†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 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.

† [*optional*] 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.

Andrews, Isaiah, James H. Stock, and Liyang Sun. "Weak instruments in instrumental variables regression: Theory and practice." Annual Review of Economics 11, no. 1 (2019).

Angrist, Joshua, and Michal Kolesár. "One instrument to rule them all: The bias and coverage of just-id iv." No. w29417. National Bureau of Economic Research, 2021.

*Illing, Hannah, Johannes F. Schmieder, and Simon Trenkle. The gender gap in earnings losses

after job displacement. No. w29251. National Bureau of Economic Research, 2021.

V. **Feb 13 - Instrumental variables (II)**
    A.   Discussion of Hvide et al. 2022 (IV)
    B.   Heterogeneous treatment effects and LATE
    C.   Judges designs

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

Imbens, Guido W., and Donald B. Rubin. "Estimating outcome distributions for compliers in instrumental variables models." The Review of Economic Studies 64, no. 4 (1997): 555-574.

Abadie, Alberto. "Semiparametric instrumental variable estimation of treatment response models." Journal of econometrics 113, no. 2 (2003): 231-263.

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.

Mogstad, Magne, Alexander Torgovitsky, and Christopher R. Walters. Identification of causal effects with multiple instruments: Problems and some solutions. No. w25691. National Bureau of Economic Research, 2019.

*Hvide, Hans K., Tom G. Meling, Magne Mogstad, and Ola L. Vestad. Broadband internet and the stock market investments of individual investors. No. w30383. National Bureau of Economic Research, 2022.

VI. **Feb 20 - Instrumental variables (III)**
    A.   Discussion of Card et al. (2022) (LATE, judges design)
    B.   Essential heterogeneity and MTE

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.

†Basu, Anirban, James J. Heckman, Salvador Navarro-Lozano, and Sergio Urzua. "Use of instrumental variables in the presence of heterogeneity and self-selection: an application to treatments of breast cancer patients." Health economics 16, no. 11 (2007): 1133-1157.

Heckman, James J., and Edward J. Vytlacil. "Econometric evaluation of social programs, part II: Using the marginal treatment effect to organize alternative econometric estimators to evaluate social programs, and to forecast their effects in new environments." Handbook of econometrics 6 (2007): 4875-5143.

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

Kowalski, Amanda E. "Reconciling seemingly contradictory results from the Oregon health

insurance experiment and the Massachusetts health reform." The Review of Economics and Statistics (2021): 1-45.

Zhou, Xiang, and Yu Xie. "Marginal treatment effects from a propensity score perspective." Journal of Political Economy 127, no. 6 (2019): 3070-3084.

*Chan Jr, David C., David Card, and Lowell Taylor. Is There a VA Advantage? Evidence from Dually Eligible Veterans. No. w29765. National Bureau of Economic Research, 2022.

VII. Feb 27 - Panel data designs (I)
    A. Discussion of Cornelissen et al. (2018) (IV, MTE)
    B. Differences in differences, triple difference

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.

†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.

*Cornelissen, Thomas, Christian Dustmann, Anna Raute, and Uta Schönberg. "Who benefits from universal child care? Estimating marginal returns to early child care attendance." Journal of Political Economy 126, no. 6 (2018): 2356-2409.

      Mar 6 – Spring break – no class

VIII. Mar 13 - Panel data designs (II)
    A. Discussion of Cabral et al. 2021 (DD)
    B. Recent developments in DD (critiques and solutions)
    C. Bartik designs

Sun, Liyang, and Sarah Abraham. "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects." Journal of Econometrics 225, no. 2 (2021): 175-199.

†Callaway, Brantly, and Pedro HC Sant'Anna. "Difference-in-differences with multiple time periods." Journal of Econometrics 225, no. 2 (2021): 200-230.

Goodman-Bacon, Andrew. "Difference-in-differences with variation in treatment timing." Journal of Econometrics (2021).

De Chaisemartin, Clement, and Xavier d'Haultfoeuille. "Two-way fixed effects estimators with heterogeneous treatment effects." American Economic Review 110, no. 9 (2020): 2964-96.

Borusyak, Kirill, Peter Hull, and Xavier Jaravel. Quasi-experimental shift-share research designs. No. w24997. National Bureau of Economic Research, 2018.

†Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift. "Bartik instruments: What, when, why,

and how." American Economic Review 110, no. 8 (2020): 2586-2624.

Borusyak, Kirill, and Peter Hull. Non-random exposure to exogenous shocks: Theory and applications. No. w27845. National Bureau of Economic Research, 2020.

*Cabral, Marika, Colleen Carey, and Sarah Miller. The Impact of Provider Payments on Health Care Utilization: Evidence from Medicare and Medicaid. No. w29471. National Bureau of Economic Research, 2021.

IX. Mar 20 – Panel data designs (III)
  A. Discussion of Atanasov and Black 2021 (Bartik/shift-share)
  B. Synthetic controls
  C. Clustering of standard errors

MHE Chapter 8.2 (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.

Abadie, Alberto, Alexis Diamond, and Jens Hainmueller. "Comparative politics and the synthetic control method." American Journal of Political Science 59, no. 2 (2015): 495-510.

Arkhangelsky, Dmitry, Susan Athey, David A. Hirshberg, Guido W. Imbens, and Stefan Wager. Synthetic difference in differences. No. w25532. National Bureau of Economic Research, 2019.

†Abadie, Alberto. "Using synthetic controls: Feasibility, data requirements, and methodological aspects." Journal of Economic Literature 59, no. 2 (2021): 391-425.

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.

†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.

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.

*Atanasov, Vladimir, and Bernard Black. "The trouble with instruments: The need for pretreatment balance in shock-based instrumental variable designs." Management Science 67, no. 2 (2021): 1270-1302.

X. Mar 27 - Density based designs
  A. Discussion of Peri et al. 2020 (Synthetic controls)
  B. Regression Discontinuity
  C. RD-DiD

MHE Chapter 6

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

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.

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

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, Carlos Dobkin, and Nicole Maestas. "Does Medicare save lives?" The Quarterly Journal of Economics 124, no. 2 (2009): 597-636.

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

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.

*Peri, Giovanni, Derek Rury, and Justin C. Wiltshire. The economic impact of migrants from Hurricane Maria. No. w27718. National Bureau of Economic Research, 2020.

XI. **Apr 3 – Non-linear models**
   A.   Discussion of Dippel (2022) (RD)
   B.   Quantile regression
   C.   Bunching

MHE Chapter 7

Koenker, Roger, and Gilbert Bassett Jr. "Regression quantiles." Econometrica (1978): 33-50.

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

†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.

†Bitler, Marianne P., Jonah B. Gelbach, and Hilary W. Hoynes. "What mean impacts miss: Distributional effects of welfare reform experiments." American Economic Review 96, no. 4 (2006): 988-1012.

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.

Persson, Petra. "Social insurance and the marriage market." Journal of Political Economy 128, no. 1 (2020): 252-300.

DeFusco, Anthony A., and Andrew Paciorek. "The interest rate elasticity of mortgage demand: Evidence from bunching at the conforming loan limit." American Economic Journal: Economic Policy 9, no. 1 (2017): 210-40.

†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.

*Dippel, Christian. "Political parties do matter in US cities... for their unfunded pensions." American Economic Journal: Economic Policy 14, no. 3 (2022): 33-54.

XII. April 10 – Selection models
  A. Discussion of Collier et al. (2021) (Bunching)
  B. Selection models

Tobin, James. "Estimation of relationships for limited dependent variables." Econometrica: (1958): 24-36.

Heckman, James. "Shadow prices, market wages, and labor supply." Econometrica (1974): 679-694.

†Van de Ven, Wynand PMM, and Bernard MS Van Praag. "The demand for deductibles in private health insurance: A probit model with sample selection." Journal of Econometrics 17, no. 2 (1981): 229-252.

Heckman, James J., and Thomas E. MaCurdy. "Labor econometrics." Handbook of Econometrics 3 (1986): 1917-1977.

†Jacoby, Hanan G., and Ghazala Mansuri. "Watta Satta: Bride exchange and women's welfare in rural Pakistan." American Economic Review 100, no. 4 (2010): 1804-25.

Dutz, Deniz, Ingrid Huitfeldt, Santiago Lacouture, Magne Mogstad, Alexander Torgovitsky, and Winnie van Dijk. Selection in Surveys. No. w29549. National Bureau of Economic Research, 2021.

*Collier, Benjamin L., Cameron Ellis, and Benjamin J. Keys. The Cost of Consumer Collateral: Evidence from Bunching. No. w29527. National Bureau of Economic Research, 2021.

XIII. April 17 – Project presentations
  Each student: ~25 minutes

XIV. April 24 – Project presentations (contd.)
  Each student: ~25 minutes