U823: Applied Micro-econometrics
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Course Overview

This course is designed to the estimation of treatment effects in applied microeconomic topics. We will analyze which research designs and empirical methods should be applied in various circumstances in order to obtain credibly causal effects of an intervention or policy in the area of health, labor, public finance, and education. We will focus on randomized field experiments, difference-in-difference designs, and regression discontinuity. We will also use instrumental variables as well as propensity score methods to obtain causal estimates when randomization is not possible.

Learning Objectives

- To compare the internal validity of randomized designs relative to non-randomize research designs
- To analyze the strengths and limitation of instrumental variables to evaluate policy
- To demonstrate the ability to specify a difference-in-differences design to circumstances in which there are time- and geographic variations in policy implementations
- To demonstrate the circumstances in which a regression discontinuity would provide plausibly causal estimates of a policy change
- To be able to describe succinctly results from a synthetic control analysis and critically compare it to results from a difference-in-difference analysis
- To be able to present results orally results from various research designs to a broad audience that is less technically sophisticated
- To be able to develop the design of a novel research project, that is internally valid and that uses one of the random or quasi-random research design used in the course.

Lectures and Expectations

Each week, I will give you either questions from one or two key readings. I expect you to come to class prepared to answer. You won't have to turn in the answers; you will get credit if you demonstrate that you grappled with the issues even if you did not get the correct answer. The point is to ensure that everyone has read the article.

Lecture notes and assignments will be posted to Blackboard. I will not always follow my notes in class. Their purpose is to give you a sense of what I will emphasize on the exam – I want time in class to be as interactive as possible. I want you to understand the intuition behind these methods, when to apply them,

and how to interpret the results. The assigned articles and questions from each are a key portion of the class. The class readings apart from those in textbooks are available on Zotero.

Computer Assignments

There are six computer assignments. Each due the week after the topic is covered. There will be two presenters of each assignment the day the assignment is due. Each presenter should take no more than 10 minutes and I will indicate which parts of the assignment should be presented.

Grading

Grades in the class are based on three inputs: your answers to questions assigned from readings each week (15%); six computer assignments (20%); your midterm exam (50%) and your research proposal (15%).

Late computer assignments will not be accepted because I will post the answers. Also, do not hand in a lot of output. Cut and paste the relevant portion of the answer below each question in the assignment. Make sure that it is easy to find your answer.

Research Proposal

In lieu of a final exam, I require that you turn in a proposal for a research project that would yield a plausibly causal estimate of a treatment effect. I do not expect you to gather data or to produce the estimates. You will each be asked to make a 5 minutes presentation of your proposal at the "Brown Bag" class on May 15. Both your classmates and I will comment on your proposal. The research proposal is due on May 29. No research proposals will be accepted after May 29.

Readings and Lecture Topics

Articles and other reading assignments are listed below. All articles are available in Zotero. The Zotero group for this class is https://www.zotero.org/groups/959116. You should have already received an invitation to join the Zotero group library via email. Zotero clients can be downloaded from http://www.zotero.org

There are a few general sources to which I will refer repeatedly throughout the course:

Angrist, Joshua and Jorn-Steffen Pischke (2009) *Mostly Harmless Econometrics* (Princeton, New Jersey: Princeton University Press). Denoted as AP below.

Morgan, Stephen and Christopher Winship (2015) *Counterfactuals and Causal Inference*. *Second Edition* (New York: Cambridge University Press). Denoted as MW below. Professor Morgan and Winship are quantitative sociologists. Their book gives excellent examples that illuminate the intuition.

Cameron, A. C. and Trivedi, P. 2005. *Microeconometrics: Methods and Applications* (New York: Cambridge University Press). Denoted as CT below.

At the 2007 NBER Summer Institute, Professors Guido Imbens (Harvard) and Jeff Wooldrige (Michigan State) gave a series of lectures on applied econometrics. The videos of their lectures are available here: http://www.nber.org/minicourse3.html. They also published an article as a result of their lectures, which is an excellent reference:

Imbens, G. and J. Wooldridge. 2009. "Recent Developments in the Econometrics of Program Evaluation." *Journal of Economic Literature* 47(1):5-86.

The lecture topics and instructors for those topics are

Week	**Date**	**Topic**
1	30-Jan	Potential Outcomes & within-study designs,
2	06-Feb	Propensity score matching
3	13-Feb	Instrumental Variables and LATE
4	27-Feb	Instrumental Variables and LATE, continued
5	06-Mar	Weak Instruments
6	13-Mar	Difference-in-Differences I
7	20-Mar	Difference-in-Differences II
8	27-Mar	Synthetic Controls
	03-Apr	*No class – Spring Break*
9	10-Apr	Regression Discontinuity
10	17- Apr	**Midterm**
11	24-Apr	Randomized Field Experiments I
12	01-May	Randomized Field Experiments II
13	08-May	Controversy: Randomization, Instrumental Variables, Modeling
14	15-May	"Brown Bag" presentation of research projects.

Week 1: The Limits of Non-Experimental Methods?

Some background. LaLonde's seminal piece was a wake-up call to the profession and it is still cited today as a key junction in applied micro-econometrics (see Angrist and Pischke 2010). I have assigned a series of questions that I want you to be prepared to discuss in class. You do not have turn in written work, but I will call on everyone to respond. I am not looking for the right answer necessarily. I am more interested in how you thought about it. See you on the 2nd.

LaLonde, R. (1986) "Evaluating the Econometric Evaluations of Training Programs with Experimental Data," *American Economic Review* 76(4):604-619.

Angrist, J. and J.-S. Pischke (2010) "The Credibility Revolution in Empirical Economics: How Better Research Design is Taking the Con out of Econometrics," *Journal of Economic Perspectives* 24(2):3-33.

Sources for notation and background as well as further readings (not required)

AP: Chapters 1 & 2, 3

MW: Chapter 2, 4, 6

Computer Assignment 1 due on February 6:

Objective: To demonstration the ability to estimate a propensity score and to apply it to the estimation of the effect of the flu vaccine on adult health

Presenters: Allman, Bayani and Chen

Week 2: Propensity score matching

Dehejia, R. and S. Wahba (1999). "Causal Effects in Non-experimental Studies: Reevaluating the Evaluation of Training Programs," *Journal of the American Statistical Association* 94(448):1053-1062.

MW Chapter 7, pp.

Of interest

Shipman, J., Swanquist, Q.T. and R. L. Whited (2017). "Propensity Score Matching in Accounting Research. *The Accounting Review* 92(1):213-244

Austin, P. and E. Stuart. 2015. " Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies." *Statistics in Medicine* 34:3661-3679.

Olmos, A. and P. Govindasamy. 2015. " A practical guide for using Propensity Score Weighting in R." http://pareonline.net/pdf/v20n13.pdf

Computer Assignment 2 due on February 13

Objective: To replicate the work of Dehejia and Wahba (1999) and extend their analysis to new data demonstrating the utility of propensity score matching to generate causal estimates.

Presenters: Das, Demiralp and Hung

Week 3: Instrumental Variables and LATE

Introduction to Local Average Treatment Effects

MW: Chapter 7.

Imbens, G. and J. Angrist (1994) "Identification and Estimation of Local Average Treatment Effects." *Econometrica* 62(2):467-475.

This is a more complete presentation of LATE

Angrist, J., G. Imbens, and D. Rubin (1996) "Identification of Causal Effects Using Instrumental Variables." *Journal of the American Statistical Association* 91(434):444-454.

Examples of LATE in action

Finkelstein et al. (2012). "The Oregon Health Insurance Experiment : Evidence from the First Year." *Quarterly Journal of Economics* 127 (3): 1057-1106

Week 4 : Instrumental Variables and TOT

Chetty, R., Hendren, N. and L. Katz. (2016). "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment." *American Economic Review,* 106(4):855-902.

Chyn, E. (2016). "Moved to Opportunity: The Long-Run Effect of Public Housing Demolition on Labor Market Outcomes of Children." Revise and resubmitted to *AER*.

Week 5: Weak Instruments

Angrist, J. D. and Krueger, A. B. (1991) "Does Compulsory Schooling Attendance Affect Schooling and Earnings," *Quarterly Journal of Economics* 106(4):976-1014.

Bound, J., Jaeger, D.A., and Baker, R.M. (1995) "Problems with Instrumental Variables Estimation when the Correlation between the Instruments and the Endogenous Variable is Weak," *Journal of the American Statistical Association* 90(430):443-450.

Buckles, C., and Hungerman, D. (2013) "Season of Birth and Later Outcomes: Old Questions, New Answers," *Review of Economics and Statistics* 95(3):711-724.

For reference

Stock, J. and Yogo, M. (2005) "Testing for Weak Instruments in Linear IV Regression, Ch. 5 in Donald W. K. Andrews, eds., *Identification and Inference for Econometric Models.* New York: Cambridge University Press: 80-108.

Computer assignment 3 due on March 13
Objective: To critically evaluate the effect of weak instruments on causal estimates.
Presenters: Lin, Liu (Chuxin) and Liu (Yi)

Week 6: Difference-in-Differences I

AP: Chapter 5

CT: Chapter 25.5

Hoynes, H., Miller, D. and D. Simon (2015). "Income, the Earned Income Tax Credit, and Infant Health." *American Economic Journal: Economic Policy.* 7(1):172-211.

Almond, D., Hoynes, H. and Schanzenbach, D.W. (2011). "Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes." *The Review of Economics and Statistics* 93(5):387-403.

Computer assignment 4 due on March 20
Presenters: Munoz Saavedra, Orozco Vazquez, Sansevrino
Objective: To apply a difference-in-difference analysis to a major U.S. policy and to critically evaluate its effectiveness at generating causal estimates.

Week 7: Difference-in-Differences II

Foote, C. and Goetz. C. (2008). "The Impact of Legalized Abortion on Crime: A Comment." *Quarterly Journal of Economics,* 407-423.
Bertrand, M., E. Duflo, and S. Mullainathan (2004) "How Much Should We Trust Differences-in-Differences Estimates" *Quarterly Journal of Economics* 119:249-275.

Computer assignment 4(part 2) due on March 27
Presenters: Advani and Zhang
Objective: To critically evaluate statistical inference in a difference-in-difference design

Week 8: Synthetic Controls

AP: Chapter 5
CT: Chapter 25.5

Abadie, A., Diamond, A., and J. Hainmueller (2010) "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *Journal of the American Statistical Association* 105(490):493-505.
Abadie, A., A. Diamond, and J. Hainmueller (2015) "Comparative Politics and the Synthetic Control Method" *American Journal of Political Science***,** 59(2):495–510.
Peri, G., & Yasenov, V. (2015). "The Labor Market Effects of a Refugee Wave: Applying the Synthetic Control Method to the Mariel Boatlift," NBER Working Paper Number 21801.

Computer assignment 5 due on April 10
Presenters: Tasnim, Thorne, and Wu
Objective: To apply synthetic control methodology and critically evaluate the internal and external validity of the estimates relative to those from a difference-in-difference analysis applied to the same data.

Week 9: Regression Discontinuity Designs
AP: Chapter 6
CT: Chapter 25.6
Cohodes, S and J. Goodman. (2014) "Merit Aid, College Quality, and College Completion: Massachusetts' Adams Scholarship as an In-Kind Subsidy. *American Economic Journal: Applied Economics 6(4):251-285.*
Hoekstra, M. (2009). "The Effect of Attending the Flagship State University on Earnings: A Discontinuity- Based Approach." *The Review of Economics and Statistics* 91(11): 717-724.

For reference:

Lee, D. S. and T. Lemieux (2010) "Regression Discontinuity Designs in Economics." *Journal of Economic Literature* 448(2):281-355

Chang et al. (2015). "Regression Discontinuity and the Price Effects of Stock Market Indexing." *Review of Financial Studies*, 28(1): 212-246.

Computer Assignment 6 due on April 24
Presenters: Yang, Zhou, Zhang
Objective: To apply a regression discontinuity design to novel data and critically evaluate the internal and external validity of the estimates.

Week 10: Midterm

Week 11: Randomized Field Experiments—I

List, J. and I. Rasul (2011) "Field Experiments in Labor Economics," in *Handbook of Labor Economics*, Vol 4A, Orley Ashenfelter and David Card, eds., Chapter 2, pp. 103-208. Read Section 1, pp. 103-140.

Joyce, T., Crockett, S., Jaeger, D., et al. 2015. "Does Class Time Matter?" *Economics of Education Review*.46:64-77

Levitt, S. and J. List (2011) "Was There Really a Hawthorne Effect at the Hawthorne Plant? An Analysis of the Original Illumination Experiments," *American Economic Journal: Applied Economics* 3: 224–238

Week 12: Randomized Field Experiments—II

Meier, P. "Biggest Public Health Experiment Ever: The 1954 Field Trial of the Salk Poliomyelitis Vaccine," In Mosteller et al. (eds), *Statistics a Guide to the Unknown*, pp. 2-13.

Shadish, W., Clark, M. and Steiner, P. (2008) "Can Nonrandomized Experiments Yield Accurate Answers? A Randomized Experiment Comparing Random and Nonrandom Assignments." *Journal of the American Statistical Association*, 103:1134-1146. *This includes the comment by Long, Little and Lin.*

Wing, C. and M. Clark. (forthcoming) "What Can We Learn From A Doubly Randomized Preference Trial? An Instrumental Variables Perspective," *Journal of Policy Analysis and Management*

Week 13: Controversy: Randomization, Instrumental Variables, & Structural Modeling

Deaton, A. (2010) "Instruments, Randomization and Learning about Development." *Journal of Economic Literature* 48(2):423-455.

Imbens, G. (2010) "Better LATE than Nothing: Some Comments on Deaton (2009) and Heckman and Urzua (2009)." *Journal of Economic Literature* 48(2):399-423.

For Reference

Heckman, J. J. and J. Smith (1995) "Assessing the Case for Social Experiments," *Journal of Economic Perspectives* 9(2):85-110.

Week 14: "Brown Bag" presentation of research proposals

Objective: To develop a novel research design that would provide causal estimates of an important policy or intervention. To be able to summarize the research project and present it orally in 10 minutes To describe the research design in a structured format of 5 pages that explains the question, data, methods and anticipated findings.