**Carnegie Mellon University**
**Heinz College**

94-835 Applied Econometrics II
Course Syllabus
Spring Semester 2021, Mini 4

## INSTRUCTOR

Akshaya Jha, Assistant Professor of Economics and Public Policy
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## COURSE ORGANIZATION

Class meets for lecture and discussion each Monday and Wednesday, March 22 through May 7. Classes are scheduled 1:30PM-2:50PM and will be in person in room HBH A301 or on Zoom. Recitations are scheduled for Fridays 8:30AM-9:50AM on Zoom.

Teaching assistants will hold regular office hours, conduct recitations, and assist in grading assignments and exams. TAs will also be available for appointments at your mutual convenience. We will announce office hours during the first week of class.

Office hours will be conducted through Zoom. Please read the separate document on online etiquette and guidelines associated with online classes.

TAs:

Xiaochen Sun (xiaches@andrew.cmu.edu), Head TA

## PREREQUISITE

You are presumed to have taken 94-834 (Applied Econometrics I), and to have a solid grounding in basic statistics, at the level of 90-711 (Empirical Methods for Public Policy and Management), 90-786 (Intermediate Empirical Methods) or 95-796 (Statistics for IT Managers). We will make good use of the material covered in those courses.

## READINGS

There is a set of readings from *Mastering Metrics: The Path from Cause to Effect* by Joshua D. Angrist and Jorn-Steffen Pischke (Princeton University Press, 2015). This is a relatively simple but sophisticated book. It is fun to read and is also very short (and inexpensive!). If you like the style of the book we suggest you follow up with a more

advanced book by the same authors, *Mostly Harmless Econometrics* (Princeton University Press, 2009).

You will likely find it useful to have a basic statistics textbook at hand. The book you used in your preparatory statistics class (90-711, 90-786, 95-796, or similar course) will be fine. In addition, many of you may find it helpful to have a standard econometrics textbook available to provide additional material on the topics we are covering. One good choice is *Introduction to Econometrics* by James H. Stock and Mark W. Watson (Pearson). You can buy a used version of the 1st or 2nd edition, which should be quite inexpensive at this point.

**COURSE CONTENT AND OBJECTIVES**

Econometrics has an important place in the data sciences. As your textbook authors say, the purpose of econometrics is to "untangle cause and effect in human affairs." Econometrics is essential for advancing understanding in the social sciences, conducting public policy evaluation, and assessing the impact of business practice.

*Applied Econometrics I* was the first course in a two-course sequence designed to teach the essentials of econometric methodology.

During the first course you:

- Learned why *random assignment* is so useful for the purpose of sorting out cause and effect.
- Developed a clear understanding of *bivariate* and *multiple regression*, and come to appreciate the value and limitations of regression methods.
- Acquired an appreciation for the use of *instrumental variables* for the purpose of evaluating causality in complex real-world applications.

*Applied Econometrics II* follows up by pursuing other methods and applications. In this course you will:

- Learn how *regression discontinuity* is used to draw inferences about causal effects from rules constraining human behavior.
- Use *difference-in-differences techniques* to study causality when experiments happen naturally in society.
- Apply *event study analysis* and *synthetic control methods* to tackle causal questions when there are multiple natural experiments, or small sample sizes.

Both *Applied Econometrics I* and *Applied Econometrics II* are "hands on" courses in which you will not only learn to read and interpret existing studies, but will also conduct econometric analyses of your own. The goal is to help you take your first few steps

toward becoming a "Metrics Master"! One of those steps is becoming competent and confident in the use of Stata to conduct empirical analyses.

**GRADING AND ACADEMIC INTEGRITY**

Your grade depends on the extent to which you demonstrate the capacity to solve problems and think critically about econometric practice.

There will be five graded problem sets. All assignments must be typed up and submitted online. Problem sets are due by 11:59pm on Thursday. Only assignments that are submitted on time will be graded. However, as an accommodation, the lowest assignment grade will be dropped when calculating your final grade.

The final grade is based on two exams (30 percent for the first exam, 38 percent for the final exam), and problem sets (32 percent).

Exams are scheduled for April 14 and May 7. Students may be excused from exams only if arrangements are made in advance or in the event of an emergency.

A grade of 0 will be assigned for any assignment or exam that does not conform to University policies regarding academic integrity, and other penalties may also pertain, including termination from enrollment at Carnegie Mellon. See the Heinz College Student Handbook.

**THOUGHTS FOR THE SEMESTER**

Your graduate-school experience might prove to be mostly enjoyable and carefree, but it is likely to entail stress as well. The University Provost provides the following thoughts for students. They seem very sensible to us:

*Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.*

*All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.*

*If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services is here to help: call 412-268-2922 and visit their website at http://www.cmu.edu/counseling/. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.*

**TENTATIVE COURSE OUTLINE AND SCHEDULE**

You should read the textbook carefully, and may find the following papers useful.

**Topic 1. Regression Discontinuity Designs** (4 lectures)

Core Ideas

- Angrist and Pischke, Chapter 4.

Applications

- Anderson, Michael L. (2014). "Subways, Strikes, and Slowdowns: The Impacts of Public Transit on Traffic Congestion." *American Economic Review*, 104(9): 2763-96.

- Howell, Sabrina T. (2017). "Financing Innovation: Evidence from R&D Grants." *American Economic Review*, 107(4): 1136-64.

- Nekoei, Arash, and Andrea Weber. (2017). "Does Extending Unemployment Benefits Improve Job Quality?" *American Economic Review*, 107(2): 527-61.

- Angrist, Joshua D., and Victor Lavy. (1999). "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement." *Quarterly Journal of Economics*, 114(2): 533-575.

- Clark, Damon and Heather Royer. (2013). "The Effect of Education on Adult Mortality and Health: Evidence from Britain." *American Economic Review*, 103(6): 2087-2120.

- Solis, Alex. (2017). "Credit Access and College Enrollment." *Journal of Political Economy*, 125(2): 562-622.

- Urquiola, Miguel, and Eric Verhoogen. (2009). "Class-Size Caps, Sorting, and the Regression-Discontinuity Design." *American Economic Review*, 99(1): 179-215.

**Topic 2. Difference in Differences** (4 lectures)

Core Ideas

- Angrist and Pischke, Chapter 5.

Applications

- 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): 772-93.

- Card, David, and Alan B. Krueger. (2000). "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Reply." *American Economic Review*, 90(5): 1397-1420.

- Davis, Lucas W. (2004). "The Effect of Health Risk on Housing Values: Evidence from a Cancer Cluster." *American Economic Review*, 94(5): 1693-1704.

- Eissa, Nada, and Jeffrey B. Liebman. (1996). "Labor Supply Response to the Earned Income Tax Credit." *Quarterly Journal of Economics*, 111(2): 605-637.

- Linden, Leigh, and Jonah E. Rockoff. (2008). "Estimates of the Impact of Crime Risk on Property Values from Megan's Laws." *American Economic Review*, 98(3): 1103-27.

**Topic 3. Event Study and Synthetic Control** (4 lectures)

Core Ideas

- Kline, Patrick. (2012). "The Impact of Juvenile Curfew Laws on Arrests of Youth and Adults." *American Law and Economics Review*, 14(1): 44-67.
- Abadie, Alberto, Alexis Diamond, and Jens Hainmueller. (2015). "Comparative Politics and the Synthetic Control Method." *American Journal of Political Science*, 59(2): 495-510.

Applications

- Autor, David H. (2003). "Outsourcing at Will: The Contribution of Unjust Dismissal Doctrine to the Growth of Employment Outsourcing. " *Journal of Labor Economics*, 21(1): 1-42.

- McCrary, Justin. (2007). "The Effect of Court-Ordered Hiring Quotas on the Composition and Quality of Police." *American Economic Review*, 97(1): 318-353.

- Currie, Janet, Lucas Davis, Michael Greenstone, and Reed Walker. (2015). "Environmental Health Risks and Housing Values: Evidence from 1,600 Toxic Plant Openings and Closings." *American Economic Review*, 105(2): 678-709.

- Abadie, Alberto, and Gardeazabal, Javier. (2003). "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93(1): 112-132.

- Abadie, Alberto, Alexis Diamond, and Jens 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.

- Bohn, Sarah, 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.