ECON 650 Applied Microeconometrics
Purdue University
Fall 2023

Professor Kevin Mumford

mumford@purdue.edu

Office: KRAN 311

RAWL 2058

Tue & Thu

8:00 - 9:30 AM

Course Description

This is a required course for Ph.D. students in economics. Students will learn how to read, evaluate, and conduct applied microeconometric research. The emphasis is on modern causal inference techniques, but this is not a course in econometrics theory. Instead of deriving properties of estimators, we will focus on the practical application of applied micro methods while also providing an introduction to empirical research in several areas.

Applied microeconometric methods are sometimes described as being a-theoretical or simply "letting the data speak." I disagree with this characterization. Economic theory is an essential ingredient in applied microeconometric analysis. This is why we wait until the completion of your first-year of PhD coursework before requiring this course. In addition to economic theory, institutional details are often critical to the estimation strategy.

Prerequisites

Students are expected to have completed the first-year PhD curriculum in economic theory and econometrics.

Learning Outcomes

By the end of the course, you will be able to:

- Understand the background and motivation for various microeconometric models

- Explain the assumptions that provide identification of the treatment effect for each method

- Use `Stata` to estimate policy-relevant treatment effect using non-experimental data

- Describe estimation methods and present results in written reports using LaTeX

- Demonstrate how to read economic journal articles that use the methods introduced in this course

- Perform PhD-level empirical research using microeconometric methods

Required Texts

This course does not follow any specific textbook and you are not required to purchase any books. I will hand out a set of course notes which draws from many sources including the following: Angrist and Pischke (2015) *Mastering Metrics*, Cameron and Trivedi (2005) *Microeconometrics*, Morgan and Winship (2007) *Counterfactuals and Causal Inference*, and Wooldridge (2010) *Econometric Analysis of Cross Section and Panel Data*.

Required Software

Completing assignments and the final exams will require using Stata, a statistical software package commonly used by economists and analysts. You will use Stata to complete a series of microeconometrics exercises designed to provide experience with various estimation methods. Purdue students do not need to purchase a license. You can download a copy of Stata to your personally-owned computer with an academic-year license from www.itap.purdue.edu/shopping/software/student.html.

You are required to use LaTeX to prepare all problem set submissions (half-page research article summaries are exempt). I am not going to teach you to use LaTeX and expect you to use Purdue-provided resources to learn to use LaTeX effectively on your own. Purdue has a partnership with Overleaf, an online LaTeX editor which I encourage you to use if this will be your first introduction to this document preparation software. If you are already an experienced LaTeX user, you are welcome to write and compile your LaTeX code in the environment of your choice.

Course Policies

Grading

The grade for the course will be based upon the following factors:

- **Half-Page Summaries** (10%) For some of the assigned journal articles, students will be assigned to complete a half-page summary of the article. This summary will need to be uploaded to the course website before the start of the class in which the article will be discussed. I will describe the format for these summaries in class.

- **Homework Assignments** (50%) There are homework exercises at the end of each assigned chapter. These assignments are designed to give students experience using the econometric techniques covered in this course. I expect students to complete the assignments using Stata and write their submission using LaTeX.

- **Final Exam** (40%) The final exam will cover material from lectures and the assigned readings.

Academic Dishonesty

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty" (Student Regulations, Part 5, Section III-B-2-a). Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest" (University Senate Document 72-18).

In this class, I expect you to write your own article summaries and to complete your own homework assignments. You are welcome to work in groups, but **do not copy/paste answers, code, or anything else into your work**. Both the student providing the help and the student receiving the help will receive no credit for the assignment if I determine that parts of the assignment have been copied.

Behavior

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

Emergencies

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors via email. You are expected to read your @purdue.edu email on a frequent basis.

Accessibility and Accommodations

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Nondiscrimination

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Purdue's Equal Opportunity, Equal Access and Affirmative Action policy which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Course Outline

The Selection Problem

- Brownlee, Shannon and Lenzer, Jeanne (2009) "Does the Vaccine Matter" *The Atlantic* November issue.

- Athey, Susan, and Guido W. Imbens. 2017. "The State of Applied Econometrics: Causality and Policy Evaluation." *Journal of Economic Perspectives*, 31(2): 3–32.

Organizing and Analyzing Data in Stata

- Gentzkow, Matthew, and Jesse M. Shapiro (2014) "Code and Data for the Social Sciences: A Practitioner's Guide." University of Chicago Working Paper.

Selection on Observables

- Black, Dan A., Jeffrey A. Smith, Mark C. Berger, and Brett J. Noel (2003) "Is the Threat of Reemployment Services more Effective Than the Services Themselves? Evidence from Random Assignment in the UI System" *American Economic Review*, Vol. 93:4, 1313-1327.

- Oster, Emily (2017) "Unobservable Selection and Coefficient Stability: Theory and Validation" *Journal of Business & Economic Statistics* 37:2.

Matching Methods

- Abadie, Alberto and Imbens, Guido W. (2006) "Large Sample Properties of Matching Estimators for Average Treatment Effects" *Econometrica* 74, 235-267.

- LaLonde, Robert J. (1986) "Evaluating the Econometric Evaluations of Training Programs with Experimental Data" *American Economic Review* 76:4, 604-620.

- Dehejia, Rajeev H. and Sadek Wahba (1999) "Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs" *Journal of the American Statistical Association* 94:448, 1053-1062.

Sample Weights

- Solon, Haider, and Wooldridge (2015) "What Are We Weighting For?" *The Journal of Human Resources*, Vol. 50(2), 301-316.

Data Visualization and Directed Acyclic Graphs

- Schwabish, Jonathan A. "An Economist's Guide to Visualizing Data" *Journal of Economic Perspectives*, Vol. 28(1), 209-234.

- Morgan and Winship (2007) *Counterfactuals and Causal Inference: Methods and Principles for Social Research*, Cambridge University Press.

Instrumental Variables

- Angrist and Krueger (2001) "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments." *Journal of Economic Perspectives* 15:4, 69-85

- Angrist and Evans (1998) "Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size" *American Economic Review* 88:3, 450-477.

- Murray, Michael P. (2006) "Avoiding Invalid Instruments and Coping with Weak Instruments" *Journal of Economic Perspectives* 20:4, 111-132.

Regression Discontinuity

- Imbens, Guido W. and Thomas Lemieux (2008) "Regression Discontinuity Designs: A Guide to Practice" *Journal of Econometrics* 142, 615-635.

- Angrist, Joshua and Victor Lavy (1999) "Using Maimonides' Rule to estimate the effect of class size on scholastic achievement" *Quarterly Journal of Economics*, 114, 533-575.

Panel Data Methods

- Wooldridge (2010) "Econometric Analysis of Cross Sectional and Panel Data" Chapter 4

- Lovenheim, Michael F. and Kevin J. Mumford (2013) "Do Family Wealth Shocks Affect Fertility Choices? Evidence from the Housing Market" *Review of Economics and Statistics*, 95:2, 464-475.

Difference in Differences

- Card, David (1990), "The Impact of the Mariel Boatlift on the Miami Labor Market" *Industrial and Labor Relations Review* 43:2, 245-257

- 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, 772-793.

- Callaway, Brantly and Pedro H.C. Sant'Anna (2021) "Difference-in-Differences with Multiple Time Periods" *Journal of Econometrics* 225:2, 200-230.

Synthetic Controls

- Abadie, Alberto (2021) "Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects" *Journal of Economic Literature* 59:2, 391-428.

- Arkhangelsky, Dmitry, Susan Athey, David A. Hirshberg, Guido W. Imbens, and Stefan Wager (2021) "Synthetic Difference-in-Differences" *American Economic Review* 111:12, 4088-4118.

Clustered Standard Errors

- Cameron and Miller (2014) "A Practitioner's Guide to Cluster-Robust Inference" *The Journal of Human Resources* 50:2, 317-372.

- Abadie, Alberto, Susan Athey, Guido W. Imbens, and Jeffrey M. Wooldridge (2022) "When Should You Adjust Standard Errors for Clustering?" Working Paper.