ECON 695: Causal Effects in Policy

Fall 2025

Instructor: Alice Wu (hwu526@wisc.edu)

Office Hours: Wednesday 1:30 PM-3:00 PM, Social Science 6424

Prerequisites: ECON 310, (STAT 240+340), or (STAT 303 and 333)

ECON 301/311 (Micro) and ECON 400/410 (Econometrics)

Credits: 3

Lectures: Mon/Weds 8:00 AM – 9:15 AM

Course Description: This course focuses on the application of econometric methods to empirical problems in economics. It provides background on issues that arise when analyzing non-experimental social science data and a guide for causal inference and machine learning tools that are useful for empirical research. Equal weight is given to theoretical development, computation, and application. By the end of the course, students will understand the types of research designs that can lead to convincing analysis and will be comfortable working with large scale data sets.

Assessment: The grade for this course will be determined by the following allocation:

- Problem sets: 25%. The lowest score will be dropped.
- Midterms: 40%. (25% on the higher score, 15% on the lower score).
- Final project: 30%.
- Class participation: 5%

Students must be available to write the midterms in class on **Oct. 8th and Nov. 12th**, and must be able to complete the final project (take-home exam) by **December 17th**. Please do not sign up for the class if you have a conflict with the midterms or final.

Problem Sets: There will be one problem set every 1-2 weeks. Problem sets are designed to help you review the econometric models and practice data processing and causal analysis. Note most assignments will ask you to program in Python (solutions will only be provided in Python). You are also encouraged to use Python for the final project. In each

problem set, you are expected to write up the response to each question and include your code (Python) in a HTML/PDF file.

Problem sets will be due at 11:59PM Central Time on due dates. **No late problem sets will be accepted.** The lowest score will be dropped.

Exams: There will be two in-class, closed-book midterms. The higher score will account for 25% of the final grade, while the lower score accounts for 15%.

Midterm 1: Wednesday, October 8th

Midterm 2: Wednesday, November 12th

Students with special needs will be accommodated – please make sure you have informed the faculty (me) by the 3rd week of the semester, and check with me at least 1 week prior to the midterms to verify the dates and location of your exam. See the sections on students with disabilities or religious observance conflicts below for details. For other students, no make up exam will be scheduled. Students will need to have a signed letter from a physician to justify missing a midterm; otherwise they will receive grade 0 on this part of the course. The same rules apply to the final project.

Final Project: In lieu of a final exam, there will be a final project due at the end of the time slot assigned for the final exam **(Dec 17, 2025, 7:05 PM Central Time)**. No late project will be accepted. The project (dataset + instructions) will be posted in the week of 12/08. Students will be given a dataset, complete data cleaning, and provide an empirical analysis using the methods covered in class. The output will be a research paper. Projects are encouraged to be done in groups up to 4 people. Groups need to be decided by Thanksgiving.

The quality of the analysis and of the writing will account for 25% of the final grade, and the other 5% will determined by peer evaluations within each group.

Class Participation: Morning birds who attend lectures will be rewarded! Students are encouraged to ask questions in class, and participate on Piazza.

Tentative List of Topics:

1. Review of statistics, probability theory, confidence intervals, the law of large numbers, central limit theorem.
2. Conditional expectation functions, best linear predictors, properties of regressions, inference.
3. Decomposition methods, reweighting, propensity scores.
4. Omitted variable bias, endogeneity issues.
5. Instrument variables
6. Randomized experimental design, average treatment effects.
7. Heterogeneous treatment effects, IV-LATE, characteristics of compliers.
8. Panel data, fixed effects, correlated random effects.
9. Difference in differences, synthetic controls, event study.
10. Regression discontinuity.
11. Nonlinear models : probit, logit, discrete choice models.
12. Ideas from statistical learning: bias versus variance; cross-validation
13. Unsupervised learning: clustering methods
14. Supervised learning: trees, classification methods
15. Shrinkage methods: Ridge, Lasso

Reference Materials

There is no required text for the class. The following are recommended references:

- Joshua Angrist and Jorn-Steffen Pischke, Mostly Harmless Econometrics. This is written by two labor economists so it has a similar perspective on many applied issues as will be adopted in this class.
- Jeffrey Wooldridge Introductory Econometrics: A Modern Approach. Any edition from 3 onward will be useful. I recommend trying to buy a used recent edition.
- Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani. An Introduction to Statistical Learning with Applications in R (ISLR). This book is available for free at http://www-bcf.usc.edu/~gareth/ISL/ : this site also other useful related materials.

Accommodations for Students with Disabilities: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students

with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations **by the end of the third week of the semester**, or as soon as possible after a disability has been incurred or recognized. Please make sure to check with me **at least 1 week prior to the midterms or the due of the final project** to arrange alternative time/location. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Students with Religious Observance Conflicts: Please contact me **during the first three weeks of the semester** if you have a religious observance conflict with the midterms or the due of the final project. The deadlines may be adjusted upon mutual agreement.

Institutional Statement on Diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfils its public mission by creating a welcoming and inclusive community for people from every background - people who as students, faculty, and staff serve Wisconsin and the world."

Grievance Procedure: The Department of Economics has developed a grievance procedure through which you may register comments or complaints about a course, an instructor, or a teaching assistant. The Department continues to provide a course evaluation each semester in every class. If you wish to make anonymous complaints to an instructor or teaching assistant, the appropriate vehicle is the course evaluation. If you have a disagreement with an instructor or a teaching assistant, we strongly encourage you to try to resolve the dispute with him or her directly.

The grievance procedure is designed for situations where neither of these channels is appropriate. If you wish to file a grievance, you should go to Social Science Room 7238 and request a Course Comment Sheet. When completing the comment sheet, you will need to provide a detailed statement that describes what aspects of the course you find unsatisfactory. You will need to sign the sheet and provide your student identification number, your address, and a phone where you can be reached. The Department plans to investigate comments fully and will respond in writing to complaints.

Your name, address, phone number, and student ID number will not be revealed to the instructor or teaching assistant involved and will be treated as confidential. The

Department needs this information, because it may become necessary for a commenting student to have a meeting with the department chair or a nominee to gather additional information. A name and address are necessary for providing a written response.

Academic Misconduct: Academic Integrity is critical to maintaining fair and knowledge based learning at UW Madison. Academic dishonesty is a serious violation: it undermines the bonds of trust and honesty between members of our academic community, degrades the value of your degree and defrauds those who may eventually depend upon your knowledge and integrity.

Examples of academic misconduct include, but are not limited to: cheating on an examination (copying from another student's paper, referring to materials on the exam other than those explicitly permitted, continuing to work on an exam after the time has expired, turning in an exam for regrading after making changes to the exam), copying the homework of someone else, submitting for credit work done by someone else, stealing examinations or course materials, tampering with the grade records or with another student's work, or knowingly and intentionally assisting another student in any of the above. Students are reminded that online sources, including anonymous or unattributed ones like Wikipedia, still need to be cited like any other source; and copying from any source without attribution is considered plagiarism.

The Department of Economics will deal with these offenses harshly following UWS14 procedures: 1. The penalty for misconduct in most cases will be removal from the course and a failing grade, 2. The department will inform the Dean of Students as required and additional sanctions may be applied. 3.The department will keep an internal record of misconduct incidents. This information will be made available to teaching faculty writing recommendation letters and to admission offices of the School of Business and Engineering. If you think you see incidents of misconduct, you should tell your instructor about them, in which case they will take appropriate action and protect your identity. You can also choose to contact our department administrator, Tammy Herbst-Koel (therbst@wisc.edu), and your identity will be kept confidential. For more information, refer to https://www.students.wisc.edu/doso/academicintegrity/