



## **A A E 737: APPLIED ECONOMETRIC ANALYSIS III**

**Credits:** 3

### **Meeting Time and Location**

Mondays and Wednesdays, 1:00 p.m. – 2:15 p.m., B30 Taylor Hall

**Instructional Mode:** face-to-face only

This class meets for two, 75-minute class periods each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for about 3 hours out of the classroom for every class period. This syllabus includes more information about meeting times and expectations for student work.

### **INSTRUCTOR**

**Instructor:** Dr. Andrew W. Stevens

### **Instructor Availability**

Office hours: Thursdays, 11:30 a.m. – 12:30 p.m., 330 Taylor Hall

**Instructor Email:** awstevens@wisc.edu

### **OFFICIAL COURSE DESCRIPTION**

#### **Course Description**

Prepares students for their own empirical work by examining contemporary econometric techniques as they are used in development, environment and natural resources, and agricultural economics. Guides students through a selection of applied models using past and current research as examples. By hearing lectures and working through papers, problem sets, replication exercises, and/or research projects, students will develop a deeper understanding of the many facets of empirical research in economics.

#### **Requisites**

ECON 709 and ECON 710

(If you have not taken these or comparable courses, please speak with me early in the semester.)

#### **Course Narrative**

*Correlation is not causation. In this course we will explore different empirical techniques that can separate causal effects from mere correlations. In other words, this course is about **causal inference**. I have designed this course for PhD-level students in quantitative social science disciplines who have a solid background in statistics, linear algebra, and econometric theory. We will connect theory to empirical applications with the ultimate goal of you being able to employ the techniques discussed in this course in your own original research. Depending on your background and objectives, this may or may not be the most appropriate course for you. Other similar options at UW–Madison include ECON 706 (Econometrics III) and PS 813 (Multi-variable statistical inference for political research).*

## LEARNING OUTCOMES

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

- explain and assess the concepts of causal inference and identification in the design-based paradigm of econometric analysis
- articulate the necessary assumptions underpinning various applied identification strategies
- assess and critique specific applications of the identification strategies discussed in this course
- conduct and interpret econometric analyses applying various identification strategies using statistical software
- summarize ongoing debates about the validity of empirical research in economics including issues of internal validity, external validity, and replicability

## GRADING

- Grade components
  - Problem sets: 50% (5 at 10% each)
  - Reading quizzes: 10% (I will drop your lowest score)
  - Final exam: 40%
- Grade calculation
  - I reserve the right to curve the following grading scale in students' favor at the end of the semester. However, I do not expect to do this.
  - Please note that this grading scale is somewhat atypical:
    - A: >90
    - AB: 80-90
    - B: 70-80
    - BC: 60-70
    - C: 50-60
    - D: 40-50
    - F: <40

## REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

There is one required textbook for this course:

- [AP] Angrist, J. D. & Pischke, J. S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

Another excellent reference for this course (probably more useful than any of the textbooks listed below) is Guido Imbens' set of notes from an NBER Summer Course in 2007 called "What's New in Econometrics." The notes are available for free online at <http://nber.org/WNE/WNEnotes.pdf>.

All other readings will be accessible through the University library or provided by me. However, I also encourage you to have at least one good reference econometrics textbook. The three listed below are all good options, and I am particularly fond of the Cameron & Trivedi and Wooldridge texts.

- [CT] Cameron, A. C. & Trivedi, P. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press
- Greene, W. H. (2017). *Econometric Analysis (8<sup>th</sup> Edition)*. Pearson.
- [W] Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

You will need access to Stata in order to complete the problem sets. Stata is available to you for free through the Campus Software Library. (If you would prefer to use another statistical software such as R, SAS, or SPSS, please speak to me early in the semester.)

## EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

- Final exam
  - There will be a cumulative take-home final exam for this course. I will provide specific instructions near the end of the semester.
  - You will have at least forty-eight (48) hours to complete the exam. Exams submitted late will receive a score of zero. Technical difficulties are not acceptable reasons to receive an exception to this policy.

## HOMEWORK & OTHER ASSIGNMENTS

- Problem sets
  - There are five (5) problem sets in this course. You will have at least a week to complete each problem set.
  - You may work individually or with up to two additional people on your problem sets. If you work with others, you must list your collaborators and each of you must submit your own write-up of answers. When coding is required, you must also submit your code.
  - In general, problem sets will not be accepted late. Each student may submit **one** problem set up to one class period late without penalty. Otherwise, the assignment will receive a zero. If there are extenuating circumstances, please contact me as soon as possible and we can discuss your individual situation.
- Reading quizzes
  - Throughout the semester, I will give short in-class quizzes on certain readings. In all cases, I will give you at least two days advanced notice that there will be a reading quiz.
  - I will drop your lowest reading quiz score. If you miss a reading quiz without communicating with me, you will receive a zero.

## COURSE SCHEDULE (I reserve the right to make adjustments if needed.)

### I. COURSE PRELIMINARIES

- W – Jan 22: Course introduction and overview
- M – Jan 27: Model-based vs. design-based approaches to causality (David Card lecture)
- W – Jan 29: Ordinary least squares (OLS)
  - AP Ch. 3.1
  - CT Ch. 4.1-4.5
  - W Ch. 2
- M – Feb 3: The Rubin causal model
  - AP Ch. 1-2
  - CT Ch. 2
- W – Feb 5: Randomized control trials
  - **Problem set 1 distributed**

### II. SELECTION ON OBSERVABLES

- M – Feb 10: Regression adjustment
  - AP Ch. 3.2
  - CT Ch. 4.1-4.5
  - W Ch. 4, 18.3.1
- W – Feb 12: Nonparametric regression I
  - **Problem set 1 DUE**
- M – Feb 17: Nonparametric regression II
- W – Feb 19: Matching methods
  - AP Ch. 3.3

- CT Ch. 25.4
- W Ch. 18.3.2
- M – Feb 24: Propensity score methods
- W – Feb 26: Additional selection-on-observable methods
  - **Problem set 2 distributed**

### III. SELECTION ON UNOBSERVABLES

- M – Mar 2: Random effects
  - AP Ch. 5.1-5.2
  - CT Ch. 21, 22
  - W Ch. 10
- W – Mar 4: Fixed effects, the within estimator, and differencing
  - **Problem set 2 DUE**
- M – Mar 9: Differences in differences and triple-differences
- W – Mar 11: Synthetic controls
  - CT Ch. 25.5
  - **Problem set 3 distributed**
  
- M – Mar 16: SPRING RECESS – NO CLASS
- W – Mar 18: SPRING RECESS – NO CLASS
  
- M – Mar 23: Instrumental variables I
  - AP Ch. 4.1-4.3
  - CT Ch. 4.8
  - W Ch. 5
- W – Mar 25: Instrumental variables II
  - AP Ch. 4.6
  - CT Ch. 4.9
  - **Problem set 3 DUE**
- M – Mar 30: Regression discontinuities I
  - AP Ch. 6
  - CT Ch. 25.6
- W – Apr 1: Regression discontinuities II
- M – Apr 6: Bandwidth issues
- W – Apr 8: TBA
  - **Problem set 4 distributed**

### IV. STATISTICAL INFERENCE AND OTHER TOPICS

- M – Apr 13: Clustering standard errors
  - AP Ch. 8.2
  - CT Ch. 24.5
- W – Apr 15: Randomization Inference
  - **Problem set 4 DUE**
- M – Apr 20: Bootstrapping
  - CT Ch. 11
- W – Apr 22: Machine learning techniques
  - **Problem set 5 distributed**
- M – Apr 27: Pre-analysis plans and registration
- W – Apr 29: Replication
  - **Problem set 5 DUE**
- M – May 4: FINALS WEEK – NO CLASS
  - **Final exam distributed**
- W – May 6: FINALS WEEK – NO CLASS
  - **Final exam DUE**

## **ACADEMIC CALENDAR & RELIGIOUS OBSERVANCES**

Please refer to the official UW–Madison academic calendar for important deadlines including the last day to drop courses or withdraw without notation on your transcript, the last day to drop courses with full tuition refund, the last day to drop courses, and the last day to apply for a pass/fail grade or convert your enrollment from for-credit to audit: <https://secfac.wisc.edu/academic-calendar/>

Wisconsin law mandates that any student with a conflict between an academic requirement and any religious observance must be given an alternative for meeting the academic requirement. If you wish to request relief from any aspect of this course for a religious observance, please notify me via email within the first two weeks of class and specify the specific days or dates for which you are requesting relief. We will work together to determine an appropriate way to satisfy the affected course requirements in an appropriate way.

## **ACADEMIC INTEGRITY**

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but are not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

## **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. Providing reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform 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. I will work either directly with 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.

## **DIVERSITY & INCLUSION**

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 fulfills 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.