AEDE 4002.01
Econometric Applications in Agribusiness and Applied Economics

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Class Hours: Tuesday and Thursday 2:20-3:40pm, Agricultural Admin Bldg. 246
Lab Hours: Monday 9:35-10:55pm, Agriculture Admin Bldg 005

Prof. Office Hours: Tuesday 4-5pm, Thursday 1-2pm, & by apt, Agriculture Admin Bldg 329
TA Office Hours: Wednesdays 2:00-4:00pm, & by apt, Agriculture Admin Bldg 344
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Course Description

This class will begin with basic econometrics models under the potential outcomes framework. It will then move to quasi-experimental approaches, including differences-in-differences, propensity score matching, regression discontinuity, spatial discontinuities and random shocks. We'll discuss censoring vs. corner solutions vs. selection. In the second half of the class we'll cover some cutting edge topics: data dimensionality reduction, plausibly exogenous IVs, causal bounds, mediation analysis, and two simple machine learning techniques. While classes will primarily be lecture and discussion, we will sometimes work through analysis examples in class, as well as focusing solely on analysis in Stata and R during labs. Problem sets are designed to help build your econometric intuition as well as your coding skills.

Required Textbooks

[AP] Angrist, Joshua and Jorn-Steffen Pischke (2009). Mostly Harmless Econometrics: An Empiricists Companion. [W1] Wooldridge, Jeffrey M. Econometric Analysis of Cross Section and Panel Data, 2nd Edition.

Supplementary Textbooks

[W2] Wooldridge, Jeffrey M. Introductory Econometrics: A Modern Approach, 6th Edition. [G] Greene, William H. Econometric Analysis 7th Edition.

Course Structure

Every lecture has required **reading**, and some have supplementary (optional) reading. I have tried to limit Wooldridge readings to only the most pertinent subsections. Mostly Harmless readings are harder to shorten, but the context tends to be very useful. For some topics I assign only articles, as no classic textbook chapter yet covers the topic. These articles are posted by module on Carmen. For most of you, completing assigned reading *before* lecture will improve your ability to engage with lecture material and learn.

I will try to post weekly beamer **presentations** to the server every Monday evening. It's possible that sometimes this won't happen, but most Tuesday and Thursday mornings you'll be able to examine the presentations prior to class. I urge you to print these slides or have them on a ipad/laptop that allows scribbling, as this will help you with note-taking. No point writing down a slew of equations that can be easily accessed via the slides.

Most Mondays I will teach a **lab** where we run through Stata code or R code, estimating the models that we discussed in class. In the first class I will also teach you to integrate Stata output and Latex, and I hope that you will use this skill for the rest of the class, as you write up your problem set solutions and final project.

Each of you will be assigned an OSU **server** for this class, so we don't have to worry about personal access to software. This server will hold the problem set data and some sample code in Stata and R, from lectures and labs. You can access the server from any computer through Desktop Remote Connect or Microsoft Remote Desktop — both freely available online. You do need to have an internet connection to do so, however.

Each **problem set** asks you to work through questions regarding a particular dataset, often related to an existing, published paper. Assignment data will be made available on your personal server, and both Stata and R are available on the server for analysis. I don't mind if you collaborate as you work on the problem sets — in fact, I encourage it, with the cautionary note that free riders learn less and suffer during the final replication project. However, you must each turn in your own, individual results/answers and the code that you used to procure those results. These answers may not be identical across students, though I realize that you'll likely give similar answers to the other people in your group. All problem set will be handed in via Carmen.

If you need an **extension** for a problem set, please let me know at least 3 days in advance.

Rather than a final exam, I require you to complete a **final replication project**. To do this, you must choose a paper for which the data are available. You may NOT procure the code from the author. (If you do this and we catch you, you will fail the course.) You will submit the paper and the data to me by the evening of March 29th; if it's not too simple or too complex, I'll approve it. Ideally, you should choose a paper focused on causal identification, but I don't require this. Only the first few modules of this course have accompanying problem sets; this allows you to work on the replication in the final weeks of the class. It will be due on April 30.

Evaluation and Participation

Grades will be based primarily on the problem sets (20% each, 60% total) and your final replication (30%), but also on class participation (10%). By class participation, I mean questions and discussion. I add in a grade for this because everyone learns econometrics better when questions, confusions and ideas are freely and openly offered. If you are a shy person, try to ask a question at least once a week. If you are a verbose person, try to ask your peers questions, or sometimes just listen — that's also a form of participation. I realize we are all coming from different backgrounds, and some of us may be more used to open discussion than others. That's ok. Find a way to participate that feels comfortable for you, and the entire class will be better for it.

General Schedule

This schedule is subject to slight changes as the semester progresses. Exam dates are noted in **bold**. Problem sets will be given on a weekly basis: distributed on Tuesdays and due the following Tuesday. Pop quizzes will be based on non-optional readings.

Week 1, 03/04 - 03/07: Identification, Potential Outcomes Framework

- Monday: Potential Outcomes Framework
  - Required: [AP] Ch 1, 2, 3.1, 3.2
- Tuesday and Thursday: IV as LATE, conditional IV, bad IVs
  - Required: [AP] Ch 4 (IV) (For original work, Angrist & Imbens 1994 Econometrica)
  - Recommended: [W1] Ch 5.1.1 (IV motivation), 5.1.2 (2SLS), 5.2.3 (IV pitfalls), 5.3 (IV and omitted vars, measurement error)
  - Recommended: Christian & Barrett 2018, Bound and Jaeger 1996 NBER
- Wednesday (tentative) Lab: Stata Commands, Interfacing with Latex
- Problem set 1 : Endogeity and Causality in Grandmothers and Granddaughters (Duflo)
  - Based On: Grandmothers & Granddaughters (Duflo 2003)
  - Posted Monday, March 4th
  - Due Friday, March 22

, 03/11 - 03/14: Spring Break

Week 2, 03/18 - 03/21: More on Causality and Identification

- Monday: TA will oversee lab for problem set 1 collaboration, Stata and Latex questions
- Tuesday: TA-run discussion of pitfalls in empirical analysis, causal relationships
  - Required EconTalk podcasts: "Susan Athey on machine learning, big data, and causation" & "Andrew Gelman on Social Science, Small Samples, and the Garden of the Forking Paths". Required Nature reading: "Retire Statistical Significance".

- Thursday: Panel data and fixed effects, propensity scores
  - Required: [AP] Ch 5.1 (fixed effects), 8.3 (clustering in panels)
  - Recommended: [W1] Ch10.1 (omitted variables problem), 10.5.1 (consistency of the FE estimator), 21.3.3 (propensity score methods)

Week 3, 03/25 - 03/28: DD and RD

- Monday Lab: Working with geospatial climate data in R
- Tuesday: Regression Discontinuity, Fuzzy RD
  - Required: [AP] Ch6 (RD)
  - Recommended: Lee and Lemieux 2010 JEL
- Thursday: Differences and Differences, Triple-difference, Continuous DD specifications
  - Required: [AP] Ch 5.2 (DD), [W1] Ch 6.5 (pooled cross section and DD)
  - Recommended: Ravallion et al. 2005 JHR
  - Note: This lecture will be moved to either morning or Wednesday the 27th
- Problem set 2: Natural Experiments in Deforestation (Alix-Garcia)
  - Based On: The Ecological Footprint of Poverty Alleviation (Alix-Garcia et al. 2013)
  - Posted Monday, March 25
  - Due Friday, April 5

Week 4, 04/01 - 04/04: Dimensionality Reduction; Censoring, Corner Solutions, Selection

- Monday Lab: Lasso in R and in Stata
- Tuesday: Data-rich environments (subsetting, collapsing, both)
  - Required: Belloni, Chernozhukov & Hansen 2014 JEP; Bai & Ng 2009 JTSE
  - Recommended: Bevis & Villa 2018
- Thursday: Differentiating Censoring, Corner Solutions, Selection
  - Required: [W1] Ch 17.1 (motivation), 17.2, 17.3 (type 1 tobit) 17.6 (2-part models and type 2 tobit)
  - Recommended: Ricker-Gilbert, Jayne & Chirwa 2011 AJEA
- Problem set 3: Predicting smallholder yields in East Africa (weather shocks, dimensionality)
  - Posted Monday, April 8
  - Due Friday, April 19
  - Relevant reading: Dell et al. 2014 JEL, Aufhammer et al. 2013 REEP

Week 5, 04/08 - 04/11: Plausibly Exogenous IVs

- Monday Lab: Oster's bounds and Conley's method in Stata
- Thursday: Plausibly Exogenous Instruments
  - Required: Altonji, Elder & Taber 2005 JHR, Angrist et al 2010 JLE, Conley, Hansen & Rossi 2012 ReStat,
- Thursday: Plausibly Exogenous Instruments
  - Required: Kippersluis & Rietveld 2018 EJ

Week 6, 04/15 - 04/18: Causal Bounds, Mediation Analysis

- Monday Lab: Conley's method
- Tuesday: Testing exogeneity, causal bounds with selection on observables
  - Required: Oster 2017 JBES, Altonji, Elder & Taber 2005 JPE
- Thursday: Mediation Analysis
  - Required: Acharya et al. 2016 APSR, Dippel et al. 2017 NBER
  - Recommended: Imai et al. 2011 APSR

Week 7, 04/22 - 04/25: A bit on machine learning

- Monday Lab: Mediation analysis
- Tuesday: Unsupervised k-means clustering, hierarchical clustering
  - Required: Athey et al. 2017 NBER
  - Recommended: Mullainathan & Speiss 2017 JEP
- Thursday: Regression trees
  - Required: Athey and Imbens 2016 PNAS
  - Recommended: Athey & Imbens 2017 JEP

Week 8 Exam Period, 04/29 - 05/02:

- Replication project is due April 30.

Institutional Policies and Resources

Academic integrity and honesty

OSU students are required to comply with the Code of Student Conduct; this includes proper attribution of all sourced materials.

Academic accessibility

OSU is committed to providing access to the educational experience to students with disabilities and health conditions that impact learning. If you have received a letter from the Office of Student Life Disability Services, which outlines the academic accommodations to which you are entitled, you must meet with me to review that letter and discuss how your learning needs intersect with the course expectations. If you suspect that you have a learning need that could benefit from academic accommodations, you should contact the Office of Student Support Services, who can help you learn more about how to proceed in this instance as well.

Title IX and sexual misconduct

At Ohio State University, we strive to foster relationships based upon mutual respect, honesty, integrity, and trust. As such, we are committed to providing an educational, living, and working environment free from all forms of harassment and discrimination for all members of our community. The university prohibits all forms of sexual or gender-based discrimination, harassment or misconduct, including sexual harassment, sexual violence, relationship violence, stalking, or violations of consent.

If you or someone you know has experienced sexual misconduct, you may find information about resources and contact information OSU's Sexual Misconduct Policy. For instance, on-campus confidential resources are available, including the counselors at the Counseling and Consultation Service (614-292-5766) and attorneys at Student Legal Services (614-247-5853). More information about on- and off-campus confidential resources, as well as medical treatment, law enforcement, and other support services, may be found at the Student Advocacy Center.

Emotional and mental support

The Counseling and Consultation Service provides support for students suffering emotionally and mentally. Any students can schedule an appointment with a counselor by calling 614-292-5766 during business hours. On most Thursdays you can also drop into "Let's Talk" for a free, informal and confidential mental health consultation called with a staff member from Counseling and Consultation Service, from 6-8 PM in the Multicultural Room at the Ohio Union. No appointment or paperwork is needed, and services are available in Mandarin Chinese, Cantonese Chinese, Korean, Hindi, and Spanish. Consultation dates are listed on the "Let's Talk" website.