Columbia University SIPA
Fall 2020

Empirical analysis of energy markets
U6616

Prof. Ignacia Mercadal

Course Description: This is a class on empirical methods with applications to questions about energy markets. The goal is to allow students to understand empirical economic research and to evaluate its policy relevance. For the most part, we will focus on typical challenges faced when we try to identify the causal effect of one variable on another in the context of energy markets, and how to address them. In addition to reading and discussing academic papers, students will analyze real datasets and replicate an empirical paper using R. Students are expected to become familiar with empirical analysis using R by the end of the course.

Class meeting: Wednesdays at 9am. Weekly recitations Friday 11am-12:50pm.

Reader: Eugene Tan (pt2535@columbia.edu). Office hours TBD.

Office hours: Mondays 1:00 - 2:30 pm and Thursdays 9:00-10:30 am and by appointment. Please sign up here.

Class format: The lecture part of the class will be recorded and posted online before the class meeting to be reviewed by the students. During the meeting, we will discuss it in the context of one or two papers presented by students under the professor's guidance, and discussed by the whole class.

Email: ignacia.mercadal@columbia.edu

Course website: All information about the course will be posted on Canvas. Students are expected to check it regularly.

Course Prerequisites: SIPA U6501 (Quantitative Analysis II for International and Public Affairs). U6400 recommended.

Grading: 10% participation, 20% in-class presentation, 35% empirical exercises, 35% final exam.

Presentation: Every class a student will briefly present one of the papers to be discussed in that class and propose some questions to motivate the discussion. The presentation should not be longer than 15 minutes. Students will be able to choose the paper to present among a list of previously selected papers.

Recitations: Every week, there will be a recitation in which students will learn to do empirical work using R. Though not required, I recommend the book *R for Data Science* by Hadley Wickham and Garrett Grolemund if you prefer to use a book for guidance.

Empirical exercises: One of the goals of the class is to learn to analyze a dataset using R. Since the class assumes no previous knowledge, learning will be based on a combination of Datacamp and empirical exercises, in addition to the recitations. Datacamp assignments will be assigned through the website starting the first week. There will also be 4 empirical exercises during the semester, in which you will have to analyze a dataset or replicate an existing paper using R. The due dates for these exercises are the following:

Empirical exercise 1: October 2
Empirical exercise 2: October 16
Empirical exercise 3: November 13
Empirical exercise 4: December 4

Readings: The textbook for this class will be *Mastering Metrics: The path from cause to effect* by Joshua D. Angrist and Jorn-Steffen Pischke. Additional references can be found here:

- Guido W Imbens and Jeffrey M Wooldridge. Recent developments in the econometrics of program evaluation. *Journal of economic literature*, 47(1):5–86, 2009

- James Stock and Mark Watson. *Introduction to Econometrics (3rd edition)*. Addison Wesley Longman, 2011
- Joshua D. Angrist and Jorn-Steffen Pishke, *Mostly Harmless Econometrics: An Empiricist's Companion* (for a more advanced treatment of the topics covered in *Mastering Metrics*)

Readings for each class are indicated below and may be adjusted during the semester. Readings with a (*) are required.

Cheating: Violations of the Code of Academic and Professional Conduct will be subject to the Dean's Disciplinary Procedures.

1 Topics

1. Potential outcomes framework and randomized experiments (2 classes)

    - Mastering Metrics, ch. 1.
    - Stock and Watson, ch. 1
    - Meredith Fowlie, Michael Greenstone, and Catherine Wolfram. Do energy efficiency investments deliver? Evidence from the weatherization assistance program. *The Quarterly Journal of Economics*, 133(3):1597–1644, 2018 (*)
    - Kenneth Lee, Edward Miguel, and Catherine Wolfram. Experimental evidence on the economics of rural electrification. *Journal of Political Economy*, forthcoming. doi: 10.1086/705417 (*)
    - Katrina Jessoe and David Rapson. Knowledge is (less) power: Experimental evidence from residential energy use. *American Economic Review*, 104(4):1417–38, 2014

2. Regression analysis (2 classes)

    - Mastering metrics, ch.2
    - Thomas R Covert and Richard L Sweeney. Relinquishing riches: Auctions vs informal negotiations in texas oil and gas leasing. Technical report, National Bureau of Economic Research, 2019 (*) Download latest version here
    - Joseph Cullen. Measuring the environmental benefits of wind-generated electricity. *American Economic Journal: Economic Policy*, 5(4):107–33, 2013

- Arik Levinson. How much energy do building energy codes save? Evidence from California houses. *American Economic Review*, 106 (10):2867–94, 2016 (*) (Link to podcast on working paper)
- Stephen P Holland and Erin T Mansur. Is real-time pricing green? the environmental impacts of electricity demand variance. *The Review of Economics and Statistics*, 90(3):550–561, 2008

3. Panel data (2 classes)

   - Mastering metrics, ch.5
   - Maximilian Auffhammer and Ryan Kellogg. Clearing the air? The effects of gasoline content regulation on air quality. *American Economic Review*, 101(6):2687–2722, 2011
   - Lucas W Davis and Catherine Wolfram. Deregulation, consolidation, and efficiency: Evidence from US nuclear power. *American Economic Journal: Applied Economics*, 4(4):194–225, 2012 (*)
   - Lucas W Davis, Alan Fuchs, and Paul Gertler. Cash for coolers: Evaluating a large-scale appliance replacement program in Mexico. *American Economic Journal: Economic Policy*, 6(4):207–38, 2014
   - Matthew J Kotchen and Laura E Grant. Does daylight saving time save energy? Evidence from a natural experiment in Indiana. *Review of Economics and Statistics*, 93(4):1172–1185, 2011
   - Justine S Hastings. Vertical relationships and competition in retail gasoline markets: Empirical evidence from contract changes in Southern California. *American Economic Review*, 94(1):317–328, 2004

4. Instrumental variables (2 classes)

   - Mastering metrics, ch.3
   - Christopher R Knittel, Douglas L Miller, and Nicholas J Sanders. Caution, drivers! Children present: Traffic, pollution, and infant health. *Review of Economics and Statistics*, 98(2):350–366, 2016
   - Wolfram Schlenker and W Reed Walker. Airports, air pollution, and contemporaneous health. *The Review of Economic Studies*, 83(2):768–809, 2015
   - Erich Muehlegger and Richard L Sweeney. Pass-through of own and rival cost shocks: Evidence from the us fracking boom. Techni-

cal report, National Bureau of Economic Research, 2017 Download latest version here

5. Regression discontinuity designs (2 classes)

    - Mastering metrics, ch.4
    - Lucas W Davis. The effect of driving restrictions on air quality in Mexico City. *Journal of Political Economy*, 116(1):38–81, 2008
    - Koichiro Ito and Shuang Zhang. Willingness to pay for clean air: Evidence from air purifier markets in China. *Journal of Political Economy*, forthcoming
    - Mark Hoekstra, Steven L Puller, and Jeremy West. Cash for Corollas: When stimulus reduces spending. *American Economic Journal: Applied Economics*, 9(3):1–35, 2017
    - David S Lee and Thomas Lemieux. Regression discontinuity designs in economics. *Journal of economic literature*, 48(2):281–355, 2010
    - Meghan Busse, Jorge Silva-Risso, and Florian Zettelmeyer. $1,000 cash back: The pass-through of auto manufacturer promotions. *American Economic Review*, 96(4):1253–1270, 2006

6. Matching (1 class)

    - Tatyana Deryugina, Alexander MacKay, and Julian Reif. The long-run dynamics of electricity demand: Evidence from municipal aggregation. *American Economic Journal: Applied Economics*, forthcoming
    - Meredith Fowlie, Stephen P. Holland, and Erin T. Mansur. What do emissions markets deliver and to whom? Evidence from Southern California's NOx trading program. *American Economic Review*, 102(2):965–93, April 2012

7. Structural analysis (1 class)

    - Natalia Fabra and Mar Reguant. Pass-through of emissions costs in electricity markets. *American Economic Review*, 104(9):2872–99, 2014 (*)
    - Nicholas Ryan and Anant Sudarshan. Rationing the commons. Technical report, National Bureau of Economic Research, 2020 Download latest version here

- Will Rafey. Droughts, deluges, and (river) diversions: Valuing market-based water reallocation. 2020 Download latest version here
- Kira R Fabrizio, Nancy L Rose, and Catherine D Wolfram. Do markets reduce costs? Assessing the impact of regulatory restructuring on US electric generation efficiency. *American Economic Review*, 97(4):1250–1277, 2007
- Christopher R Knittel. Automobiles on steroids: Product attribute trade-offs and technological progress in the automobile sector. *American Economic Review*, 101(7):3368–99, 2011