Instructor: Meredith Fowlie, 327 Giannini Hall
Contact: fowlie@berkeley.edu
Office hours: Fridays 10-12 noon or by appointment.

Course description: This course is designed to help prepare graduate students to conduct empirical research in energy and environmental economics. This supplements topics covered in ARE 212 and 213, and builds on some of the theoretical foundations laid down in ARE 261.

The course has two broad objectives. The first is to develop an in depth understanding of some specific empirical methods and research designs that are used in the field of energy and environmental economics. The second is to familiarize students with some of the economic models and empirical findings that direct and inform ongoing research in this field.

The first half of the course is more methods-oriented and lecture-based. The second half of the course will be more topics-oriented and paper-based.

Prerequisites: Students should be familiar with the econometric methods covered in ARE 212 and 213. Previous coursework in environmental economics will be helpful, but not required.

Audit policy: The more the merrier! However, there is a price of admission. If you do want to audit, you will be asked to present one paper. This will give you (the auditing student) the opportunity to more comprehensively understand a paper of your choosing.

Academic integrity: I expect it to see it in all of you. These expectations are elaborated upon here: http://sa.berkeley.edu/conduct/integrity. If you are in doubt about what constitutes cheating or plagiarism, please consult with me.

Assignments and grading:

Problem sets (30%) I will assign three or four problem sets in the first part of the course that emphasize applications of methods we are discussing. These can be completed in small groups, but each student must write up his or her own responses.

Paper presentation (25%) Good presentation skills are essential if you want your research findings to be understood by more than just you. This class will give you the opportunity to improve your presentation skills in a very collegial environment. In the second half of the course, each student will present and discuss one of the empirical papers we cover in class. Presentation guidelines will be posted on the course website.
Paper summaries (10%) In-class discussions of papers work much better when people have read the papers! For a subset of the papers we read (subset chosen by you), you will be asked to submit a short (<1 page) paper summary before class.

Replication exercise (25%) The best way to really understand a paper is to take it apart and understand how it works. This exercise asks you to select a paper you are very interested in, obtain the data, and replicate the key results, and think critically about how the analysis could be usefully extended.

Research sketch (10%) An important goal of the class is to help you generate research ideas of your own. A one page sketch of two possible research ideas is due on April 1. I will provide feedback on these. You will then have several weeks to refine the idea. During reading week, we will meet for two egg timer sessions. Each student will have ten minutes to pitch his/her idea. We will then debrief the idea as a group for ten minutes.

Statistical software: Problem sets will be based on Stata and Matlab. Students may use the software of their choosing. However, problem set solutions and classroom discussion will use Stata and Matlab.

Textbook: We will pick and choose from a variety of texts, papers, and resources. In the first half of the course, we will draw most heavily from the following resources:


Imbens, Guido and Donald Rubin. Causal Inference in Statistics and Social Sciences (2015). This book is not yet published – release date sometime in March. I use the unpublished – and not ready to distribute- manuscript to inform my notes on causal inference. Based on my sneak preview, I highly recommend this book!


Rough course outline

I. Getting oriented


Application:


II. The (so called) gold standard: Randomized field experiments


Special topics: Spillovers, external validity, quantile treatment effects


Baird et al. (2014) “Designing Experiments to Measure Spillover Effects”


Bitler et al. (2014) Can Variation in Subgroups’ Average Treatment Effects Explain Treatment Effect Heterogeneity? Evidence from a Social Experiment

McConnell, Margaret, Betsy Sinclair and Donald P. Green (2010) “Detecting Social Networks: Design and Analysis of Multilevel Experiments”.

III. Causal inference using quasi-experimental data


a. **Fixed effects models and differences-in-differences**

Review: Angrist and Pischke, Chapter 5.1 - 5.2.

**Application**


b. **Matching estimators and regression –based adjustments**


**Applications**


c. **Instrumental variables**


**Applications:**


d. **Non-random selection**

**Application**


e. **Selection continued: taste-based sorting**

**Application**


**IV. Discrete choice models**
a. **Discrete choice modeling: Logit and mixed logit**

Train: Chapters 2,3,6

**Applications**


b. **Discrete choice models with unobserved choice characteristics**

Train chapter 13

Knittel, Chris and Konstantinos Metaxoglou "Estimation of Random Coefficient Demand Models: Challenges, Difficulties and Warnings" working paper and codes available on Knittel's website.


**Applications**


E. **Introduction to dynamic structural estimation**


**Part II: Empirical applications**

**Note:** We will only cover a subset of these topics. We will allocate class time according to student interest.
1. **Electricity markets- Supply**


2. **Electricity markets- demand**


3. **Energy efficiency/Energy using durables**


4. **Gas prices, fuel economy, consumer demand**


5. Oil and natural gas


6. Energy in the developing world


ENVIRONMENT/ENVIRONMENTAL POLICY

1. Effects of air quality regulations on industrial activity


2. **Market-based environmental regulation**


** Calel, Raphael and Antoine Dechezlepretre (2012) “Environmental Policy and Directed Technological Change: Evidence from the European carbon market”


Deschenes, Olivier and Greenstone, Michael and Shapiro, Joseph S. (2013), Defensive Investments and the Demand for Air Quality: Evidence from the NOx Budget Program and Ozone Reductions.


Lemoine, Derek (2013). “Green expectations: Current effects of anticipated carbon pricing”.

3. **Fuel economy standards/low emission vehicles**


** Bento, Antonio, "The Unintended Consequences of Regulation in the Presence of Multiple Unpriced Externalities: Evidence from the Transportation Sector" (with Kevin Roth, Daniel Kaffine and Mathew Zaragoza), American Economic Journal: Economic Policy, Forthcoming


Jacobsen, Mark, “Evaluating U.S. Fuel Economy Standards in a Model with Producer and Household Heterogeneity,” working paper (2010). (NOTE: This paper is closely related to the Bento et al. 2009 AER article. Please read that one as well.)


Li, Shanjun (2014) Better Lucky Than Rich? Welfare Analysis of Automobile License Allocations in Beijing and Shanghai
4. Fuel regulations


5. Climate change

Albouy, Graf, Kellogg and Wolff, “Aversion to Extreme Temperatures, Climate Change, and Quality of Life.”


6. Pollution and health


Currie, Janet, and Matthew Neidell, “Air Pollution and Infant Health: What Can We Learn from California’s Recent Experience?” Quarterly Journal of Economics 120 (2005), 1003-1030.


7. Envirodevonomics


**Jack, B.K. “Uncertainty, self-selection and the design of subsidies: Evidence from Zambia” (with Samuel Bell, Paulina Oliva, Christopher Severen and Elizabeth Walker).


The following is a tentative outline for the course. I will provide updates as needed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>1 T Jan 20</td>
<td>Intro lecture</td>
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<td>2 R Jan 22</td>
<td>Experimental research design - basics</td>
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<td>3 T Jan 27</td>
<td>Research design alternatives</td>
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<td>4 R Jan 29</td>
<td>Power calculations</td>
<td>Distribute PS1</td>
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<td>5 T Feb 3</td>
<td>Three special topics: SUTVA violations, external validity, quantile effects</td>
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<td>6 R Feb 5</td>
<td>Conclude experimental research designs</td>
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<td>Introduce Quasi-experimental research designs</td>
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<td>7 T Feb 10</td>
<td>Fixed effects/DID</td>
<td>PS1 due</td>
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<td>8 R Feb 12</td>
<td>Semi-parametric/non-parametric matching</td>
<td>Distribute PS2</td>
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<td>9 T Feb 17</td>
<td>Instrumental variables</td>
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<td>10 R Feb 19</td>
<td>Selection models</td>
<td>PS2 due</td>
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<td>11 T Feb 24</td>
<td>Equilibrium sorting models</td>
<td>Debrief PS2</td>
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<td>R Feb 26 CLASS CANCELLED</td>
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<tr>
<td>12 T Mar 3</td>
<td>Introduction to discrete choice models</td>
<td>Distribute PS3</td>
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<td>Replication paper selection</td>
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<td>13 R Mar 5</td>
<td>Logit/Mixed logit</td>
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<td>14 T Mar 10</td>
<td>Discrete choice models, differentiated products, unobserved choice characteristics</td>
<td>PS3 due</td>
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<td>15 R Mar 12</td>
<td>Finish BLP discussion</td>
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<td>16 T Mar 17</td>
<td>Structural estimation of dynamic models</td>
<td>Debrief PS3</td>
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<td>17 R Mar 19</td>
<td>Structural estimation of dynamic models / wrap up class</td>
<td>Replication summary due</td>
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<td>SPRING BREAK</td>
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<td>17 T Mar 31</td>
<td>SMUD seminar</td>
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<td>18 R April 2</td>
<td>Special topics/paper discussions</td>
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<td>18 T Apr 7</td>
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<td>19 R Apr 9</td>
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<td>20 T Apr 14</td>
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<td>21 R Apr 16</td>
<td>Class Cancelled!</td>
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<td>22 T Apr 21</td>
<td>Special topics/paper discussions TBD</td>
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<td>24 T Apr 28</td>
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<td>25 R Apr 30</td>
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<td>R&amp;R week – student egg timer presentations</td>
<td>Replication due May 8</td>
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