Causal Inference and Evidence-based Policy
ECON 8899; PMAP 8899
Time: M-W 1:30 pm – 2:45 pm
Location: 426 Sparks Hall

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Course Web: Ulearn (accessible from top menu at GSU’s home page)

Office Hours: Mondays 12:15 pm to 1:15 pm and by appointment.

Course Description
Did California’s Proposition 99 reduce sales of tobacco products in the state? Did the Clean Air Act result in cleaner air? Do charter schools increase student achievement and, if so, what types of students respond most? Cause and effect questions like these motivate much of the empirical work in policy sciences. Does X cause Y? If X causes Y, does it cause Y in all situations? If X causes Y, how large is the effect of X on Y and how does the size compare to other causes of Y? To answer these cause-and-effect questions, a counterfactual model of causality and a unified methodological framework has been developed over the last three decades.

This class aims to teach students to apply and interpret the counterfactual model and associated methods in answering policy-relevant empirical questions. The course has a heavy reading load with an emphasis on readings that elucidate the intuition and the application of the core conceptual ideas. I am a firm believer that the most fundamental principles can be stated in plain English. Thus the course stresses intuition (in English) over mechanics and proofs. Nevertheless students will be expected to apply the mechanics in the context of a term paper.

Whether you are a student with substantial graduate work in empirical methods or a student with only the pre-requisites covered, you should expect to gain a deeper understanding of approaches to answering causal questions and of the nature of evidence itself. Importantly, you will see more clearly the connections among the various approaches to estimating causal effects. Even for students with substantial coursework in statistics, these connections are often missed.

I have outlined a provisional syllabus below, but we can adapt it based on student interest and background. The main emphasis of the course is like any other graduate course: to encourage students to think critically, to speak and write simply and clearly, to own and use a body of facts and ideas that are widely known, to detect errors and fallacies, to resolve intellectual problems, and to advance our collective knowledge through independent research.

Course Prerequisites
A graduate-level statistics course that covers probability theory, hypothesis testing and linear regression (examples include ECON8740 and ECON8840; ECON 9710 and 9720; PMAP 9111 and PMAP 9121). Contact the professor if you are unsure whether your background is sufficient for the course.
Required Textbooks
 Morgan, SL and C Winship. 2007. Counterfactuals and Causal Inference: methods and principles for social research. $24.86


 The course reading list will be also include journal articles and most of these are available via the Pullen Library electronic journals portal (http://wwwlib.gsu.edu/ejournals/). Articles that are not available via Georgia State University Library will be posted on ULearn.

 Recommended Textbooks
 Rosenbaum, P. 2010. Observational Studies. Springer. Given this book’s expense ($94), it is not required, but I do recommend it if you plan to do empirical work for a career. Copies of a few relevant chapters will be available online.

 Grading
 I will grade you based on your performance on homework problems, one manuscript review, class participation (including keeping up with the readings) and a term paper. Please remember that all university regulations, deadlines, and policies must be observed (including the Policy on Academic Honesty).

 Homework Problems (20% of grade)
 The homework problem sets are designed to bridge the gap between the teaching of theory and the application of that theory to empirical analysis. By doing the homework sets, students will make the theory operational and will apply statistical software to do causal analysis. You can choose to use SPSS, STATA or R software (other programs only with permission of instructor). Students can discuss homework sets among each other, but each student must hand in his or her own work.

 Manuscript Review (15% of grade)
 The purpose of the manuscript review is two-fold: (1) to offer you the opportunity to apply your knowledge to evaluating an original piece of research; and (2) to offer you the opportunity to see what might be involved in conducting a review of an article for a journal or agency. The components of the review are at the end of this syllabus.

 Final Paper (60% of grade)
 The final paper is designed to encourage you to do original research on a policy topic of your choice. You are strongly encouraged to choose your topic from the professor’s list of suggested topics (which will be posted a few weeks into the semester). You need special permission to choose a topic that is not on the list. We will discuss the paper requirements in more detail in class. The basic idea of the paper is that it should be publishable somewhere (whether you publish it or not is your choice). I am not asking for a major breakthrough that is destined for a top journal. Choose something manageable that demonstrates you can recognize an interesting causal question, can apply your knowledge of evaluation design, statistical methods.
and the real world to attempt to answer the question, and can communicate your results clearly, concisely and cogently. A well-posed and answered “small” question is much more desirable than an ambitious, but convoluted and opaque tome. Students tend to do best when they take a published empirical article, or one of the professor’s available data sets, and then replicate the original analysis and extend it in some small but useful way (e.g., updating data, applying different methods). The approximate weights on different characteristics of the paper are:

(25%) Explanation of the causal relationship of interest, the ideal experiment, and the identification strategy.
(55%) Analysis and interpretations of results
(15%) Caveats, implications, and suggestions for future research.
(5%) 10 minute presentation of your draft paper to the class (if >24 students in class, we may eliminate this presentation and put weight into Analysis and Interpretations).

The paper topic must be selected in consultation with me. A two-paged proposal must be handed in by 1 October. The earlier you hand in a proposal, the more input I can have in directing your research. A 3-5 page proposal with detailed empirical design and methods description and, if necessary, a more clearly formulated research question is due on 10 October. Each of you will send me an email the week of 5 November to describe progress of your paper and any problems you may be having.

I recommend, but do not require, that you complete your preliminary results by 14 November and generate a draft paper by 26 November. Class presentations will begin on 28 November and will continue, if necessary, through the final exam period. The final paper is due at 5 pm on the day of the regularly scheduled final exam (5 December). More details on the paper will be forthcoming early in the semester.

Class Participation (5% of grade)
Class participation essentially means (1) that you show up for most classes (no need to give me excuses for missed classes) and (2) you show up having read the assigned readings on most days. I will speak more about what I mean by class participation on the first day of class. As a commitment device, you will often be asked to type up a half page of comments and questions on each reading and bring it to class. These submissions, which will include a description of how you would extend the paper or make it better, will count towards class participation. If the class is small enough, I may also assign students to do a brief presentation on one of the readings. There is no better way to learn a topic than to try to teach it to others.

Preliminary Course Outline
I. Causal States, Potential Outcomes, Identification and Treatment Effects
II. Experimental Designs
   Selection on Observables
III. Estimating Causal Effects by Conditioning: Matching
IV. Estimating Causal Effects by Conditioning: Regression
V. Partial Identification, Sensitivity Analyses, Multiple Control Groups, and Tests of Known Effects
Selection on Unobservables

VI. Instrumental Variable Estimators of Causal Effects
VII. Regression Discontinuity Designs
VIII. Explanation and Identification of Causal Effects by Mechanisms
IX. Repeated Observations and Estimation of Causal Effects

Other topics

X. Heterogeneous Treatment Effects
XI. Synthetic Controls and Comparative Case Studies
XII. What Constitutes “Evidence?”

Reading Assignments

In general, we will use the required textbooks for the key concepts (supplemented with other texts and review articles, when needed). We will use journal articles as examples of applications. Starting in September, I will attempt to achieve the following structure: (1) assign chapters on theory and at least one applied article; and (2) the next week will “look back” at the previous week with a second applied article and then introduce new theory. Below is a draft list of the reading assignments. I expect I will alter the list as we go, depending on student interest and revealed abilities.

* indicates required reading. Readings without the asterisks will be described in class, but you need not read them in depth (but do skim them). If other readings are assigned, you will receive them well in advance.

I. Causal States, Potential Outcomes, Identification, Treatment Effects and Elaborate Theories

Morgan and Winship, Chapters 1-2*
Angrist and Pischke, Chapters 1-2*
Rosenbaum, Chapter 1* [available at course website]

Morgan and Winship, Chapter 10
Rosenbaum, Chapter 11.6


or

Ferraro, PJ. 2009. Counterfactual thinking and impact evaluation in environmental policy. In Special Issue on Environmental program and policy evaluation, M. Birnbaum & P. Mickwitz (Eds.). New Directions for Evaluation 122: 75–84.]

For more technical discussions of causality, see Holland (1986; JASA), Heckman (2000; QJE), and, especially, J. Pearl’s book Causality.
II. Experimental Designs

Duflo et al. 2006. Using randomization in development economics research: a toolkit.*

Orr, L. 1999. Social experiments: evaluating public programs with experimental methods. Chapters 1-2, and 6.* [available online – Chapter 6 is most important. In Chapter 1 read closely sections on internal versus external validity, limitations of experimental method, ethics of experimentation, and informed consent; skim the rest. In Chapter 2, read sections on relating experimental impacts to policy decisions and interpreting treatment-control differences in outcomes (much of the stat theory should be review); skim the rest]

[For a more technical introduction, see Rosenbaum, Chapter 2. available online]


III. Estimating Causal Effects by Conditioning: Matching

Morgan and Winship, Chapters 3-4*


Effectiveness of Protected Area Networks in Reducing Deforestation. *Proceedings of the National Academy of Sciences* 105(42): 16089-16094.*


[for more technical material on matching, see Rosenbaum, Chapter 3, available online]

IV. *Estimating Causal Effects by Conditioning: Regression*

Morgan and Winship, Chapter 5.*
Angrist and Pischke, Chapter 3.*


V. *Partial Identification, Sensitivity Analyses and Tests of Known Effects*

Morgan and Winship. Chapter 6*


Rosenbaum. Chapter 4* [available online]


Manski, C. 2011. Policy analysis with incredible certitude. *The Economic Journal,* 121 [every student thinking of doing policy research should at least skim this article]


Rosenbaum, Chapter 6

VI. Instrumental Variable Estimators of Causal Effects

Morgan and Winship, Chapter 7*

Angrist and Pischke, Chapter 4*

[re-read Duflo et al. Randomization Toolkit on creating your own instrumental variables]*


Joshua Angrist and Guido Imbens, “Comment on ‘Instrumental Variables: A Study of Implicit Behavioral Assumptions,’” JHR.

James Heckman, Reply to previous, JHR.

VII. Regression Discontinuity Designs

Morgan and Winship, Chapter 9.2*

Angrist and Pischke, Chapter 6*

Boudelmeyer and Skoufias. An Evaluation of the Performance of Regression Discontinuity Design on PROGRESA

VIII. Repeated Observations and Estimation of Causal Effects

Morgan and Winship, Chapter 9.1, 9.3-9.4*

Angrist and Pischke, Chapter 5* [also read Chapter 8 on “nonstandard standard errors”]


IX. Explanation and Identification of Causal Effects by Mechanisms

Morgan and Winship, Chapter 8 (re-read Chapter 3 on causal graphs)*


X. Heterogeneous Treatment Effects

Angrist and Pischke, Chapter 7 (quantile regressions)*

Orr, Chapter 6.*

Ferraro, PJ and JJ Miranda Montero. Long-term, heterogeneous treatment effects from non-pecuniary environmental programs: a large-scale field experiment.*

XI. Synthetic Controls and Comparative Case Studies

Abadie et al. 2010. Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program. JASA.*

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**XII. What Constitutes Evidence?**

[Imbens and Angrist exchange in JEL issue]*

**Learning Objectives**

1. The student should be able to understand and apply the basic theory from the prerequisite classes.
2. The student should be able to explain what is meant by causal inference in the counterfactual framework.
3. The student, when faced with a specific policy problem, should be able to identify key attributes of the problem that are amenable to causal inference using experimental or quasi-experimental designs.
4. For a given causal question, the student should be able to describe an experimental design capable (in principle) of uncovering a causal relationship, and discuss the advantages and disadvantages of such a design from the perspective of causal inference, practical design and policy implications.
5. In the context of non-experimental policy or program implementation, the student should be able to select the most appropriate evaluation design(s) and methodology conditional on the characteristics of the available data and the policy question, implement these design and methods, and appropriately interpret the results and their potential biases.
6. The student should be able to evaluate the quality of evidence from a given empirical study: in other words, they should be able to articulate the causal relationship of interest, describe the identification strategy, describe the implicit assumptions on which this strategy rests, and characterize the quality of the inferences drawn.

NOTE: The course syllabus provides a general plan for the course; deviations may be necessary.
Manuscript Review
(Due: 24 October)

You will be asked to review a manuscript, which will be posted on Ulearn two weeks before the due date. Attach to your detailed review a cover letter indicating whether you think the manuscript should be (1) accepted as is or with minor changes that are noted in your review; (2) revised and re-submitted along the lines recommended in your review; or (3) rejected. Explain why. This recommendation is for the editor only and should not be in your comments to the author. Remember to consider the intended audience and whether this paper makes a contribution to the relevant literature. A few of these manuscripts are not quite ready for submission to a journal, but you should treat them as if they were submitted.

Here’s a suggested structure for your review (you can adapt as you see fit):
General Impression: start with a paragraph that summarizes the author’s point and your general impression of the article (highlight your key points).
Existing Literature: This section is needed if you feel that something in the literature was missed or misrepresented.
Writing Style: Don’t spend a lot of time editing the writing style, but if you think the paper was poorly written or well written, say so.
Specific Comments (Major): Here is where you put in your major accolades, critiques, and questions.
Specific Comments (Minor): Here is where you put in other critiques or unanswered questions that are not critical to ensuring the paper is a valuable contribution, but you believe could improve the paper. This is also the section where you would point out typographical errors (however, there is no need to do so. You’re not an editor. You’re a reviewer.).

This class is a class in causal inference, so you must offer your opinions on the design and causal inferences drawn. Think about confounding factors (those identified by author or those that you might identify) and how well the authors control for them. You are also encouraged to make comments on other aspects of the manuscript.

Here are some guiding questions that may or may not be appropriate for your particular review.

1. What question(s) is the author trying to answer? What are the conclusions and are they consistent with the data or the analysis?
2. Is the paper well written and clear in its arguments?
3. If there is theory (in some cases it may be implicit rather than explicit), does it adequately motivate the empirical analysis? In other words, does the empirical design seem well matched to the theory? If there is a formal theoretical model, is it specified appropriately? What are the implicit assumptions that may be violated in the empirical context studied?
4. What are the confounding factors and does the author’s empirical design address them adequately? If not, is the potential bias something that would overturn the author’s conclusion?
5. Does the author neglect anything from the past literature on this topic (this may require you doing a skim of the literature to familiarize yourself with it) or does the author misrepresent her contribution?
6. Identify strengths of the manuscript.
7. Identify errors or weaknesses of paper, if any (e.g., hard to justify assumptions, strange formulation of the model), or how the results may change with a realistic change in assumptions or addition of other factors (you may be able to show something analytically or with a numerical example, but if you cannot, simply discuss how the results may change if one were to change an assumption or a variable).
8. Ideas for extensions or future research on the topic.

The review (letters to the editor and authors) should be typed and 5-10 pages double-spaced (12 point font; 1 inch margins). There are two files: the cover letter to the editor, in which you put your name and the letter to the authors in which you do NOT put your name.

The review is supposed to be double-blind so even if you figure out who the author is, please do NOT contact the author. I will be giving your review to the authors without your name. Thus, in addition to the paper copy you submit in class, you should also submit your report to the authors to me electronically with no name on it.

I will post an example of a real referee report. I tried to strip identifying information from it but you could still figure out who the authors are. I’m giving you this to help you in your development as an economist. Please be professional and do not distribute it or do something else stupid with it like post it on the web.

Note that the sample review I post is just one review. Others I have done look a lot different and are a function of the paper and journal. They may be shorter, longer, much more positive, or much more negative. My comments and style reflect one man’s opinion on doing a review. So take my advice in this domain with that in mind. I will also post a couple of other guideline documents, written by others, for doing scholarly referee reports.

Lastly: Do Not Lard Your Review with BS – This is Not a Book Report