PLSC 508b

Dissertation Workshop:
Research Design & Causal Inference

Syllabus
Yale University
Spring 2010

Workshop time: Tuesdays, 1:30-3:30
Workshop location: RKZ 202
Instructor: Chris Blattman, Departments of Political Science and Economics, christopher.blattman@yale.edu
Office Hours: Tuesdays 9am to 12pm, 77 Prospect St., Room 103
Instructor website: http://chrisblattman.com/

From http://xkcd.com/552/
Purpose and Nature of the Course:

Short story: Regardless of your specialty, this workshop is designed to improve your research plans, your dissertations, and your job prospects.

Using applications ranging from politics to health to criminology to economics, you’ll learn to rip apart research designs and causal claims. The goal is to help students sharpen their skills as consumers and producers of applied empirical research.

Before spring break, your job will be to read applied papers and write scathing review reports. In class we’ll take published papers and find their fatal flaws. We’ll spot bad science, poor theory, selection problems, spurious correlations, endogenous relations, weak instruments, and measurement error.

After break, we’ll do the same to your own research plans, papers, or paper replications. Students will present their own work. In class we’ll break your project down and build it back up again, stronger than before.

You’ll learn how to design better data collection, test for robustness and sensitivity, interpret coefficients, and fix causal concerns you never knew you had. It’s a dissertation paper boot camp. By the end of class, you’ll know when to hold it, when to fold it, when to walk away, and when to run.

Requirements

Research design and causal inference is first and foremost an intellectual and philosophical skill, and so solid qualitative researchers should be able to take this class, excel, and improve their own research.

You need to have taken 503 (Regression analysis) and 504 (Advanced quant) or the equivalent. Course 507 covers a similar set of topics, but is a complement to rather than a substitute for this class (and is not a prerequisite).

Credit versus audit

Auditors are welcome, but the class is capped at roughly 15 students. If the number of applicants exceeds 15, priorities are as follows:

1. Political science PhD students (2\textsuperscript{nd} year or higher) who want to take the course for credit
2. Political science PhD students (3\textsuperscript{rd} year or higher) who want to audit
3. PhD students from outside the department who want to take the course for credit
4. 1\textsuperscript{st} year political science PhD students who want to take the course for credit
5. Undergraduate students who want to take the course for credit
6. All other categories

Second-year PhD students must take the class for credit (no auditing option).

Requirements & Grading

For credit

Your final grade has four components:

- Participation: 30%
- Weekly assignments: 0% (see below)
- In-class midterm: 40%
- Student paper, project plan, or replication: 30%
Weekly assignments (discussed below) do not have direct bearing on the final grade (except through their effects on quality of participations and the midterm).

Assuming we have space you can audit the class, but you’ll be required to attend, participate, and present your own projects. If there are space constraints, auditors will be permitted under exceptional circumstances only.

Auditors

Auditors will be expected to do the following:

- Perform all readings
- Attend all student project presentations, providing verbal comments to the presenters

Participation

The meetings will be student driven. Students will be expected to provide critical analysis of the readings and student projects in class. You will be graded on the quality and (to a lesser extent) the quantity of your contributions.

Weekly Assignments

Each week you will write and submit a summary and review of the week’s readings, plus any other notes you want to add. These weekly reports will not be graded. Rather, I will spend the class discussing the papers and methods and main lessons I want you to learn from the readings. During the midterm, however, you will receive a folder with all of your reviews.

The report should summarize key elements of the readings, and focus on critiques of each paper’s data and empirical strategy as well as suggestions for improvement or alternative analysis. See “How to read and review an empirical paper” at the end of this syllabus for suggestions on how to approach this review.

The report can include other notes, including notes from the previous section, econometric notes, etc.

Each assignment should be 8 pages or less, in 12 point font, with 1 inch margins. These should be submitted in paper form in class.

Midterm

There will be an in-class midterm on March 23 that covers the readings and the econometric concepts and critiques discussed in class. All class discussion and all readings are testable—both the applied papers but also the material in the required books/papers on theory.

During the midterm, I will hand back to you all of the weekly assignments you submitted during the semester for use in the midterm. The more paper details, class notes, etc that you place in the weekly assignments, the better off you will be on the midterm.

You will also be allowed one 8x11 “cheat sheet” with anything you want to write on it.

Student projects

Description

Students are expected to present a short paper, project, or replication exercise.

Three other types of projects are permissible, with the instructor’s permission:
• Replication of a published paper
• A plan or prospectus (i.e. a research design and plan, survey instrument development, etc.) for research to be conducted in the summer or academic year following the course
• Empirical papers and projects that are partly completed (i.e. a draft paper has been written). In these cases, students are still expected to do a significant amount of work on their data, analysis and presentation during the course. Papers that begin more polished will have higher expectations and be graded accordingly. What kind of paper or project are we talking about? Ideally you will produce a new or in-progress paper, where the data are available but analysis has just begun (and a draft paper is not yet written). A second-year “research and writing” paper is a good candidate, so long as it is not complete.

Co-authored projects are acceptable, but expectations will be higher.

**Presentations**

Approximately two to three students will present each class. Presentations will be no more than five minutes in length, and will be oral with the aid of printed tables and figures. The remainder of the class will be spent in a critique and defense of the presented materials. Everyone else will have read that submission prior to coming to class.

The student will submit preliminary topic ideas to the instructor by e-mail (up to one page) by Jan 26. We will sometimes spend the first 15 minutes of class discussing people’s paper ideas.

It should go without saying: all topics should address the issue of causal identification.

A 2 to 3 page description of progress, analysis, and preliminary results will be submitted by e-mail to the instructor no later than March 2. Students are encouraged to visit me in office hours before March 5 to discuss the project and progress. I will be in Africa over the spring break and not available to meet.

You will be required to email a draft paper to me and the class on the Monday before your presentation, so that all have a chance to read and comment on them in advance.

Materials ideally should include:

• Tables and figures
• Text of 10 to 15 pages in length (double-spaced, 12-point font, 1 inch margins) organized as follows: research question; research design; model summary (if relevant; data; empirical strategy; results; conclusions; and scope. Literature reviews, background, lengthy motivations, etc should be omitted or included as an appendix.
• Optional: a copy of the dataset and analysis code
• Please follow the assignment guidelines. If you have excess material, submit in appendices. If you have a full paper (e.g. your research and writing paper) do not submit that full paper unless it meets these guidelines.

If you are writing a paper or doing a replication, here is the recommended structure:

1. Question and motivation (very brief)
2. Theory and/or competing hypotheses
3. Empirical strategy
   a. Tests of the theory: empirical predictions; description of how to distinguish between alternative hypotheses
   b. Causal identification strategy: rationale; identification assumptions; tests of assumptions, remaining identification concerns and their implications
   c. Other statistical issues (e.g. non-independence, measurement error, etc)
4. Data and measurement
   a. Description of data (sample frame, sampling strategy, methodology, potential sample selection, etc)
   b. Measurement (key variables, possible measurement error, etc)

5. Results

6. Discussion
   a. Conclusions
   b. Scope conditions/external validity
   c. Implications for theory, further research, etc

7. Next steps/research plan

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**Essential Reading**

**Required**

The following papers and books are required reading:


All of the above are dense and detailed (and testable on the midterm). You may feel you understand just a fraction the first time you read them. If you plan to practice empirical work that addresses causality, you should go back and read these over and over again. Each time will be rewarding.

**Strongly recommended**

The essential econometric text, as far as I am concerned, is the following:

- Jeffrey Wooldridge. 2002. *Econometric Analysis of Cross-Section and Panel Data*. Cambridge: MIT Press (especially, but not only, chapters 4, 5, 6, 10, 11, 17, and 18)

This is a very useful article for applied empiricists:


The following resources may also prove helpful.

- *Handbook of Econometrics Vol. 1-6*
- *JEP Symposium on Econometric Tools*
Lectures
Reading marked with an asterisk (*) should be the focus of your weekly assignments

1. Introduction (Jan 12)

2. Panel and cross-country-time series analysis (Jan 19)
   - Imbens & Wooldridge, sections 1-4
   - Angrist & Pischke, Sections 1.2, 3.1, 3.2, and 5.1

3. Selection on observables and unobservables (Jan 26)
   - Imbens & Wooldridge, Sections 5.1-5.4, 5.6, 6.1, 6.2

4. Selection on observables and unobservables (Feb 2)
   - Angrist & Pischke, Sections 3.3, 3.4, 5.3, 8.2

5. Differences in differences (Feb 9)
   - Angrist & Pischke, Section 5.2
6. Matching (Feb 16)

- Imbens & Wooldridge, Sections 5.5, 5.8
- Angrist & Pischke, Sections 3.3, 3.4

7. Instrumental variables (Mar 2)

- Angrist & Pischke, Section 4
- Imbens & Wooldridge, Section 6.3

8. Instrumental variables & Synthetic control (Mar 9)

Spring break

9. Midterm (March 23)

10. Regression Discontinuity (March 30)
   - Imbens & Wooldridge, Section 6.4 (RD)
   - Angrist & Pischke, Section 6

11. Student projects (Apr 6)

12. Student projects (Apr 13)

13. Student projects (Apr 20)
Recommended readings by topic

Causal identification using observational data


Measurement and Measurement Error

Difference in Differences


Instrumental variables


Regression Discontinuity

Matching
Sensitivity analysis

Attrition
Hirano, Keisuke, Guido W. Imbens, Geert Ridder, and Donald B. Rubin. 2001. "Combining panel data sets with attrition and refreshment samples." Econometrica 69 (6).
How to read and review an empirical paper

Questions you can/should address in your reports:

**Research question and hypothesis:**
- Is the researcher focused on well-defined questions?
- Is the question interesting and important?
- Are the propositions falsifiable?
- Has the alternative hypothesis been clearly stated?
- Is the approach inductive, deductive, or an exercise in data mining? Is this the right structure?

**Research design:**
- Is the author attempting to identify a causal impact?
- Is the “cause” clear? Is there a cause/treatment/program/fist stage?
- Is the relevant counterfactual clearly defined? Is it compelling?
- Is the method for doing so clear and compelling? Has statistical inference been confused with causal inference?
- Does the research design identify a very narrow or a very general source of variation?
- Could the question be addressed with another approach?
- Useful trick: ask yourself, “What experiment would someone run to answer this question?”

**Theory/Model:**
- Is the theory/model clear, insightful, and appropriate?
- Could the theory benefit from being more explicit, developed, or formal?
- Are there clear predictions that can be falsified? Are these predictions “risky” enough? Does the theory generate any prohibitions that can be tested?
- Would an alternative theory/model be more appropriate?
- Could there be alternative models that produce similar predictions—that is, does evidence on the predictions necessarily weigh on the model or explanation?
- Is the theory a theory, or a list of predictions?
- Is the estimating equation clearly related to or derived from the model?

**Data:**
- Are the data clearly described?
- Is the choice of data well-suited to the question and test?
- Are there any worrying sources of measurement error or missing data? Are any proxies reasonable?
- Are there sample size or power issues?
- Could the data sources or collection method be biased?
- Are there better sources of data that you would recommend?
• Are there types of data that should have been reported, or would have been useful or essential in the empirical analysis?

**Empirical analysis:**
• Are the statistical techniques well suited to the problem at hand?
• What are the endogenous and exogenous variables?
• Has the paper adequately dealt with concerns about measurement error, simultaneity, omitted variables, selection, and other forms of bias and identification problems?
• Is there selection not just in who receives the “treatment”, but in who we observe, or who we measure?
• Is the empirical strategy convincing?
• Could differencing, or the use of fixed effects, exacerbate any measurement error?
• Did the author make any assumptions for identification (e.g. of distributions, exogeneity, etc)?
• Were these assumptions tested and, if not, how would you test them?
• Are the results demonstrated to be robust to alternative assumptions?
• Does the disturbance term have an interpretation, or is it just tacked on?
• Are the observations i.i.d., and if not, have corrections to the standard errors been made?
• What additional tests of the empirical strategy would you suggest for robustness and confidence in the research strategy?
• Are there any dangers in the empirical strategy (e.g. sensitivity to identification assumptions)?
• Can you imagine a better, or alternative, empirical strategy?

**Results:**
• Do the results adequately answer the question at hand?
• Are the conclusions convincing? Are appropriate caveats mentioned?
• What variation in the data identifies the elements of the model?
• Are there alternative explanations for the results, and can we test for them?
• Could the author have taken the analysis further, to look for impact heterogeneity, for causal mechanisms, for effects on other variables, etc?
• Is absence of evidence confused with evidence of absence?

**Scope:**
• Can we generalize these results?
• Has the author specified the scope conditions?
• Have casual mechanisms been explored?
• Are there further types of analysis that would illuminate the external validity, or the causal mechanism at work?
• Are there other data or approaches that would complement the current one?