**Causal Inference in Education Research**

**OVERVIEW**

Many important research questions in the social sciences are about causal relationships. Examples from education research include:

* Does teacher performance pay increase student achievement?
* Do remedial courses help college students improve graduation rates?
* Does computer-assisted learning help children learn more in school?
* Does attending an elite college (versus a non-elite college) help people to earn higher wages in the labor market?

In the past, most studies in education explored *relationships* among educational variables (e.g. relationships between school inputs/interventions and student outcomes) and not the causal relationships between educational variables. In fact, in the past, few researchers designed and implemented research studies in such a way that they could answer causal questions. In recent years, however, researchers are increasingly engaged in designing studies to find out “what works in education” – that is to understand the causal effects of different types of educational inputs/interventions/programs.

In addition, the questions that educational policymakers ask often have to do with causal relationships. For example, policymakers may wish to know if particular policies have impacts on education quality. They may wish to know which policy (among several alternatives) is the most cost-effective or what policies and programs can increase educational equality. There is a lot of interest among policymakers, thus, in answering causal questions.

The purpose of this seminar is to help you learn about a variety of methods that are used to conduct causal inference in education research. It is hoped that by the end of the seminar, you will have some familiarity with how to design research studies that examine causal relationships as well as to analyze the data collected through such research designs.

**SEMINAR STRUCTURE**

The seminar will meet 8-9 times for approximately 3 hours each time. Typically, each seminar will include an interactive lecture devoted to an experimental or quasi-experimental research approach. These approaches include randomized controlled trials, matching, regression discontinuity, and others. We also explore some recent literature on examining the “causal chain” – that is exploring the mechanisms or channels through which educational interventions work (i.e. affect educational outcomes).

In addition to the lectures, we will also take time during some of the seminars to learn how to analyze data from causal research designs using statistical packages. Therefore, I hope you can bring a laptop (or share one with a friend) to the seminar with the software R already installed on it. If you do not have R installed on your computer already, you can download it for free from <http://cran.r-project.org>.

**SEMINAR REQUIREMENTS**

*Participation:* Please attend each seminar and contribute to the discussions.

*Readings:* There are a couple of outstanding textbooks that can help you learn the material presented in the seminar:

*Shadish, William R, Thomas D. Cook, and Donald T. Campbell. 2002. Experimental and Quasi-Experimental Designs for Generalized Causal Inference. Boston, MA: Houghton Mifflin Company*

*Willett, John B.; Murnane, Richard J. (2010). Methods Matter:Improving Causal Inference in Educational and Social Science Research. Oxford University Press.*

I will also ask you to skim/read certain papers about specific methodologies before some of the seminars (see the list below). I will also occasionally recommend a few well-known papers that use causal research designs and that answer important research questions.

*Assignments:*

We will have a joint project to learn to use matching procedures in R. Other than that, I have decided to keep assignments to a minimum, so that you can use your time to review the seminar material and formulate questions that can help you learn the material more deeply.

**READINGS (so far)**

1. **Causal Inference and Randomized Experiments**

Chapters 3-5 of *Methods Matter*

Abhijit V. Banerjee, Shawn Cole, Esther Duflo, Leigh Linden. (2007). Remedying Education: Evidence from Two Randomized Experiments in India. Find at http://econ-www.mit.edu/files/804

1. **Regression Analysis (for review, if needed)**

Stock & Watson (2007) Introduction to Econometrics , Chapter 6

1. **Matching**

Stuart, E.A. (2010). Matching Methods for Causal Inference: A review and a look forward. *Statistical Science* 25(1): 1-21.

Ho, D.E., Imai, K., King, G., and Stuart, E.A. (2011). MatchIt: Nonparametric preprocessing for parameteric causal inference. *Journal of Statistical Software* 42(8). <http://www.jstatsoft.org/v42/i08>

1. **Regression Discontinuity**

Chapter 9 of *Methods Matter*

Lee, D.S. and Lemieux, T., 2010. Regression discontinuity designs in economics. Journal of Economic Literature 48(2), 281-355.

Reardon, S., Arshan, N., Atteberry, A., & Kurlaender, M. (2010). Effects of Failing a High School Exit Exam on Course Taking, Achievement, Persistence, and Graduation. Educational Evaluation and Policy Analysis, December 2010 vol. 32 no. 4 498-520.