

**The E2e Project's Education Programs:
A Short Course on Randomized Control Trials
for Energy-Efficiency Evaluation**

Instructor: Professor Maximilian Auffhammer

September 8th, Workshop length: 1/2 day

Randomized control trials (RCTs) are the gold standard for evaluating the effectiveness of programs in a wide variety of fields, including medicine, education, and international development. This course will give an overview of RCTs and describe how they can be applied to evaluate energy-efficiency programs. The course will also provide practical suggestions on how RCTs can be implemented and alternative approaches if an RCT is infeasible. The material covered is designed for energy-efficiency professionals with some training in statistics.

Introduction to Randomized Control Trial Research Designs

Topics: Energy-efficiency program evaluators face a difficult task. In order to identify savings from a program, they need to describe how much energy would have been consumed if the program hadn't existed. In other words, they need to provide a "counterfactual" description of the world. This session will describe common approaches to developing counterfactuals, including both observational studies and randomized control trials. We will discuss inherent challenges, including sample selection, statistical biases from omitted variables, and external validity.

Implementing Randomized Control Trials to Evaluate Energy-Efficiency Programs

Topics: A randomized control trial can be designed in many ways, but the treatment and control groups should be identified prior to implementation of the program. This session will describe common issues confronted in developing randomized control trials including identification of the treatment and control groups and the importance of random assignment to these groups. Good treatment and control groups enable an evaluator to pinpoint the impact of a program and eliminate other influences.

While randomized control trials offer an effective way to measure the impacts of a program or policy intervention, it is often neither practical nor appropriate to mandate or force a group of consumers to receive a "treatment." Fortunately, there are experimental research design alternatives that do not require mandatory assignment. This module will introduce some of these alternatives (including randomized encouragement designs, recruit-and-delay, recruit-and-deny).

Quasi-Experimental Approaches

Topics: In some empirical contexts, randomized control trials are simply not practical and/or infeasible. In those cases, quasi-experimental research designs can be an effective substitute. Quasi-experimental studies assign households to treatment and control groups by a method other than random assignment. Their effectiveness depends on program details and the data available. This session describes a set of quasi-experimental approaches, provides examples from the energy efficiency context and discusses their limitations. We will review examples of effective quasi-experimental studies.

Maximilian Auffhammer is an Associate Professor in the Agricultural and Resource Economics department and Director of the International Areas Studies Teaching program at UC Berkeley. He

received a B.S. in environmental science (1996) and a M.S. in environmental and resource economics (1998) from the University of Massachusetts at Amherst, and a PhD in economics from UC San Diego in 2003. His research focuses on environmental and resource economics, energy economics and applied econometrics. He is a Research Associate at the National Bureau of Economic Research in the Energy and Environmental Economics group, a Humboldt Foundation Fellow, and a lead author for the Intergovernmental Panel on Climate Change (IPCC). He also serves on the editorial board of the Journal of Environmental Economics and Management. He is also the recipient of the 2007 Cozzarelli Prize awarded by the National Academies of Sciences, the 2009 Campus Distinguished Teaching Award and the 2007 Sarlo Distinguished Mentoring Award.