

Rejoinder

Guido Imbens

I am very grateful for the comments on the paper and the careful reading that went into them. Since instrumental variables concepts and methods have become popular in a range of substantive areas beyond economics, there have been a number of significant contributions from other areas, and it is useful to have the different perspectives on these methods that these comments reflect. I will attempt to address some of the issues raised in the comments, but many of these comments will undoubtedly stimulate new studies, as the general area of research on causal inference in observational studies continues to flourish.

KITAGAWA: “INSTRUMENTAL VARIABLES BEFORE AND LATER”

I am grateful for the kind words by Kitagawa. He has been doing very interesting work on testing for validity of instrumental variables in recent years (e.g., Kitagawa, 2010, 2013) that will undoubtedly be influential in the literature. I am also glad that Kitagawa likes my summary of the differences between econometric and statistical approaches to causality as “choice versus chance.”

Kitagawa’s comments on the impact of the local average treatment effect literature on economic practice agree with my views. As emphasized in the paper, the LATE concept was never intended to change the question of interest, but to clarify what we could learn from the data. Nevertheless, in some cases the LATE may well be representative of a subpopulation that is of substantial interest on its own. Consider the draft lottery example (Angrist, 1990; Hearst, Newman and Hully, 1986) where the compliers are the men who served, or would have served, in the military, because of their draft lottery number. Arguably, this is the group on the margin for whom the effect of military service is most interesting. Similarly, in the Angrist and Krueger (1991) study of the returns to education using compulsory schooling laws as an instrument, the compliers are

the individuals for whom schooling decisions are affected by compulsory schooling laws, again arguably an interesting subpopulation for educational policies that are often targeted at those receiving lower levels of education. Nonetheless, in general the subpopulation of compliers is not chosen for its interest, but because we can hope to learn something about them. It is about the primacy of internal validity over external validity (Shadish, Cook and Campbell, 2002).

Kitagawa discusses instrumental variables in the context of another example that, like the supply-and-demand example I discuss in the paper, is a classic one, that of the estimation of returns on inputs in a production function. Specifically, he focuses on the causal effect of labor inputs on output. The starting point for an economist is exactly as Kitagawa describes: firms do not choose input levels randomly, but choose them optimally, for example, to maximize profits. This leads quickly to settings where we cannot simply regress output on inputs if we are interested in the causal effect of input on output. Moreover, the context in combination with economic theory on firm behavior suggests where a researcher might look for instruments that satisfy the exclusion restriction, namely cost variables that affect the choice of input levels but that affect output only through their effect on input levels.

In his comments, Kitagawa also distinguishes between various objectives for the researcher. If the goal of the researcher is what he calls “scientific reporting,” Kitagawa agrees with my recommendation to report both estimates of the local average treatment effect and bounds on the overall average treatment effect. If, on the other hand, the goal is directly to make a decision, say, on whether to extend the treatment to the entire population or not, he advocates a decision theoretic approach, either Bayesian along the lines of Chamberlain (2011), or the type of Manski “data-alone” frequentist approach. I agree with that, and I think the distinction between scientific reporting and decision making is a useful one to bear in mind.

RICHARDSON AND ROBINS: “ACE BOUNDS; SEMS WITH EQUILIBRIUM CONDITIONS”

Richardson and Robins make two sets of comments, one about bounds on the average causal effect (ACE), and one about simultaneous equations models (SEMs).

Guido W. Imbens is the Applied Econometrics Professor and Professor of Economics, Graduate School of Business, Stanford University, Stanford, California 94305, USA and NBER (e-mail: imbens@stanford.edu; URL: <http://www.gsb.stanford.edu/users/imbens>)