Joshua D. Angrist and Jörn-Steffen Pischke. **Mastering 'Metrics: The Path from Cause to Effect**. Princeton, NJ: Princeton University Press, 2014, 295 pages, $35.00 paperback.

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In the era of so-called Big Data, topics like statistics and econometrics become increasingly important. But for a lot of people, the term econometrics sounds boring or intimidating, especially after skimming through textbooks on the subject. *Mastering Metrics: The Path from Cause to Effect* attempts to demonstrate that econometrics can be accessible, exciting, and useful. The book is authored by two respected econometricians; however, their style is relaxed and humorous, leaving the math and rigor mostly (but not all) to the appendixes. The motif throughout the book is Kung Fu—in fact, the authors refer themselves as "Master Joshway" (Joshua Angrist) and "Master Stevefu" (Jörn-Steffen Pischke). (As an example of their humor, see Angrist's recent Amazon profile picture standing with [someone who looks like] Bruce Lee.)

The brief introduction serves to understand the scope of the subject and the authors' philosophy regarding it. The first thing to note is their brief definition of econometrics (or '*metrics*, as they fondly refer to): "[the] use of data to answer cause-and-effect questions" (p. xi). This is in contrast to views from other econometricians, who pay less attention to the issue of causality or are less optimistic that it can be inferred in nonlaboratory environments with these techniques (Chen & Pearl, 2013). In fact, causality is a big issue throughout the book. The main tools for establishing causality, according to the authors, are data analysis and statistical inference. In an analogy that by itself justifies the Kung Fu theme, they argue that "There is a mystical aspect to our work as well: we're after truth, but truth is not revealed in full, and the messages the data transmit require interpretation . . . Like Caine's journey [in Kung Fu], the Way of 'Metrics is illuminated by questions" (p. xi). Very nice.

The following chapters are structured around what Angrist and Pischke call the Furious Five of econometric research (randomized trials, regression, instrumental variables, regression discontinuity, and differences-in-differences). Chapter 1 is devoted to examine randomized trials, based on experimental assignment—the ideal method by which other methods can be assessed. It is the ideal method because it allows comparisons *ceteris paribus*, that is, other things equal. An example of this method, analyzed to some detail in the book, is a work by Finkelstein et al. (2012) in which they looked at the effect of randomly assigning people to health insurance

on different outcomes. Chapter 2 focuses on regression and the importance of statistical control and matching. As a way of mimicking a randomized trial, researchers need to make an apples-to-apples comparison among groups of individuals. For example, if someone studies the effect of attending to elite private universities on future earnings, she/he should try to disentangle attendance from other variables like SAT scores that may occur simultaneously. Any analysis that fails to control for an important variable such as this may fall prey to omitted variable bias, which, in turn, can affect the estimation of a causal effect. Chapter 3 examines instrumental variables (or just "instruments") in which random assignment is incomplete or occurs naturally. An instrument can also be any variable that (a) is related to the explanatory (or independent) variable, (b) does not depend on omitted variables, and (c) is unrelated to the outcome beyond the explanatory variable. The chapter also explains two-stage least square (2SLS) regression, the right way to estimate the effect of the explanatory variable of interest when an instrument is available.

Chapter 4 explains regression discontinuity designs, in which a cutoff score is used as a treatment. For example, one may examine the effect of attending to elite high schools (like the Boston Latin School), which admit kids on the basis of a cutoff value for an index based on GPA and admissions tests. So, the idea is to compare kids who are slightly above or below the cutoff. Because the cutoff is arbitrary, these kids are quite similar in several characteristics such as motivation and family background. Thus, it is possible to assess the effect of being educated in an elite high school on, for instance, future achievement. Chapter 5 centers on differences-in-differences designs. These designs involve assessing change in time for different groups. It was used in a study examining the effect of changes in minimum legal drinking age (MLDA) policy on death rates from 1970 to 1983 among 18–20 years old by comparing different states (which had MLDA of different ages at different times). Finally, Chapter 6 uses different methods from the Furious Five toolkit to study the effect of schooling on wages, an issue that the authors have been pondering a lot over the past few years.

Overall, this is an excellent book as an introduction to econometrics, focusing on the conceptual stuff and giving specific and appealing examples. At the end of each chapter, the book also provides an historical perspective of each of the five tools, which I found informative and fascinating. Although the book's intended audience is undergraduate students in economics (as a companion book, not a main textbook), I believe that it will be well received by managers who are interested in understanding how to precisely determine the effects of managerial policy (and therefore, accurately estimate return on investment (ROI), among other indicators). Likewise, it will be of interest for those managers who are just interested

in improving their critical thinking skills. I also believe that researchers from other social sciences (for example, psychology) who are not typically exposed to econometrics, but who are interested in field research, will find the book thought provoking and useful. Most people who have a PhD in psychology—in particular, industrial and organizational (I-O) psychology—-have a good understanding of experimental methods and multiple regression, so Chapters 1 and 2 should be just a review for them, with some interesting extra insights. However, Chapters 3–6 involve methods that are barely taught or even used in I-O psychology or organizational behavior research (although, as Angrist and Pischke note, the regression discontinuity design was first applied by psychologist Donald T. Campbell in the 1960s). A case in point is instrumental variables and 2SLS regression, which combined can be powerful tools to estimate causality in field research. It may also help overcoming the detrimental effects of common method variance (for example, biased studies that solely rely on self-report surveys; Antonakis, Bendahan, Jacquart, & Lalive, 2010). Furthermore, regression discontinuity and differences-in-differences designs can be, under certain conditions, particularly useful in studying the effectiveness of training programs in organizations. Thus, there is much to learn from the book, even for the trained researcher.

With that said, if you have read—and understood—*Mostly Harmless Econometrics* by the same authors (Angrist & Pischke, 2002), I wouldn't suggest *Mastering 'Metrics*. *Mostly Harmless* is a longer book that deals with similar issues and tools, and utilizes a somewhat more sophisticated language, more theorems, proofs, and so on. But if you did skim it and could not understand a thing, *Mastering 'Metrics* is a better place to start. It is also important to mention that, as I noted above, although *Mastering 'Metrics* leaves the math mostly to the appendixes, some of it is in the main text as well. The statistics and algebra are only elementary, but it is likely that the math averse will struggle understanding some sections or even chapters of the book. At any rate, most people will find the book enjoyable, even if they decide to skip these sections.

In closing, this book may require some time to digest for the uninitiated, but eventually it will be quite rewarding for any student, researcher, or policy analyst interested in understanding the intuition behind the tools to study the causal effects of policies in real-world settings.

REFERENCES

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