

## Book review

### Joshua D. Angrist and Jörn-Steffen Pischke

*Mastering 'Metrics: The Path from Cause to Effect*

Princeton University Press, December 21, 2014

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After their highly praised book *Mostly Harmless Econometrics*, Joshua Angrist and Jörn-Steffen Pischke recently published a new book called *Mastering 'Metrics: The Path from Cause to Effect*. This latest book is written for a somewhat different audience though. The first book was intended for more advanced practitioners of impact assessment. This new book is more introductory, explaining important issues such as counterfactuals, treatment effects and selection bias to an audience much wider than academics, particularly focussing on those who are new to these issues. Because of this wider public, the impact of this latest book might be even larger than their first bestseller. Nevertheless, also among academics there is probably a good demand for a book like this. When reading the book and writing the review I was surprised how many of my colleagues were also reading it, some of them even considering it to use in a course.

One of the many strengths of *Mastering 'Metrics* is the use of various cases to illustrate problems, tools and outcomes. Examples of such cases are the effect of Minimum Legal Drinking Age on death of 21 year olds, the effect of attending top colleges on future wages or the effect of tight banking policies on bank failures during the Great Depression. All chapters present one 'metrics technique, explained using one of these case studies. This is a fresh approach compared with most 'metrics textbooks that often first discuss the mathematics of a technique, with examples and applications often given in later paragraphs. Angrist and Pischke's lucid and intuitive approach has the advantage that readers not well-grounded in statistics and mathematics get a good feel for the problems involved in making meaningful impact assessment.

Throughout the book quotes and humour are borrowed from the classic Kung-Fu TV series. For example, statisticians and econometricians are consistently coined as 'masters', there are funny illustrations depicting the authors as two Kung-Fu masters, and many Kung-Fu related quotes about truth and search for it, which I think provides a nice connection to 'metrics. Moreover, the structure of the book is based on the Furious Five: randomised trials, regression analysis, instrumental variables, regression discontinuity design and differences in differences. Of course this choice can be criticised since the last four are all variants of regression analysis, though exploiting additional artefacts of the problems and data at hand. On the other hand, this structure does not

differ much from many review papers on econometric tools for impact assessment. Practitioners may wonder however why e.g. propensity score matching (PSM) is not treated in a separate chapter. Matching is mentioned in Chapter 2 on regression, but that's somewhat hidden. Another choice could have been to start with classic statistical approaches such as ANOVA that are often used as a starting point in assessing treatment effects. In that sense the Kung-Fu based choice for a Furious Five is somewhat restrictive.

All chapters have a similar structure: first, the core of each chapter is a non-technical exposition of the problem. This is often enjoyable to read and provides a good introduction to problems encountered. For example explanation of treatment effects and selection bias using the example of two different students with different health conditions that decide on buying health insurance is very clear. At the end of each chapter a few 'masters of metrics' that made path breaking contributions to the topic are shortly introduced. Finally, most chapters have an appendix that provides short text-book style technical background for those that desire some additional formal background. Non-academics will probably skip this, but students and applied researchers may find this a good overview. These appendices make the book also more suitable for courses and workshops. Finally, each chapter is summarised in a short conversation by Kung-Fu masters Stevefu or Joshway and Grasshopper.

Chapter 1 discusses randomised trials (RTs) as the ideal approach to randomise out unobserved differences that may lead to selection bias. RTs are discussed as tool in itself, but are also presented as a benchmark approach for other methods that can be used when RTs are not possible. This is a very well-crafted chapter that intuitively explains core issues as causal effect, selection bias and counterfactuals. Chapters 2–5 discuss alternative approaches that can be applied when RTs are not possible. Since most of these use some kind of (modified) regression analysis, it is logical that Chapter 2 starts with straightforward regression. Besides the obvious possibility of including observables as controls to reduce the selection bias problem, the authors also discuss more ingenious uses of regression, e.g. based on grouping of respondents. Potential problems such as the omitted variable problem are also intuitively explained. Chapter 3 goes a step further in discussing instrumental variables. Although I found this the most tedious chapter to read, I appreciated the discussion on using randomised variables as instruments, which may be new to some readers. Regression discontinuity designs are discussed using a very specific dataset on number of deaths just before and after becoming 21. A nice insight of this chapter is that some specific problems with specific data characteristics allow for an alternative 'metrics approach. This chapter was again enjoyable to read, as well as Chapter 5 on the last of the Furious Five, differences-in-differences. Chapter 6 provides a synthesis of most methods, showing how different methods can be used to provide causal evidence on the impact of schooling on wages.

Again, the lucid and intuitive approach used by the authors is refreshing compared with the text-book style of writing we have become so accustomed to in 'metrics. Because of this style, the authors clearly had to make choices in what to explain and what to leave out. However, there a few small issues that

I regret to be missing. First, although RTs are presented as the benchmark approach there is no guidance on how large RTs should be. It is mentioned that the large sample size is crucial to randomise out unobservables (Law of Large Numbers), but how to determine what is large enough? People may differ in thousands of treats, so what guarantees that certain sample size is large enough to randomise out all these unobservables? Control and treatment groups that are too small also have implications for balancing tests. This issue is hardly discussed in most textbooks and is also absent here. Second, as mentioned earlier, some other approaches like standard ANOVA or PSM are not discussed at all. Of course, the authors can justify these omissions since they clearly intended not to overload the reader with methods and mathematics.

To conclude, I appreciate this book a lot because of its fresh approach. But there is something else. Currently there is a lot of fuss about RTs as the tool that masters of 'metrics should use. Project proposals with a proposed expensive RT seem to be ranked higher than proposals using more classic approaches. This implicitly suggests that classic tools like regression and IV are outdated. This great book shows that although RTs have benefits they are simply not always possible. Therefore, we should cherish some of the older tools that we have in our 'metrics toolkit since they can provide a solution to answering the causal question at hand.

**Cornelis Gardebroek**

*Wageningen University, The Netherlands*

*koos.gardebroek@wur.nl*

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