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## Cause and defect

**Instrumental variables help to isolate causal relationships. But they can too far**

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"LIKE elaborately plumed birds...we preen and strut and display our t-values." That was Edward Leamer's uncharitable description of his profession in 1983. Mr Leamer, an economist at the University of California in Los Angeles, was frustrated by empirical economists' emphasis on measures of correlation over underlying questions of cause and effect, such as whether people who spend more years in school go on to earn more in later life. Hardly anyone, he wrote gloomily, "takes anyone else's data analyses seriously". To make his point, Mr Leamer showed how different (but apparently reasonable) choices about which variables to include in an analysis of the effect of capital punishment on murder rates could lead to the conclusion that the death penalty led to more murders, fewer or had no effect at all.

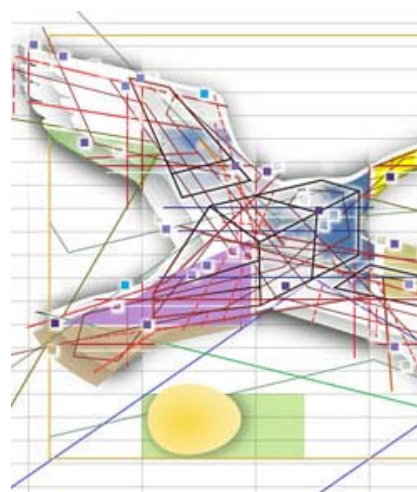


Illustration by

In the years since, economists have focused much more explicitly on improving the cause and effect, giving rise to what Guido Imbens of Harvard University calls "the c literature". The techniques at the heart of this literature—in particular, the use of so-called "instrumental variables"—have yielded insights into everything from the link between education and crime to the economic return from education. But these methods are themselves coming under attack.

Instrumental variables have become popular in part because they allow economists to overcome one of the main obstacles to the accurate estimation of causal effects—the impossibility of controlling for every last influence. Mr Leamer's work on capital punishment demonstrates that the choice of controls matters hugely. Putting too many variables into a model can degrade the results. Worst of all, some relevant variables may simply not be observable. For example, the time someone stays in school is probably influenced by his innate scholastic ability, but this is very hard to measure. Leaving such variables out can easily lead econometricians astray. What is more, the direction of causation is not always clear. It is not always clear, for example, whether deploying more policemen reduces crime, or whether crime is confused by the

that more policemen are allocated to areas with higher crime rates.

Instrumental variables are helpful in all these situations. Often derived from a quirky environment or in public policy, they affect the outcome (a person's earnings, say, in the original example) only through their influence on the input variable (in this case, number of years of schooling) while at the same time being uncorrelated with what (scholastic ability). The job of instrumental variables is to ensure that the omission from an analysis—in this example, the impact of scholastic ability on the amount of—does not end up producing inaccurate results.

In an influential early example of this sort of study, Joshua Angrist of the Massachusetts Institute of Technology (MIT) and Alan Krueger of Princeton University used American education laws to create an instrumental variable based on years of schooling. These mean that children born earlier in the year are older when they start school than those born later in the year, which means they have received less schooling by the time they reach the legal leaving-age. Since a child's birth date is unrelated to intrinsic ability, it is a good instrument for teasing out schooling's true effect on wages. Over time, uses of such instrumental variables have become a standard part of economists' set of tools. *Freaky Economics*, the 2005 bestseller by Steven Levitt and Stephen Dubner, provides a popular treatment of many of the techniques. Mr Levitt's analysis of crime during American election cycles—where police numbers rise for reasons unconnected to crime rates, is a celebrated example of an instrumental variable.

Two recent papers—one by James Heckman of Chicago University and Sergio Urzua of Northwestern University, and another by Angus Deaton of Princeton—are sharply critical of this approach. The authors argue that the causal effects that instrumental strategies are uninteresting because such techniques often give answers to narrow questions. The results from the quarter-of-birth study, for example, do not say much about the return to education for college graduates, whose choices were unlikely to have been affected when they were legally eligible to drop out of school. According to Mr Deaton, using such instruments to estimate causal parameters is like choosing to let light "fall where it then proclaim[ing] that whatever it illuminates is what we were looking for all along."

## IV leagues

This is too harsh. It is no doubt possible to use instrumental variables to estimate effects on uninteresting subgroups of the population. But the quarter-of-birth study, for example, sheds light on something that was both interesting and significant. The instrumental variable instance allows a clear, credible estimate of the return from extra schooling for those inclined to drop out from school early. These are precisely the people whom a policy might seek to prolong the amount of education would target. Proponents of instrumental variables also argue that accurate answers to narrower questions are more useful than unreliable answers to wider questions.

A more legitimate fear is that important questions for which no good instrumental variable can be found are getting short shrift because of economists' obsession with solving specific problems. Mr Deaton says that instrumental variables encourage economists to avoid "thinking about how and why things work". Striking a balance between accuracy of results and importance of issue is tricky. If economists end up going too far in emphasising accuracy,

may succeed in taking “the con out of econometrics”, as Mr Leamer urged them to—leave more pressing questions on the shelf.

Links to the papers referred to in this article can be found [here](http://www.economist.com/c) (http://www.economist.com/c) from the print edition | Finance and economics

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