OTHER THINGS EQUAL

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The A-Prime/C-Prime Theorem

I am pleased to announce a theorem about theorems which describes tolerably well how half of economics has developed. It goes like this:

The A-Prime/C-Prime Theorem

For each and every set of assumptions A implying a conclusion C, there exists a set of alternative assumptions A', arbitrarily close to A, such that A' implies an alternative conclusion, C', arbitrarily far from C.

Take free trade as an example. Suppose that the first set of assumptions, A, are competition, convexity, full employment, and so forth, which lead to the blackboard conclusion, C, that the North American Free Trade Agreement is swell for the American economy. Imagine a paper published at time t drawing such a conclusion (sorry: I just can't express myself without mathematics). You know as well as I do what will happen before time t + 1: a paper will be published showing that, on the contrary, if the assumptions are jiggered a bit, to A', by introducing, say, a nonconvexity in the ith industry, then the old conclusion fails, and C' is erected in its stead: the North American Free Trade Agreement is rotten for the American economy. If you don't like nonconvexity (it covers a lot of ground), try transaction costs or macroeconomic considerations.

Look at the figure on the following page. It says that if you change the assumptions a little (the economic theorems in question don't provide a standard for how little) then the conclusions, if you're clever about it, can change as much as you want.

Ask yourself whether the A-Prime/C-Prime Theorem doesn't pretty well describe half the contents of economics journals nowadays. (It described them in olden days, too, right back to Plato, but that's another story.) The figure of a half comes from Wassily Leontief's observation that half the contents of the leading economics journals are theoretical, the same percentage as in sociology, and by contrast with the more ten percent in the leading journals of chemistry and physics (Leontief, 1962).

Take, for example, rational expectations. Professor L of Chicago proves on a blackboard that certain assumptions A lead to the conclusion C that the public can figure out what the government is up to, and so the government can't fool all of the people all of the time. A implies C. Some months later Professor P of Harvard proves that if you alter the assumptions A by what looks like a tiny bit, making them...


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that economics has adopted the intellectual values of the math department instead of the physics department. (Again it's nothing new; it also goes back to Plato.)

In other words, economists, surprisingly, are more mathematical than physicists. I'm not saying that economists know more math than physicists do, which is false. The average physicist is a stunningly better applied mathematician than the average economist. I'm saying what's true, that economists have adopted the intellectual values of the math department. By contrast, the physicists, unlike mathematicians and economists, are not in love with blackboard proof.

The contrast comes out in new Santa Fe Institute, founded recently by Kenneth Arrow and a famous physicist to help economics imitate physics. In 1989 Science described the physical scientists at the Institute as "baffled to discover how mathematically rigorous theoretical economists are. Physics is generally considered to be the most mathematical of all the sciences, but modern economics has it beat" [Pool 1989, 701]. The point is that the physicists do not feel "bested", since unlike economists they do not regard mathematical rigor as something to be admired for itself. They have used the Schrödinger equation happily since 1906 without knowing whether it has solutions in general. They can't solve the three-body problem, but can simulate the path of the moon to any required degree of approximation.

Economists assure each other that science involves axiomatic proofs of theorems and then econometric tests of the implied correlations. But the economists are mistaken, as they would see if they were to look outside the math department for their model of science. "It is to be admitted," wrote the philosopher of science Paul Feyerabend, "that some sciences going through a period of stagnation now present their results in axiomatic form, or try to reduce them to correlation hypotheses. This does not remove the stagnation, but makes the sciences more similar to what philosophers of science think science is" [1978, 20].

In truth the physicists could care less about mathematical proofs and very little about correlation hypotheses. They simulate, they calculate, they spend their time reading the physical equivalent of agricultural economics or economic history. Pure pencil-and-paper guys are common enough in physics departments, but they do not set their intellectual agenda. Our own Bus Brock found to his surprise that it is important for the economics reader...to realize that many natural scientists are not impressed by mathematical arguments showing that 'anything can happen' in a system loosely disciplined by general axioms. Just showing the existence of logical possibilities is not enough for such skeptics. The parameters of the system needed to get the erratic behavior must conform to parameter values established by empirical studies or the behavior must actually be documented in nature. [1988, 2 (typescript)]

Actually documented in nature: that's what interests scientists. To the seminar question asked by an economist, "where are your proofs?" the physicist replies, "You can whip up theorems, but I leave that to the mathematicians" [Pool 1989, 701].
When a problem came up in a seminar at the Santa Fe Institute, the best physicist present solved it overnight with a computer simulation, approximately, while the best economist, likewise overnight, derived an analytic solution, exactly. Who is the more mathematical?

Economists argue over the federal budget next year or the stability of capitalism forever to know how big a particular badness or offsetting goodness will be. Will the distribution of income be radically changed by the outlawing of interest? Will free trade with Mexico raise American national income much? Mathematics does not care about such questions of magnitude. Disproving the Goldbach Conjecture, which is empirically true for every calculated case, would take only one even number, N, that could not be expressed as the sum of two primes. Mathematics does not care if N were the only such number; the Conjecture would be falsified. Science cares. For engineering purposes, making a computer lock, for example, the Goldbach Observation works fine, whether proven as a theorem or not.

So economics needs to imitate physics and stop imitating mathematics. Notice I did not say "stop using mathematics." It would be idiotic to complain of the use of mathematics. You might as well complain about using English or using diagrams. But the A-Prime/0-Prime Theorem proves that we are overinvesting in mathematics questions of existence and underinvesting in physics-department questions of magnitude.

Well, not exactly "proves". It's an empirical question. Come to think of it, I haven't yet found a proof of the Theorem. But as the physicist said, "You can whip up theorems; I leave that to the mathematicians."

REFERENCES


Other Things Equal, a column by Donald N. McCloskey, appears regularly in this Journal.

BOOK REVIEWS


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Writing which claims topical relevance to the economics of the erstwhile Soviet Union and Soviet bloc has a rather short half-life these days. This collection of essays by academics, policy makers and businessmen from the USA, Russia, France and Hungary, has suffered a mixed fate at the hands of recent history: some of the contributions retain their relevance while others now look distinctly dated, particularly following the disintegration of the Soviet Union after the failed coup of August 1991.

The volume is the product of a joint venture organized by the Geonomics Institute, on the American side, and the Institute for the Study of the USA and Canada (ISKAN) of the Soviet Academy of Sciences. Its papers come from an international workshop held in July 1989 and a conference in October 1989. The goal of these meetings was "to make an initial in-depth examination of what reforming the ruble and monetizing the Soviet economy will entail." While the main focus is on ruble convertibility (and the editors lay claim to 'the first multinational plan for achieving ruble convertibility by the year 2000'), the papers range over several related topics, including the historical background to perestroika, the demand for capital in the Soviet economy, joint ventures in Poland, and reform of credit markets.

Taking the sections of the book in turn, I begin with the papers by Josef Braden and Robert Daniels dealing with the historical setting of perestroika. History has treated these papers unkindly. Braden draws a parallel between the crisis of Soviet socialism under Gorbachev circa 1989 and the crisis of U.S. capitalism in the 1930s, and suggests that, just as the changes wrought by the New Deal seem in retrospect more of an incremental evolution than a revolution, Gorbachev's perestroika may emerge in the long view as an evolutionary adaptation of the Soviet system. After the break-up of the Union and the banning of the Communist Party, combined with the continuing destruction of the old centrally-planned economy, this view hardly seems sustainable at present. Daniels, in a similar vein, talks of Gorbachev's policies in terms of "a moderate revolutionary revival," that is, a revival in more benign forms of the ideals motivating the Bolshevik revolution of 1917, following the periods of totalitarism and stagnation. Such may have been Gorbachev's original intention, but the effects of his policies have turned out to be quite different (and quite beyond his control). In this respect the warnings of Vsevolod Ilyichov (Gorbachev's right-hand man, and generally reviled in the West as a "reactionary") may seem remarkably prescient.

Section 2, dealing with perestroika and the demand for capital, includes pieces by two ISKAN scholars, Vladimir Popov and Alesxei Kutsitsin. Popov offers an interesting