

The Pretense of Rigor: The Model, The Market, and the Price System

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“If you don’t use mathematics, how can you know that your theories are logically coherent?” “Through the use of deductive logic,” was the answer provided in the very first doctoral dissertation I ever attended. Dr. James Thorn is who raised the question, and soon to be Dr. Juan Carlos Cachanosky is who responded in the defense of his thesis “Economic Science versus Mathematical Economics.” I was only an undergraduate at the time, and my good fortune is that Dr. Sennholz had invited to join his graduate seminar in my junior year and I attended for the next year and half. Grove City College is a small liberal arts college in rural western Pennsylvania, but Sennholz also held an appointment the International College in Los Angeles. Students from Argentina, France, and the US were pursuing their masters and doctoral degrees under his supervision at the time. I was weighing my options for post-graduate career, and at the time Sennholz invited me to join the group (the only undergraduate) becoming an economics professor was not the obvious choice. By the time I witnessed Cachanosky’s dissertation defense, it was becoming obvious that this was going to be my ultimate career pursuit.

I had become passionately interested in the theoretical structure of economics, the history of economic ideas and their evolution, and the practical consequences for public policy of economic science. But economics is a weird scientific discipline. I agreed with Cachanosky’s critique of much of mathematical economics. The models economists built with the tools of mathematical reasoning often reflected a rather distorted and narrow view of the market and clouded our understanding of the operation of the price system. On the other hand, economic reasoning is a brilliant illustration of the power of logic to cut through loose thinking and explain how the world works. To follow that logic the discipline selects on aptitudes that align with advanced mastery of mathematics and statistics. Without those aptitudes, you cannot survive the graduate school education that is required. So what is someone to do who both has the aptitude but also finds the critique persuasive?

I will tell you what I did, even though it will only tangentially relate to the argument in this paper. First, I scrapped any notion of pursuing law school and refocused on graduate school in economics. Second, I read economics non-stop on every work break I could; not just popular books and articles by Milton Friedman and John Kenneth Galbraith, but great tomes in economics from Adam Smith, J. B. Say, Eugen Bohm-Bawerk, Ludwig Mises and Murray Rothbard. Finally, I studied Morris Klein’s *Mathematics: The Loss of Certainty* and understood in my even immature mind that the Hilbertian project of building pure axiomatic systems could not succeed. There would always be gaps, and in those gaps perhaps the most important questions would be found. Squaring that with the arguments of Mises and Rothbard became a sort of lifetime obsession of mine.

Cachanosky’s thesis was more radical than just that economist overuse mathematics in their theory construction practice. He argues that the form that economic theory takes must be dictated by its subject matter, not philosophical fashions of the day. Economics is about purposeful human action, and the exercises in mathematical model building become problematic when the requirements of formalization transform the economic problem, we are studying itself. The problem is not, I would argue, mathematical systems versus verbal chains of reasoning per se, but when the approach by design eliminates the every phenomena we as scientists are hoping to illuminate: the agony of choice, the coping with our ignorance, the discovery of opportunities, the entrepreneurial acts of alert and creative human actors, the constant need for adaptation and adjustment due to changing circumstances, the institutional framework within which economic activity takes place, and the continuous learning required to incorporate the endless stream of new and fresh knowledge that the market process generates.

Economists, like Cachanosky and myself, are frustrated with mainstream practice of model building because the exercise renders the science incapable of capturing what F. A. Hayek called “the marvel of the market”. High theory sought to provide existence proofs, while classic theory from Adam Smith to Hayek sought to understand and explain social cooperation mediated through the “higgling and bargaining” of the market, the adjustments in the price system that guide and cajole participants to pursue productive specialization and realize peaceful social cooperation through exchange. The very technique of building a system of simultaneous equations substitutes a pre-reconciliation of plans to assure a unique P and Q vector that clears the market, rather the higgling and bargaining. And, even in the comparative static exercises of partial equilibrium the exogenous source of change is not in the theory met with higgling and bargain in response, but with the establishment of the new P and Q vector required for market clearing. Of course, in our teaching we often tell a story to our students to help them see the implicit adjustment process the model fails to capture but requires to make sense of the representation. This is what Richard Nelson has called “appreciative theory”, but what it isn’t is “formal theory”. Economic science is practiced using

formal theory, not appreciative theory. Appreciative theory is what we use in teaching and in communication outside the confines of scientific discourse.

Cachanovsky is arguing that this move is scientifically dangerous. Mathematical model building does not necessarily make economic theory more precise. The assumptions required for tractability too often eliminate the need to explore the central characteristics of a market economy. The logical validity of the model does not guarantee the explanatory adequacy of the model. Too much is lost. And what is lost is of scientific significance. Cachanovsky's enduring contribution is identifying a problem of explanatory displacement. Economics become increasingly precise about the properties of an theoretical representation that was becoming increasingly irrelevant with each new development.

He was not alone in offering this observation. Obviously Austrian economists such as Mises, Hayek and Rothbard made strong arguments that fit with his presentation. Cachanovsky's work offers a detailed account of the arguments from Jevons, Walras, Arrow-Debreu, Samuelson, and Hahn, and provides a critical assessment from the perspective of an Austrian economist. But in my remaining space I want to point to some voices outside of the Austrian circle that have raised similar objections about the problems that mathematical economics represents for scientific progress in economics. The problem is not mathematics as such, but that methodological tools constrain what we economists permit ourselves to see. Juan Carlos Cachanovsky's "Economic Science versus Mathematical Economics" (written in the early 1980s) identified a serious methodological danger to progress in the science, and since that time there have been significant voices within the mainstream of the discipline that have subsequently identified closely related problems. I will focus on the critiques one can read in Paul Romer, Brian Arthur, and Deirdre McCloskey. But let me begin with a long quote from Kenneth Boulding, the 2nd John Bates Clark Medal winner, who wrote a warning note in his review essay of Paul Samuelson's *The Foundations of Economic Analysis*. In the pages of the *Journal of Political Economy*, Boulding told us: "It may be that today the greatest danger is from the other side. The mathematicians themselves set up standards of generality and elegance in their expositions which are a serious bar to understanding. Conventions of generality and mathematical elegance may be just as much barriers to the attainment and diffusion of knowledge as may contentment with particularity and literary vagueness. ... It may well be that the slovenly literary borderland between economics and sociology will be the most fruitful building ground during the years to come and that mathematical economics will remain too flawless in its perfection to be very fruitful." Go back to my point about Morris Klein – it is that literary borderland, I am contending, that exists in those gaps that the Hilbertian system fails to close. And the science of economics to make progress must operate in those gaps if we hope to explain not only market theory and the price system, but the wealth and poverty of nations, as well as the hopeful promise of a world of generalized prosperity and perpetual peace. The pretense of rigor causes economists to ignore the gaps and in that ignoring we turn a blind eye to the questions that motivated our science as it was practiced in its finest hours.

Paul Romer is a major mathematical economic theorist, the developer of modern growth theory, and a Nobel Prize winner for these contributions. He has criticized modern economics for what he calls "mathiness". Good theory, Romer argues, requires a tight correspondence between theoretical propositions and empirical claims. Mathiness enables scientifically unhelpful slippage. Mathematics can conceal rather than discipline argument in economics. He ends his Nobel Lecture with advice to young economists pointing out how competitive the field is, and concludes: "Economic theory sells people short by emphasizing the selfish pursuit of material goods. Sometimes people rise above our low professional expectations. I'm convinced that our discipline is, finally, ready to take the other parts of human motivation more seriously, both the ugly side revealed by "us versus them" and the better side too. To be relevant, to offer practical policy advice, economists must embrace the full range of motivation that William Faulkner alluded to in his Nobel banquet speech: "love and honor, pity and pride, and compassion and sacrifice." I think I would push him to see the link between broader behavior foundations and a deeper appreciation for processes of creativity, novelty, discovery, and continuous learning through adaptation and adjustment, and the institutional framework which either encourages and gives space to the clever, creative and resourceful human actors to populate the world of our study, or handcuffs them and blocks their efforts to pursue productive specialization and realize peaceful social cooperation, and instead directs them back in the direction of those very Malthusian traps his work so desperately pushed to escape. But his critique of mathiness is very welcomed in the modern effort to put economics on methodological foundations more conducive to the study of purposive human actor.

Brian Arthur is a major developer of modern complexity theory. A former professor at Stanford and research fellow at the Santa Fe Institute, Arthur's work was at the heart of the utilization of formal tools to break out of the Walrasian box. In a recent article addressing "Economics in Nouns and Verbs", he argues that traditional

mathematical models handle quantifiable nouns, but cannot deal very well with the verbs of economic activity. Discovery, adapting, learning, creating, experimenting, innovating and institutional formation tend to disappear from the analysis under current methodological strictures. The methodological biases of economists must be challenged, and economics as a discipline must take processes of activity into account if the discipline is to make progress. Only in following Arthur, can mainstream economists move, e.g., to study what prices actually do in the economics process rather than what “price” represents in an equilibrium model. It is not just a matter of asking what prices are consistent with equilibrium, but what does the changing of prices induce people to do in coordinating their action with those of others.

Deirdre McCloskey provides perhaps the most comprehensive critique of the theoretical and empirical practices of modern mainstream economists. She equally attacks what she has dubbed “blackboard economics” and “the cult of statistical significance.” Both result in substituting form for substantive judgement, and produce an economic version of “cargo cult science”. In her demand for a great theoretical understanding the dynamics of the price system and the power of the market, she stresses not only what property, prices and profit-and-loss do but the beliefs and virtues that undergird the entire system. This contrasted with the standard abstract model of maximization and equilibrium that leads economists to stress the litany of one exception after another to produce a massive catalogue of market failures, and to engage in normative theorizing parading as positive analysis in the guise of welfare economics.

Existence proofs, rather than an appreciation of how prices guide economic actors, how profits lure them, and how losses discipline them. As we have been stressing, equilibrium model building by the nature of the construct preclude economists studying the processes of adaptation and adjustment that result in the equilibrium in the first place. This is a point that the mathematical economist Franklin Fisher sought to examine in his *Disequilibrium Foundations of Equilibrium Economics*, where he argued that unless economists could articulate the processes of adjustment that produce the equilibrium, then the “faith” we economists have in our equilibrium based welfare propositions should be questioned. Again, Cachanosky’s summary of the problems that the mathematical representation of economic theory is relevant to precisely this point raised by Fisher.

The last paragraph of Hayek’s famous “Use of Knowledge in Society”, he highlights this problem with conventional mathematical economics. The approach “habitually disregards an essential part of the phenomena with which we have to deal: the unavoidable imperfection of man’s knowledge and the consequent need for a process by which knowledge is constantly communicated and acquired.” Any approach that blinds us to these issues, rather than highlights them in our analysis is blocking scientific progress, not advancing the science. It only gives us the pretense of rigor, rather than providing rigorous and disciplined analysis of those critical areas that exist in the gaps.

Cachanosky’s work “Economic Science versus Mathematical Economics” remains 40+ years after it was originally defended sadly still relevant, and as such must be read by contemporary economists. Methodological works are foundational to our science. Methodology matters because not only does it determine what the science considers acceptable answers, it dictates what are considered acceptable questions for economists to ask. The questions that Cachanosky demonstrates have preoccupied the great economists like Adam Smith, are pushed to the sidelines scientifically not because they didn’t advance knowledge, but because their insights were not amenable to the fashionable methodology of modern economics demanding formalization and represented in a mathematical model.

The choice confronting us is not really one where we must choose categorically between mathematics and prose, formal theory and history, or theory and empirical work. It is, instead, between methods that illuminate the processes through which human beings coordinate their plans and methods that obscure those processes in pursuit of tractability. Economics is best understood as a science of human action in motion. We are trying to explain processes of coordination through time. Remember the title of Adam Smith’s great book *An Inquiry into the Nature and Causes of the Wealth of Nations*. That is an inquiry into transformation from an existence characterized as poor and sick (low levels of income and short lives) to one of rich and healthy (high levels of income and long lives). The Great Fact of human history is a non-scalar; it is a true transformation to something new. What drives this process in the alert and creative entrepreneurs, who discover what was overlooked by others to realize gains from trade, to discover lower cost methods of production, to see the demand for new goods and services. Understanding this process requires more than inputs/outputs and technological coefficients. It turns on human actors not automata and models of competitive equilibrium.

Ronald Coase summed up the dilemma very well when he wrote: “The stupendous loss in the depth and richness of human nature is a noticeable part of the price we have paid in transforming economics from a moral science of man creating wealth to a cold logic of choice in resource allocation. No longer a study of man as he is,

modern economics has lost its anchor and drifted away from economic reality. As a result, economists are hard pressed to say much that is coherent and insightful, although their counsel is badly needed in this time of crisis and uncertainty.”

The cost of our pretense of rigor has been high, and it is high time that we faced up to this waste of intellectual resources that caused our science to make wrong turns (Keynesian Demand Management and excessive aggregation; General Equilibrium and excessive formalism; Econometric Testing and excessive empiricism). We need to reconnect with Adam Smith and the great political economists. We need to study exchange and the institutions within which exchange relationships are forged and transactions take place. We need to study man struggling to negotiate between alluring hopes and haunting fears. And we need to embrace as our central puzzle the coordination of economic activities that result in social cooperation among human actors often separated by great social and physical distance, and to appreciate how the answer to that puzzle is to be found in the creative, clever and resourceful entrepreneurial actors that rely on property rights to structure incentives, prices to guide exchange and production decisions, profits to lure us to pursue ventures, and losses to compel us to learn and reallocate resources and efforts toward more value creating ventures. It is this path toward scientific progress, and faux notions of science must not be allowed to continue to block that progress. Read Cachanosky, learn from him, and adopt his approach to being a scientific economists.