

The Development of Econometrics

A recent survey of American graduate students asked what mattered most for success in economics: 57% said that "excellence in mathematics" was "very important"; only 3% said the same of "having a thorough knowledge of the economy", while no less than 68% thought that was "unimportant" (1). The present emphasis on mathematical formalism and the consequent evaluation of economic models in terms of logical validity and internal consistency makes the role of econometrics rather ambiguous. On the one hand, this self-referential evaluation of economic theories denies the importance of empirical testing. On the other, economics aspires to be a policy science, to be taken seriously by decisionmakers. Sargent refers to the strategy of current research as such: "These little models are abstractions. The test for whether they are realistic or not is in the econometrics" (2). The function of econometrics, then, in the current understanding of what is meant by economics as a science is to be an indirect corroborator of theory. Empirical models exist at several removes from the underlying theoretical models and hence econometric results are treated with due caution and scepticism. This essay seeks to explore how the role of econometrics as a validator of economics as a science has developed through time, in line with the evolution of the definition of economic science and with changes in our appreciation of the capabilities of econometrics.

Prior to the 1930s economists saw their subject as the parallel of Hamiltonian mechanics in physics(3). This entailed the development of marginal analysis, "a calculus of pleasure and pain". Economic theory was believed to be exact and true, but incomplete. The quantum revolution in physics, it is argued, forced economists to revise this picture and to actively incorporate random factors in their economic models. To this end, the use of statistical techniques (especially probability theory) seemed appropriate. The Econometrics Society had been founded in 1930 to further "the unification of the theoretical- qualitative and the empirical- quantitative approach to economic problems". Prior to this, the two strands were largely divergent. Empirical economists specialised in seeking new relationships by exhaustive data analysis projects. A good example was the agricultural economist von Thunen who based his farm specialisation theories on his interpretation of farm records collected over many years. Empiricism, then, was intent on developing its own results rather than testing the prescriptions of theoretical economists.

The introduction of statistical techniques into economic models in the 1930s instilled optimism that a reconciliation could be achieved. The application of classical probability theory to economic problems also made viable the testing of theoretical results, it was believed. Early work, such as Tinbergen's report for the League of Nations, engendered a debate about the proper methodology in economics. Keynes led the counterattack (4). He argued that making classical probability assumptions was inappropriate except when economic situations resembled games of chance. Moreover, multiple regression analysis as employed by econometricians merely established correlation and not causation and was invalid anyway if the empirical model was misspecified. A second round in the debate was the controversy between Koopmans and Vining in the late 1940s (5). The function of empirical research, Koopmans argued, was to investigate the validity of theoretical statements, measurement without theory being a wasteful exercise. The use of aggregated data to test hypotheses concerning individual agents was justified on standard stochastic principles, the influence of idiosyncratic factors cancelling out. Vining's retort was that realism should not be sacrificed for the sake of the researcher's convenience (6).

This debate essentially concerned conflicting opinions as to what constitutes a science and the validity of regression econometric methods. Haavelmo's

manifesto for econometrics took a pragmatic line: "the question is not whether probabilities exist or not, but whether- if we proceed as if they existed- we are able to make statements about real phenomena that are 'correct for practical purposes' " (7). This instrumentalist position, placing emphasis on predictive ability rather than description, is consistent with later developments in economic methodology such as the work of Friedman. However it was antithetical to the realist requirements of Keynes and Vining.

The second set of objections could not be so easily evaded. The AER style of econometrics which developed was rather too confident in the ability of classical probability to deal with the non- experimental nature of economic data. At the extreme, the assumption of correct model specification implied that the econometrician was doing no more than corroborating a theoretical model that was axiomatically correct. Most seriously, the assumption of a well- behaved error term could not be maintained. The neat division between deterministic and random components was believed to be important if the contemporaneously popular positivist vision of science was to be upheld. Positivism required the direct confrontation of theory by the factual evidence and the AER method attempted to do this.

The perverse behaviour of the error term was forcing applied econometricians to engage in various illegitimate procedures (collectively known as data- mining) to achieve workable model specifications. Inevitably, this had consequences for econometrics' role as a validator of economics as a science. But movements in the philosophy of science were also occurring. The impossibility of objectivity in the observation of data was acknowledged and it was recognised that scientific progress was due more to individual innovation and paradigmatic shifts than to 'normal' research. Feyerabend parodied the situation by espousing methodological anarchy.

The consequence for economics as a science was that methodological pluralism is possible. For the majority, as outlined in my opening paragraph, the most fruitful strategy is taken to be greater mathematical formalism. Pluralism does also open the door to a resurrection of the old empiricist tradition, it should be noted. The new philosophy of science was also of comfort to econometricians. Given that science was limited in its capabilities and that its results were highly uncertain, it followed that a more modest role was suitable for econometrics. Moreover, the theory- laden nature of data observation conferred legitimacy on data- mining practices.

These arguments are incorporated in the new econometric methodologies of Leamer and Sims (the US school) and Hendry (the LSE school). Key words are fragility, sensitivity, tentative, conditional, whimsy. The US school even treats the concept of probability as tentative, taking a Bayesian approach. It is argued that econometric results are only useful if they are robust to changes in the modelling assumptions, making sensitivity testing essential (8). Hendry emphasises the very approximate relationship between the empirical model and the underlying data- generating process (9). It is interesting to make the connection between the atheoretical ethos of Sim's VAR approach and the older empiricist tradition, also. The tendency in these new methodologies, it might be argued, is to maximise the credibility of economic science by making as few claims as possible for the econometrics (10).

This leaves affairs as stated in the opening paragraph of this essay. Spanos argues (11) that the desired convergence between the theoretical and empirical approaches is now more possible. The complex relationships between the DGP, theoretical models and empirical models are better appreciated today and the new cointegration models recognise that economic theory has to be considerably 'boosted' in terms of dynamic specification in order to be statistically significant. This more sophisticated role for econometrics, Spanos argues, requires a more general definition. I shall conclude with his holistic interpretation of what econometrics is and this definition is illustrative of the new scepticism

concerning the proper bounds of economics as a science, which is required if economics is to restore its relevancy to real-world problems. Thus - "econometrics is concerned with the systematic study of economic phenomena using observed data" (12). Not an overly arrogant statement, by any means!

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References

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