

ECONOMIC THEORY AND MEASUREMENT*

Occasionally there springs up in the academic community extraordinary "cells" of ideas and research of such life and vitality that their influence reaches out into the whole world of the intellect. Such, for instance, was the group of economists at the University of Vienna at the close of last century, or the group at Cambridge University between the world wars. It is becoming more and more clear that the Cowles Commission and the leaders of the Econometric Society constitute such a group in the present day, in the sense that no economist anywhere in the world can afford to remain completely ignorant of the ferment of ideas, the new research techniques and new points of view which are constantly proceeding from the activities which center in a few rooms in the Social Science Building at the University of Chicago. Econometrics has been one of the most significant "growing points" of economics in the past twenty years. It is not however a "school" in the sense of the "Austrian School", contending for the supremacy of its theoretical position against other schools, so much as a "movement", finding its bond of unity in the common skills and methods of its adherents rather than in any uniformity of theoretical position. The nerve center of this world movement is unquestionably the Cowles Commission, and the report on their first twenty years of work is therefore of peculiar interest.

The report consists first of a brief history of the Commission, intended to give the lay reader—and especially the non-mathematical reader—some idea as to what this ferment of activity is all about. The history is brilliantly written—it is indeed a striking commentary on the essential unity of all high competence that a group specializing in the supposedly arid areas of high mathematics and statistics should produce a document which is a model of expository English, giving a clear picture in short compass not only of the history of the Commission, but of the ideas, techniques and theories which it has germinated and fostered. Like so many important creative contributions to human life and culture, the Commission is the result of a happy union of artist and patron—the artist in this case being represented by a small international group of economists who were interested in the application of more exact quantitative methods to the field of economics, and the patron of course being Alfred Cowles, a man with a rare combination of interest, objectivity, and, one presumes, financial resources. In Alfred Cowles indeed the econometricians found an ideal patron: a man something of an artist in the field himself, but with the sensitivity and insight to permit the unhampered development of the field by first-rate practitioners, often I am sure, in directions which were not along the lines of his own personal interests.

The name "Commission" is itself interesting and significant, though the report does not say why it was adopted. A research organization of this kind is usually called an "Institute": the word "Commission" carries with it a certain sense of "commitment" to a specific task—it is used, for instance, in the expression "Royal Commission" or "Congressional Commission" to mean an *ad hoc* body created

* A review note of *Economic Theory and Measurement: A Twenty Year Research Report, 1932-1952*. Cowles Commission for Research in Economics. The University of Chicago, 1952. 180 pages.

for a special investigation. In its early days in Colorado Springs one does get the impression that the embryo organization was "commissioned" to do rather specific pieces of research which were of interest to its sponsors: the work on stock market forecasting and on silver money perhaps were something of this nature. Especially after the move to Chicago in 1940, however, it is apparent that the research of the Commission increasingly follows an internal dynamic of its own creation. Nevertheless one detects a certain difference between the "Commission" and the ordinary research institute in the commitment of the Commission to an idea—the idea expressed in its motto which is also the title of the report, "Theory and Measurement". The guiding idea behind the work of the Commission has been that of the *interaction* of theory and measurement in economics—theory guiding the attempts at measurement, and measurement in turn profoundly modifying theory, forcing it into forms which it would never have taken had it not been for the exacting requirements imposed by the quantitative method. In this respect the Cowles Commission differs somewhat from the work of the other great American economic research agency—the National Bureau for Economic Research, where the emphasis has been on the collection and description of economic data rather than on the close interaction of theory and measurement. It would be unjust to describe the work of the National Bureau as measurement without theory, nevertheless the anti-theoretical biases of Wesley Mitchell inevitably left a stamp on the work of the Bureau, in the sense that its theory is not so much *economic* theory as a theory of measurement and description. For this reason the present writer at least cannot escape the impression that valuable as the work of the National Bureau has been, the work of the Cowles Commission has surpassed it in quality, and has made a much greater impact on the development of economic thought and knowledge.

The central interests of the Cowles Commission were stated very clearly by Marschak in the 1943 report; the statement is worth quoting. "The method of the studies is conditioned by the following four characteristics of economic data and economic theory: (a) The theory is a system of simultaneous equations, not a single equation; (b) some or all of these equations include 'random' terms, reflecting the influence of numerous erratic causes in addition to the few 'systematic' ones; (c) many data are given in the form of time series, subsequent events being dependent on preceding ones; (d) many published data refer to aggregates rather than to single individuals. The statistical tools developed for application in the older empirical sciences are not always adequate to meet all these conditions, and much new mathematical work is needed. To develop and improve suitable methods seems, at the present state of our knowledge, at least as important as to obtain immediate results—it is planned to continue these methodological studies systematically. The available results of mathematical analysis are currently applied and tried out in econometric investigations; conversely, new situations arising in the course of practical work present new problems to the mathematician. It is intended to make this hand-in-hand work the basis of the Commission's activities."

The publications of the Commission in recent years reflect strongly the interests focussed in Marschak's statement. The basic concept is that of the "model"—

a system of simultaneous equations containing random terms, the variables of which are economic aggregates, and the parameters of which may be estimated by means of certain mathematical manipulations of data contained in time series. Monographs Number 10 (Statistical Inference in Dynamic Economic Models), edited by T. C. Koopmans, and Number 11 (Economic Fluctuations in the United States, 1921-1941) by L. R. Klein represent the immediate fruit of the line of work laid down by Marschak. It is characteristic however of the vitality of the Commission that it has also produced work of great interest and importance which is not in the direct line of its program—such is the famous monograph of Kenneth Arrow, *Social Choice and Individual Values*, which rocked welfare economics to its foundations and which opened up for economists a whole new field of mathematical logic. On the methodological and theoretical side there has been a great deal of interest in the theory of economic behavior, both under assumptions of certainty and, what is by far the most important problem, under the more realistic assumption of uncertainty. Marschak himself in a number of papers has been an important contributor to this field. Finally there has been a great deal of interest in what has generally come to be known as “linear programming”, in spite of the attempt on the part of the Cowles Commission itself to popularise the expression “activity analysis”. Monograph Number 13, *Activity Analysis of Production and Allocation*, edited by Tjalling C. Koopmans (1951) is a comprehensive collection of essays in this field, and by far the most important work to date in what promises to become a whole area of economic thought and techniques.

It is impossible to summarise what is itself a summary, but I hope I have said enough to justify the proposition that when the history of economic thought in the twentieth century comes to be written, the work of the members of the Cowles Commission will occupy a large part of the book. In support of this proposition one may cite not the least interesting part of the report, an appendix which consists of brief biographies of all people who have been associated with the work of the Commission since its foundation. This appendix reads almost like an international “Who’s Who” of economics, and is a striking testimony to the world-wide impact of the Commission.

It is all the more important, therefore, to ask ourselves at this point what is the significance of such a development for economics as a whole. Are we now reaching the point where mathematical economics occupies the center of the stage, and an economist without at least some mathematical background is as handicapped as, say, a physicist in a similar condition? There will probably always be specialization in “mathematical economics”, just as there is in mathematical physics, but are we getting to the point where there is really no “non-mathematical economics”, just as there is no “non-mathematical physics”? Judging by the extraordinary vitality of econometrics and its ability to attract such a large proportion of the most brilliant younger economists, the answer to these questions would seem to be in the affirmative. What this means in effect is that economics is moving closer to the sciences and away from the humanities. In this movement there is much that is good, for a great part of the universe of the economist is capable of organization around the idea of measurement, and is therefore capable of being expressed in the language of measurement, which is mathematics. There is no reason why there

should not exist an economic science, just as well founded as any other science. Indeed, economics has certain advantages of its own which the other sciences do not possess: it is able, for instance to study its universe both at the "molar" level in terms of aggregates and also at the "molecular" level in terms of the behavior of individual economic organizations. Few of the other sciences have this advantage, and I have hopes that economic science will have much to contribute to other sciences—certainly to the biological, and perhaps even to the physical sciences in method and in conceptual framework.

Economic science, however, is not the whole of economics, and it is at this point that a possible danger arises in the development of a "subculture" of econometricians, enjoying a great deal of lively communication among themselves, but cut off from the less mathematical members of the profession by a difficulty of language—mathematics being a language which is not universally known. The more econometrics develops, therefore, the more important it becomes that there should be "middlemen" capable of interpreting the work of the econometricians to those whose interests lie more towards economic policy and legal economics, and also capable of "feeding back" to the econometricians problems which arise in the legal and administrative sphere. A good example of the failure of such interaction has been that of the American Anti-Trust Law and its administration, where if anything the work of the "pure" economics has served to add confusion to an already chaotic situation, and the lawyers and administrators have not apparently been able to present their problems to the economists in a way that has stimulated fruitful research. If this has been so even at the relatively mundane mathematical level of, say, the theory of imperfect competition and monopoly, how much more difficult is it going to be to organize fruitful interaction between the makers and administrators of laws in the economic sphere and those whose mathematical conversation soars to the realm of saddle points, convex sets, Markov chains, non-linear stochastic difference equations, and similar elegances. The present report is, indeed, a clear indication that the Cowles Commission is aware of this problem, for the report itself is a most praiseworthy, and indeed a very successful attempt at precisely the kind of communication for which I am arguing. Nevertheless the problem remains, and I suspect needs to be worked on at deeper levels than the preparation of reports. One of the greatest dangers facing mankind is the development of non-communicating groups within the general framework of the growth of knowledge. We all tend to draw "iron curtains" round our own speciality, and attempts such as this report to raise these curtains are among the most important intellectual endeavors of our time.

University of Michigan
Ann Arbor, Michigan (U. S. A.)

KENNETH E. BOULDING