

PROBLEMS OF QUANTITATIVE RESEARCH IN ECONOMICS

By

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A better title for today's lecture and discussion would be "Data and Concepts in Quantitative Research in Economics." The discussion starts from a basic question that all of us ought to confront once in a while: where does the economist get his information, how does he know what he says he knows? And I plan to discuss this question with reference to quantitative research in economics, quantitative data and information on economic processes. Let me begin by drawing a sharp, perhaps artificially sharp, distinction between primary economic data and economic measures. Primary economic data are, for example, the tonnage of rice produced in a region or a country, or the price of a bushel of wheat in a given locality at a given time. These are not economic measures of consumer goods (of which rice is only a part), nor of the cost of living (of which wheat price is only one component entering the price of bread). Economic measures are, to use the most widely known examples, the GNP of a country, or its balance of payments. Economic data are the raw materials for the economist to use in deriving what may be defined as the quantitative counterpart of economic concepts, namely, the economic measures. An economic concept is a well defined, analytical element in the economic process, and what we have to face is the problem of converting economic data into economic measures. It is in the conversion of primary data into relevant economic measures — relevant to meaningful analysis — that economists exercise their influence on, and attain some control over, the quality and quantity of primary data.

This distinction sets the framework for the discussion that follows. We have, on the one hand, the problem of securing an adequate

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supply of economic data of appropriate quality which will permit the economist, once he understands the process of data collection, the requirements of the economic concepts and the implied structural relations formulated in economic theory, to convert these data into economic measures. On the other hand, there are problems with the concepts. Some of the concepts are often derived from specific economic and social conditions and criteria, and many of them are applicable only to certain parts and types of economic reality. In using economic measures for testing hypotheses and more important, in interpreting or analyzing regularities, not only the reliability and scope of the primary data are tested but also the adequacy of the conceptual structure that underlies the measures, and thus the appropriateness of the theories and their assumptions. The latter is a valuable check of the relevance and realism of the economic concepts and theoretical relations, often leading to changes in the demand for data. For example, in the industrialized countries the growing importance of education relative to material capital, the growth of the service sector as against the agricultural and industrial sectors, the emergence of Keynesian theory, and so on, have led to the collection of more data on education, on distributive trades, and on the expenditures approach to GNP.

Where do we get the primary economic data, where do they come from, and who produces them? We face here in a sense a question that is faced in all empirical scientific disciplines. In many so-called exact sciences, the data are mainly experimental data, the results of experiments devised by the scientist, effectively controlled by his objectives, and performed under his guidance and direction. Our discipline has very few such experimental data. The economists must rely almost exclusively on observational data, which must be collected on a vast scale as compared to experimental data which are collected only on specific, key aspects of hypotheses and theories sharply formulated. This in turn implies that in observational sciences like economics, there is a proliferation of competing hypotheses which are difficult to test and dispose of, as in experimental sciences.

There are observational sciences like astronomy and meteorology, in which we do have data that are non-experimental in nature. But observational sciences and observational bodies of data may differ in one important respect; namely, whether or not the process of securing the observations is controlled by the scientist (professionally controlled), or whether the degree of control by the scholar concerned with the use of data is limited. Let me cite an example of a

discipline in which, at least in the recent decades and centuries, the collection of observational data was tightly controlled by the scientific community for whose use these data were originally produced. For example, in the case of astronomical observations, the observations are manned by professional technicians, the telescopes are being operated at the instruction of the scientific community. The technical conditions under which the measurements are taken are specifically set, the margin of error is clearly indicated. But the degree of control exercised by the specific community in the collection of observational data varies with the sciences.

In the case of the social sciences in general, most of the quantitative data that we get — whether in economics, or demography — are not fully controlled. And one might ask why. Why is it that a census may show an error of five per cent undercount, or reveal an age distribution that looks queer? Or take a sample of farm households or urban households and ask them about their income and expenditure, and the results fall far short of comparable national account items, maybe by about 30 or 40 per cent. Why do we not use professional observers, putting them into the household to record every item of consumption or every item of income received so that we have controlled observations? The answer is that it is both prohibitively expensive and politically impossible.

In the social sciences, most of the data are the results of either administrative processes, or of self-reporting by the agent whose activity is being studied. On the date of the census, the census investigator comes to the household to ask the housewife how many people there are in the family, what their ages are, and so on, and the answers are recorded with whatever biases and errors may exist in the answers. We always have to ask: What are the consequences of having to operate with data of this kind? We have to prepare for two consequences. One is the accuracy of the data — the quality of the data in terms of accuracy and completeness is likely to be deficient. And the deficiency is essentially a function of what may be termed the degree of accountability and quantifiability of the process. This is a serious problem, especially in studies dealing with comparative data on countries at different stages of development. If accountability and quantifiability is a function of socio-economic development, this is something which is bound to be greater in the case of developed countries than in the less developed countries. We face then a serious problem in the sense that comparative measures will be naturally biased by the different capacities of the different societies to produce data of adequate reliability. This is true not only in

cross-section comparisons, but is also of the long term records for a given country.

The second source of difficulty is a question of supply — not so much of the quality of the data, as of missing areas for which no data would be available whatsoever, especially in estimating comprehensive measures of the total product of the economy such as the GNP. This raises another question: What determines the supply of data? In my view, what determines the supply of data is the realization on the part of the social authority, namely, the Government, that certain information is needed to meet emerging problems, for policy making, and for social progress. For example, in the U.S. the data acquired first of all were the periodic census of population needed as the basis of voting and electoral apportioning. We had data on foreign trade largely because the U.S. was interested in the control of foreign trade. These served as the oldest bodies of data in the U.S., going all the way back to 1790. There was no early census of agriculture to speak of, although fairly early in the 19th century the major crops began to be reported on. The first census of manufacturing in 1830 was so inadequate that for all practical purposes 1840 was the first date for the Census of Manufacturing. We had no worthwhile data on employment and unemployment until the 1930s nor data on the distribution of income until the late 1930s. The first census of commerce was in the 1920s.

Governments often do not respond to emerging problems until there is sufficient pressure, and this may not be forthcoming until the problem has emerged throughout the nation and a broad consensus had developed that data are needed for the understanding and solution of the problem. Then, since a long period of data accumulation is required for the analysis of the problem, there is likely to be a serious lag in the supply of primary data. One can go through the records of other countries to observe that the provision of basic quantitative, social and economic data is a function of the changing structure, level of development, and sequence of problems sufficiently grave, so that the sovereign authority uses its power to allocate resources and to exercise pressure for the securing of such data.

One should add that this supply problem has been complicated in recent years by the effort of international agencies, particularly the UN, to secure national account estimates from a variety of countries. In many cases the accounts are relatively worthless because the country is not ready for national accounts. Take for example Ethiopia: a country which has never had a population census not

even a sample, and with extremely limited means of communication and transportation. The idea that a country like this could generate reliable or half-reliable estimates of national income year by year on a standard basis is unrealistic. For most countries, estimates such as GNP are an amalgam of good, mediocre, and poor data. The publishers of GNP accounts are under the intellectual obligation of describing in detail the methods and sources of the estimates.

A physicist can take the results of an experiment on faith, especially if he is a theoretical physicist and not an experimental one, knowing that given the rules of the discipline, the measures that he gets are subject to the indicated margins of error, and subject to a precise description of the relevant conditions under which the experiment was performed. The counterpart of this in economic research would be if every measure such as the Ethiopian national income were accompanied by an indication, a clear indication, as to how it was derived and what was the margin of error, to permit the investigator himself to accept it or to reject it according to his discretion. Unfortunately this requirement is not frequently followed. One of the difficulties in graduate economic training that I see is that the graduate students of economics never learn how the measures they are using are derived.

Now we come to the concepts, and here we have a somewhat different set of difficulties — to be illustrated by discussing briefly what happened in the application of these economic measures to the study of economic growth in the early postwar decades. All economic measures are conditioned by the theory that underlies them. There is no such thing as an *absolute* economic measure; all of them are conditioned, each one separately, by the body of economic doctrine that is reflected in the concepts. This means that when the data are converted into economic measures, we find a quantitative counterpart of the concepts. So the national products will differ from the UN concept if you consider the final services (not embodied in other output) unproductive (as in the Marxist countries).

There is a certain logical structure in the system of concepts. For example, in the system of concepts concerning production structure, theoretically the growth of inputs and outputs should balance. But in the study of economic growth in the 1950s, a large residual of output growth which was not explained by the growth of inputs remained in growth accounting. Since economists and other scholars cannot stand a vacuum (i.e., the residual), great pressure was generated towards revision of concepts that would reconcile them with the

empirical results. This took, in fact, the form of regarding education as human capital, thus expanding the concept of capital.

Whether this is a proper solution or not is not my concern now (although I have considerable doubts that this is the proper answer). But note what happened in the interplay between using the data to derive economic measures corresponding to a certain conceptual and theoretical system, and then discovering that the expected results were not consistent with the theoretical expectations. The economists went back to the conceptual system to ask what was missing to produce the unexpected residual.

In a sense this is the strength of the whole process. I started out by making a sharp distinction between economic data — economic relevant data — and economic measures, indicating that one shifts from economic data to economic measure by using the data to find quantitative counterparts of concepts that form an analytical system. So it is really using the data to test and derive the parameters of theory, and to discover that it is incomplete in one way or other, forcing one to look for alternative changes in the concepts, assuming that the basic data are relatively adequate for the purpose.

Let me cite another similar instance. It occurred in the 1930s when the first long-term studies of capital formation and national savings were made at the National Bureau of Economic Research. These were initiated in the early '30's and published from 1935 on. For the first time the rate of national savings (defined as) identically equal to capital formation was measured. That rate for the U.S., measured from the 1870s to 1930s, showed a remarkable stability. This was another puzzle because theoretically one would expect that as the nation became richer, one should get a higher savings ratio, since the cross-section surveys showed rising savings as one moves from the lower income brackets to the higher. Instead, the results showed a constant proportion of gross capital formation, gross savings ratio, and a declining proportion in net savings. Immediately there began a theoretical flurry as how to explain this, and to revise the theory.

The foregoing discussion of the experience of developed countries suggests certain implications for research having to do with growth problems in the LDCs. It is easy to argue that the difficulties of the supply of data and of their concepts are likely to be far greater in the LDCs than they have been in the DCs — at least for three reasons.

One is that the data base and the capacity of the economic processes in the LDCs to generate reliable measures of their own performance are much more limited than in DCs. We need to have some adaptations, even of the statistical techniques, to be able to handle the problems properly. It is rather a pity that the national statistical survey of India is not as well known as it should be because it was one of the best experiments in which a large, sophisticated body of statisticians in India tried to wrestle with the statistical problems of a huge developing country. In any case, I want to emphasize very strongly that it is important to trace the quality and consistency of the data as they are published by cross-checking, by cross-comparing; and by recognizing that if there are major deficiencies, it may be intellectually dangerous to use the data.

Secondly, the conceptual structure originated mainly in the developed countries, so that it is less suited to the structure and problems of developing countries. For example, if I were the head of a statistical office of a developing country, I would think twice before accepting the UN national accounting system, because it is full of requirements that are of very little value for developing countries, i.e. certain types of sectoring and certain types of definition which a developed country could use far more than a developing country. In my experience with statistical agencies in developing countries, I found them devoting a surprising amount of effort to fill out the empty boxes of the Standard National Accounting System of the UN.

Thirdly, if the concepts are not quite suitable, I see no reason why the available intellectual resources within the developing countries should not be used, whether in the statistical field or in the economic analysis field, to depart from the International Standard System, and try to derive measures and approximations that are far more relevant to the rural small scale enterprise type of operations, and even to some of the larger-scale operations that may nevertheless reflect certain specific institutional conditions in the country.

Finally, it is necessary to have in any country a body of expertise to bridge the gap between the data, the concepts, and the measures. In the developed countries (that is, those that I am familiar with, particularly the US), there is a great deal of such expertise, located primarily in government offices and also in the academic communities, so that when the measures begin to depart from the acceptable concepts, as in the measure of unemployment, or in the index of

consumers expenditures, or if the indices of consumer prices begin to deviate from reality too much, then pressure is immediately applied by some parts of the government, some parts of the business community, some parts of the labor community, and from the academic fields, each with its own contingent of skilled resources for handling data and concepts, with the result that changes are soon made. In developing countries, however, the scarcity of such talent poses difficulties; on the one hand, there are people who can produce the data and, on the other, there are people who can devise theoretical concepts and operate theoretical models. But the number of people who can combine the two is extremely limited; at least that was my experience when I worked in India as a consultant, and in Taiwan on some of their data. It is typical of a developing country that these kinds of sophisticated resources are extremely rare. One of the tasks still in store is to produce more of these skills; just as a developing country needs its own engineers, its own technological innovators, it also needs its own statisticians and economists.

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