

MATHEMATICAL METHODS IN ECONOMIC RESEARCH

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Mathematical methods have acquired a paramount importance in economic studies. The results obtained by such methods have a growing influence on the development of political economics.

In our days outstanding scientists devote the entire scope of their activities to the development of mathematical methods suitable for revealing economic processes. Nevertheless it is not their work that, first and foremost, determines the changes. Similar personalities lived also in the past: Cournot laid down the foundations of mathematical economics more than one-hundred years ago. However, economic analysis based on mathematical methods could for a long time not gain ground beyond the scope of a school of economics and has not become an organic part of the general development of political economy. Today the situation is different: mathematics are penetrating economics over a large front. This change has been prepared by objective social and economic transformations.

Socialist economy is particularly receptive to economic analysis based on mathematical methods. The national economic approach, the exact foundations of scientific hypotheses and the prevalence of reasonableness in the considerations hasten the application of modern mathematics and of contemporary apparatus in computation techniques.

Microeconomy and macroeconomy, i.e. research on the factory level and on the level of national economy, have for a long time been distinguished from each other, yet they were liable to be regarded as showing purely quantitative differences. The indices obtained by summing up the factory data and the decisions taken on this basis on the level of national economy are still characteristic of the planning and economic organizational work of the socialist State, yet, fortunately, the correct approach to national economy, i.e. the intention to disclose the phenomena of economic life in their organic correlations and interactions, is gradually gaining wider ground; the analysis based on the input-output balance has been adopted.

* This is a short summary of the lecture delivered in the Department of Economic-Mathematics of the Society of Economics by Dr. Béla Csikós-Nagy, President of the National Price-Office.

The disclosure of the intricate relations in the social production system requires, by its very nature, modern mathematical methods, up-to-date computation techniques. Price phenomena are particularly suitable for the application of contemporary apparatuses, which open up unexpected vistas in the analysis of prices, as testified by the series "Cost Accounting in National Economy" published by the National Price-Office. The calculation of value and of different price types can today be looked upon as essentially correct. We are able now to study

- the effect of changes in the price type upon the price proportions
- and the content of net income from prevailing prices computed on the national economy level,
- the problem of the price scissors,
- the costs of currency production in export goods etc.

These results influence our mentality too. It is becoming natural that the statements to be demonstrated by mathematical methods cannot be replaced by hypotheses. We also have to take into consideration Joan Robinson's claim that the great obstacle to applying scientific method in economics "is that we have not yet established an agreed standard for the disproof of an hypotheses"; and that "... economics limp along with one foot in untested hypotheses and the other in untestable slogans" (*Economic Philosophy*, London 1962).

This is somewhat characteristic of us, too. It is well known, for instance, that the price system of the socialist countries is generally considered a double-level system. The hypothesis is that the prices of the means of production contain a lower net income than those of the consumer goods. This has been inferred from microeconomic data. When, however, by transforming the balance of input-output relations computations were made to check the price system, the prices of the means of production and of consumer goods were found to be single-levelled. The larger the ground mathematical methods are gaining, the more obvious it becomes that quantitative correlations cannot be explained or proved in a purely logical way.

The scientific foundation of optimal programming and of rational decisions is usually regarded as the chief reason why mathematical methods and up-to-date computation techniques are spreading so rapidly. The greatest difficulty in taking such decisions is, as is known, to get the necessary amount of variants. Contemporary computation techniques not only solve this problem but in many questions of detail offer a rich hierarchy of variants, and if the programming is correct, they point out the solution that is most appropriate for reaching the various possible objectives.

There is a rather neglected field of rational solutions: the mechanization of management. The novel way of raising the problems of price formation in connection with the mechanization of management has aroused the interest

of price specialists. For the past years we have gradually simplified railway and postal rates. Some years ago this would have been looked upon by experts as an "crude" violation of trade characteristics. Today the experts themselves regard simplification as the principal requirement of "up-to-dateness". What was earlier looked upon as a trade characteristic turned out to be century-old tradition coming into a sharpening conflict with the requirements of modern society.

Thus the mathematical methods and the up-to-date computation techniques do not only enhance scientific work in general but have a positive effect also on the minor problems of daily life. Under such conditions it is an obvious absurdity to ask whether these methods are needed or not, whether they are useful to science and society. Yet, it is equally obvious that whenever significant new tendencies appear, these are inevitably accompanied by certain negative phenomena which must not pass unnoticed.

Several years ago we were annoyed because some of us defended themselves by ideological declarations against possible criticism; now we are struck by the boldness of some mathematicians wishing to replace the discussion of economic problems of mathematical declarations. This phenomenon is closely linked with another negative feature, which could be termed schematization. Carried away by its spell are those who are not content with offering supports in the form of mathematical formulae to economic decisions but wish to substitute the formulae for decisions which require, by their very nature, also political assessment.

Some of economist mathematicians are inclined to put even very simple chains of thoughts into formulae. They try to turn economics into a textbook of mathematics, which thus would be accessible only through a system of equations. But it is even worse if they try to authenticate superficial or incomplete ideas by means of intricate formulae.

In order to extend the use of mathematical methods the tasks ahead of us are three-fold:

- to eliminate the arbitrary use of mathematical formulae and of symbols for marking economic processes;
- to combine good mathematics with a more profound economic analysis. Because the more refined the analytic method is, the greater number of qualitative elements assume a quantitative form, consequently, intricate phenomena can be disclosed by mathematical formulae more profoundly;
- to strengthen the consciousness of responsibility. Economist mathematicians must be aware of the practical applicability of the formulae and of the conditions necessary for it.