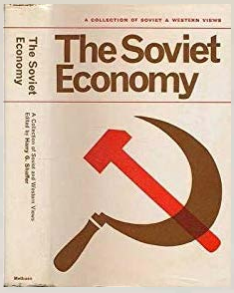

TOWARDS MATHEMATICAL METHODS OF ECONOMIC PLANNING AND ADMINISTRATION*

Leonid Kantorovich
Mathematician, Economist, Member, U.S.S.R. Academy of Sciences

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Mathematics . . . and its methods have long been widely employed in the natural sciences and technology. But up until fairly recently—some twenty years or so ago—hardly any mathematics, besides elementary arithmetic, algebra and statistics, was used in economic planning and administration. Yet economic analysis and planning pose many problems which are difficult, if not impossible, to solve without the help of exact science. Here is an elementary example.

Given: sand for 60 construction projects is delivered from eight landing stages. Determine the most efficient organisation of deliveries. Obviously, it is impossible to deal with all the possible alternatives, which run into the billions. At the same time, haulage costs will depend to a substantial degree on how correct the final choice is. This is where linear programming comes into the picture. Its methods enable one to obtain an optimal solution without having to go over all the possible alternatives.

Problems of this order crop up every day, and linear programming offers comparatively simple solutions, often not even requiring a computer. Not so, to be sure, when the task is to draw up a plan for a whole industry, or to distribute the placing of orders, or to decide on a site for new enterprises. With the massive development of technology, machinery and industrial installations, and the increasing inter-dependence of plants nowadays, such problems are extremely complex. Linear programming methods are applicable

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here too, but they must be bolstered by technological and economic analyses and relevant economical and statistical data, supplied by the joint efforts of many experts. Computations have to be made by computers. The new methods can be used for calculating cattle feed, drawing up transport haulage routes, the composition of a furnace charge or time-tables for construction jobs.

It is a regrettable fact that, although linear programming was first developed in the Soviet Union, for many years we lagged behind other countries in its practical applications. Much has been done to rectify this situation, and here in Siberia (in particular, in the Mathematical Institute, where I work) we are busy elaborating and improving mathematical methods of economic planning and administration and developing new analogues for solving the important and complex problems confronting the national economy.

Linear programming is increasingly becoming a conventional tool of economic administration. The greater the range of precision computations the more apparent it is that the new methods are by their very nature best adapted to a socialist economy. Only here is it possible to utilise them for solving problems of economic planning, of tremendous difficulty but at the same time extremely promising.

This point is also stressed by many eminent scientists in capitalist countries. The views have been quoted of such leading American experts as M. Friedman and H. Houthakker, and Norbert Wiener has been cited to the same effect. We can with full right speak of the influence of Soviet planning experience on such celebrated economists as G. Stone (Great Britain), R. Frisch (Norway), J. Tinbergen (Holland) and K. Gruzon (France). At the same time, many articles appearing in the Western press claim that the apparent success of the application of mathematics and cybernetics to socialist planning is indicative of a retreat from Marxism on the part of Soviet scientists.

This counterposing of mathematics to Marxism reveals either a total misconception of the problem in hand, or it is pure propaganda. Socialism is the living practice of Marxism, and Soviet science, including mathematical methods in economics, helps to provide the best solution to the problems arising as our society advances. In this connection it would be worthwhile to dwell in greater detail on the advantages which socialism offers for precision economics.

In our socialist society we seek solutions that are most advantageous not merely to a single enterprise or concern but to the economy as a whole. In drawing up a plan for the development of socialist economy, in addition to stating the target figures other basic indices, such as wholesale prices, return on investments etc., are also estimated and fixed. In calculating an optimal plan with the help of linear programming we obtain at the same time an objective evaluation of different facts. This system of evaluations makes it possible to reduce to a common denominator expenditures varying widely in

respect of scope and time. These objective evaluations are employed in computing such primary indices as prices, recoupment rates, efficiency rates, etc.

Optimal planning and its indices must become a means of achieving best results with least expenditure—all in the public interest.

The greatest promise lies in the application of optimal planning methods on a national scale. This is an extremely difficult scientific task, comparable with the harnessing of nuclear power or the conquest of outer space. But it is here that one can look forward to the greatest achievements in accelerating the rate of economic expansion and raising the living standards. It is not accidental that the draft directives of the 23rd Communist Party Congress on the five-year economic development plan rank the development of research in theoretical and applied mathematics high on the priority list of indices contributing most to the acceleration of scientific and technical progress.

Some economists, while agreeing in principle with the possibility of applying mathematical methods to economic planning on a wide scale, see this as a matter of the more or less distant future. . . . [I do] not share this view, and here are . . . [my] arguments.

We have everything necessary, including the scientific base, for gradually going over to a system of optimal planning. To be sure, as pointed out, it is extremely complicated. But then space conquest began with the launching of unmanned satellites. The results of the first—and no longer isolated—steps in optimal planning point to the great effectiveness of scientific recommendations. Here are but two examples.

We were asked to determine the break-down of the machine and tractor fleets for a group of state farms of Novosibirsk Region, such as to ensure the timely carrying out of all farming work with minimum operational expenditures and investment. Our computations revealed that a judicious choice of machines could cut investments by 20-30 per cent. The benefit of introducing this methodology on a national scale is self-evident.

Another problem, solved by the Siberian branch of the Academy of Sciences in co-operation with steel industry workers, was to determine how best to load the country's rolling mills. (Here, incidentally, is an example of a problem that simply could not be posed in a capitalist economy.) Many initial figures had to be taken into account: hundreds of mills, thousands of types of shaped articles, tens of thousands of orders. Initial estimates reveal that existing capacities can produce five to seven per cent more rolled stock than at present. Our conclusions on this score are already being put into effect.

More and more problems embracing more and more departments are being solved. I am convinced that the introduction of optimal methods in planning and developing economic indices is a feasible and, moreover, imperative task for the near future.