

THE EQUATIONS OF MATHEMATICAL ECONOMICS AND THE PROBLEM OF ECONOMIC CALCULATION IN A SOCIALIST STATE

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I
It has been contended that it would be possible for a socialist economy to solve the problem of economic calculation by applying the equations by the aid of which mathematical economics describes the conditions of economic equilibrium. This view made its first appearance in an article by Barone published in 1908¹; since then it has been advanced time and again and enjoys marked popularity at the present time.

Hayek has shown the practical difficulties which stand in the way of this attempt at solving the problem. The calculation would have to include all conceivable uses, and ways of combining all available goods. Moreover it is not sufficient here to bring together under a common denominator all the quantities of goods which appear to form a single class from a technological standpoint. Since the economic profitability of transporting goods from place to place must be reflected in the equations, and since the latter must also solve all problems of location, goods which are similar from a technological point of view, but which are not available for use at the same place must appear in the calculation as independent items. If Hayek (1935, pp. 207–14) estimates the order of magnitude of the number of necessary equations and calculations as hundreds of thousands, this is

EDITOR'S NOTE: Ludwig von Mises published a French language version of this paper, translated from German by Gaston Leduc, in *Revue d'économie politique* in 1938 (97, no. 6:899–906). Mises himself wrote this English language version which was previously unpublished. In this article, he discusses the different elements of the case against using mathematical equations to solve the problem of economic calculation in socialism that were advanced by himself and F.A. Hayek. The editor would like to thank Grove City College for access to this manuscript and permission to publish it.

¹An English translation is found in Hayek (1935).

certainly far below the number which we are justified in assuming on the basis of this factor.²

It is at once clear that the collection of these data, and the setting up of the corresponding equations, is a task far beyond the powers of a socialist central administration composed of mere human beings. The practical impossibility of carrying out the proposals connected with this or any similar solution is certainly not disputed. In consequence, we might, if we were concerned solely with the problem of economic calculation in the socialist state and with the practicability of socialism, leave the matter here. The proposals are however of special interest from the point of view of economic theory. Their closer consideration leads to important propositions concerning the character of the equations of mathematical economics.

II

The only way we can analyze exchange transactions is by assuming that they are directed toward producing a state of affairs in which no further exchange takes place, either because a state of complete satisfaction has been reached, or because a situation has been reached which, though not completely satisfactory, could not in the given conditions be made more satisfactory by further transactions. In its use of the static equilibrium concept, economic analysis does not go so far as to construct a state of complete standstill in which no more trading takes place. It confines itself to the construction of a situation in which the process of exchange follows a uniform course. In the future the same transactions are supposed to be continually repeated, because the conditions which give rise to exchange, and the conditions under which it has to be effected, remain unchanged. In this equilibrium situation there is no inducement for the economic subjects to change the allocation of means of production, because there is no conceivable and possible way of using them which appears better suited to satisfy their wants.

The equations which describe the economic equilibrium give expression to this method of approach in mathematical language. They say no more and no less. They say: If an equilibrium situation is to be reached, it can only be a position such that it will no longer be possible to improve the satisfaction of wants: by making changes.

It is particularly characteristic of these equations in economics that they are necessarily inapplicable to all practical purposes and computations. The equations of mechanics may help us to foresee future events, because the physicist is able to find out approximately the empirically constant relationships between physical quantities. If we insert these constants in the equations we can work with them. We cannot with exactitude of course but nevertheless with sufficient accuracy for

²Pareto (1927, pp. 233–34) has shown that for 100 individuals and 700 goods the number of equations to be solved is 70,699.

practical purposes solve given problems. With the equations of economics it is a different matter. For within the sphere of human trading activities we do not know any constant quantitative relationships. All quantities that we are able to ascertain have therefore no general significance but only an historical one (Mises 1933, pp. 113–15, 150ff).

Thus even if we know the present conditions, we are unable to say anything of a quantitative nature, on the basis of this knowledge, about the pattern of future values. This is the big mistake that has been made by all those who have wanted to substitute “quantitative” economics for “qualitative” economics. A quantitative treatment of economic problems can only be economic history: it can never be economic theory. And there is no economic history of the future.

The equations which describe the state of economic equilibrium include consumers’ preferences. These are the preferences which will prevail at the moment when the equilibrium is established on the market. They are different from today’s preferences as we know them from the way in which they are expressed on today’s market. Today we know nothing about these future preferences and cannot predict what they will be. Thus, though we may know the present-day condition of the market and all the data determining the configuration of today’s market position, including consumers’ preferences as they are expressed in that market position, we still do not know the future preferences of consumers. We may be justified in assuming that they change. This assumption does not help however. For the economic system is not in equilibrium today, and we want to know the consumers’ preferences for the point of time when it will be in equilibrium and when, in consequence, other conditions will prevail. The progressive approach of things towards an equilibrium situation which we have in mind, and which forms the subject of our inquiry, means the progressive transformation of the conditions determining the preferences and therefore also of the preferences themselves.

The problem is not only that, in order to make use of the equations, we need to know the scale of preferences that will prevail at a future point of time and which are not known to us today. Even today’s preferences are only known to us in so far as they are reflected in the system of prices ruling on today’s market. That is to say we know roughly how great is the demand for a certain article by the price prevailing for it on the market today. But we know nothing of what the demand would be if another price prevailed. We do not even know the shape of the supply and demand curves; we only know the position of one point at which the two curves cut or, more precisely, have cut today. Experience tells us so much and no more. It can provide us with no information about the data which we require for solving our equations.

Finally there is still a third point which needs mention: The state of equilibrium which our equations describe is a purely imaginary state of equilibrium. It is merely a hypothetical, though indispensable, tool of analysis which has no counterpart in reality. Thus it is not only a future state which differs from the state of the

moment that has just passed and with which we are acquainted: It is merely an imaginary theoretical construction which will never become reality.

Hayek (1935, p. 211) has also pointed out that the possibility of using the equations describing the state of equilibrium for purposes of economic calculation presupposes a knowledge of the future scales of preferences of consumers. But here he has in mind only a complication of the practical task of applying the equations, and not a fundamental and insuperable obstacle to their use for any such process of calculation.

It makes no difference whether we conceive of the socialist state as a dictatorship of the central administration in which only the valuations of the dictator carry weight, or whether we conceive of it as a state which tries to imitate a democratic system in which the preferences of individual consumers or groups of consumers are supposed to determine the direction of economic activity. Even the dictator cannot know today what his relative preferences will be at a later date under changed circumstances: he is no more capable of knowing this than is an individual consumer.

III

The equations describe the hypothetical equilibrium position which the economic system would ultimately and finally reach if all causes liable to give rise to changes in preferences were to disappear from that system.

Economic calculation, which is essential to the economic system, does not, however, require that we should know this hypothetical situation which can certainly never be reached in the actual economic system. What is necessary for the direction of the economy is only the knowledge of the next step which is required to be taken in the economic system. It is necessary to find out which of all the conceivable changes can, in the given conditions, secure the fullest satisfaction of wants from the standpoint of the preferences of the consumers or of the dictator. For this purpose the equations which describe the final equilibrium position are quite inappropriate. They say absolutely nothing about the path which the economic system has to follow in order finally to reach the equilibrium. Some recognition of this fact is distinguishable in the criticism which is constantly brought against these equations that they are only "static" and not "dynamic."

IV

Socialists who are not amenable to reason have the habit of parrying the argumentation which sets forth the impossibility of economic calculation in the socialist state by pointing to an alleged deficiency in the economic calculation, in money terms, of the capitalist society. They will therefore not hesitate to bring the following objection against the foregoing exposition: All that the entrepreneurs in the capitalist exchange economy know are the relative valuations and prices of today. This does not however prevent them from taking their calculations and

producing on the basis of these calculations. Why should it be any different for the economic dictator of the socialist state?

This kind of question merely reveals an entire lack of understanding of the problem under discussion.

The future is always uncertain for human beings. Consequently every transaction which is carried out for a future date is speculation. In this respect there is no difference between socialism and capitalism.

It will always be happening that new facts appear, which people have not foreseen, and which cause them to say after the event that they would have acted differently if they had known beforehand what was going to ensue. People cannot take account in their economic activities of things that are unknown to them. We cannot therefore blame the method of economic calculation of the capitalist system, operating on the basis of the money prices of the market, for the fact that the expectations of the economic subjects are occasionally disappointed subsequently by the occurrence of unforeseen events. In economic calculation regard is taken of the future configuration of conditions of supply and demand only insofar as people foresee them, or think they can foresee them, in the present. It is merely the expectations of the entrepreneur about the future which influence the market situation of today and contribute towards the formation of today's prices: this applies particularly to the prices of means of production and of consumption goods which do not perish rapidly.

If we proceed to argue that, for the solution of his equations, the general manager of the socialist economic system would have to have data which are not and cannot be known to him, this does not mean to say that he will know less about the future and about future needs than does the entrepreneur in the capitalist economic system. The analysis of this problem belongs to another chapter of the treatment of the problems of the socialist economy, and has nothing to do with the question of economic calculation. We may assume for purposes of the argument that the dictator of the socialist economy knows just as much, or just as little, about the future as the capitalist entrepreneur. In any case even this dictator will desire a variety of things, and he will have to discover in which way the objects he aims at can be most effectively reached. Here "most effectively" means, of course, merely: as effectively as is possible from the standpoint of present-day knowledge. In making considerations of this kind the capitalist economy uses calculations in terms of money: it calculates on the basis of market prices, which also take account of the future insofar as it can be taken account of in the present. Now in order to solve his equations, the dictator would have to know the relative valuations which will correspond to the future equilibrium situation, i.e., to a situation which is different from the situation in the present and which can never be reached in the real world.

The monetary form of calculation operates by way of market prices in which the future also is reflected as it appears today to the parties on the market. The

socialist director-general, however, needs, if he is to solve the equations, the knowledge of a hypothetical situation which is different from the reality with which he is acquainted and is a construction of our thinking which we know, without any doubt, will never become reality. It is no help to him in setting up his equations to know the conditions that are given today and the opinions that prevail today about the shape of things in the future. He would need to know how things would look if a hypothetical state were reached in which all data had become rigid, and no further change would be set in motion, because no change could afford any further increase in welfare.

Our conclusions are thus as follows: In the capitalistic economy it is possible to make calculations on the basis of our present-day knowledge. It may be that mistakes will occasionally be made because unexpected events interfere with our plans and expectations. In the socialist state however it would not even be possible to calculate on the basis of our present knowledge. Those who think that it would be possible to apply the equations of mathematical economics for making the calculations fail to see that included among the items of which these equations are composed are unknown preference scales belonging to a situation which is unreal and can never be realized in practice. The circumstance that they are unknown frustrates all attempts to use the equations for purposes of economic calculation.

REFERENCES

- Barone, Enrico. 1908. "The Ministry of Production in the Collectivist State." Reprinted in Hayek (1935).
- Hayek, F.A. 1935. *Collectivist Economic Planning*. London: Routledge and Kegan Paul.
- Mises, Ludwig von. 1933. *Grundprobleme der Nationalökonomie*. Jena. Translated as *Epistemological Problems of Economics*. George Reisman, trans. New York: New York University Press [1976].
- Pareto, Vilfredo. 1927. *Manuel d'économie politique*. 2nd Ed. Paris.