

## Mechanistic and Organistic Analogies in Economics: The Place of Game Theory

### Some notes on H. Thoben's article

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*Kyklos* 1982 contains an interesting article by H. THOBEN on 'Mechanistic and Organistic Analogies in Economics reconsidered'. I have no important disagreement with the article as far as it goes, but in my opinion there is one dimension which is missing in the article: A discussion of game theory approaches in comparison with the analogies which are treated in the article. The purpose of the present note is to elaborate a little bit on this point. Such an extension of the range of approaches to be compared would perhaps also call for a modification of Professor THOBEN's conclusion. I think the issue is quite important and timely, since we have seen recently an increasing interest in discussions of the methodology of economics, see for instance the survey in A. W. COATS [1982] and references given there. A. W. COATS' article appears in the same issue of *Kyklos* as H. THOBEN's article, and also in A. W. COATS' survey I miss a discussion of game theory approaches. In fact, the same applies to most surveys and discussions of the methodology of economics that I have seen.

It has often been declared in recent years that there is a crisis in economic theory. I do not subscribe to this point of view, but there is no doubt that a comparison between the state of economic theory on the one hand and actual events and trends of development in economic life on the other hand poses many challenging questions and ought to stimulate critical examinations and reconsiderations. My personal view (which I shall not elaborate on in this brief note) is that the system of decision-making is the crucial issue and that traditional approaches in economic theory are not rich enough to come to grips with current problems and tendencies concerning decision-making in various economic environments. It is then important to explore what help we can get from the use of concepts and viewpoints from game theory, because game theory considers a wider range of possible decision-making situations. The classical economic viewpoint of individual rationality in the face of a given environment appears only as one special, limiting case in this broader theory. I therefore think it is a somewhat unfortunate omission if discussions of methodology in economics fail to consider game theory.

H. THOBEN considers mechanistic and organistic analogies in economics, where organistic analogies, if I understand him correctly, form a broader class which contains biological analogies as a special case. If one considers game theory as a special science

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in its own right, then one could perhaps say that game theory approaches in economics form a new class of analogies in addition to mechanistic and biological or organic analogies. However, there is a very important difference. Mechanical sciences and biology were not developed in order to contribute to social sciences, and a development of social science theories by analogies with these other sciences will have to be somewhat artificial. They are analogies or imitations which are used because one has not developed satisfactory concepts and theories on one's own ground in social sciences. Except for the earliest papers in game theory, game theory has been developed mainly (but perhaps not exclusively) in order to further the development of social sciences, including economics as perhaps the most important field of application. This is very clear already from the introductory parts of JOHN von NEUMANN's and OSKAR MORGENSTERN's book (as well as from the title '*Theory of games and economic behavior*'). Application of game theory in economics is therefore not similar to applications of analogies with mechanistic or biological sciences; game theory is constructed precisely for the purpose of being used in economic theory. Its concepts and theories are not something alien to economics, and they are not specialities applicable only to very special or peripheral problems. Instead, they are very natural concepts and theories referring to central and fundamental aspects of economic behaviour. It is perhaps somewhat unfortunate if we continue to refer to game theory as something special; instead we ought to integrate the relevant concepts and theories which originate from game theory into economics in a natural way and simply talk about theory of economic interaction (L. JOHANSEN [1981]).

The game theory point of view is essentially different from the mechanistic point of view. This was perfectly clear to VON NEUMANN and MORGENSTERN. They took great care to point out that one player's assumptions about other players' behaviour could not be described 'by statistical assumptions' because actions were purposive and each player had to understand the 'principles and the interactions of the conflicting interests of all participants'. They also point out that the kind of mathematical problems encountered in game theory 'is nowhere dealt with in classical mathematics', clearly implying that no analogy with mechanistic sciences is possible.

Game theory is usually divided into the theory of non-cooperative games and the theory of cooperative games.

In non-cooperative games, the outcome for each participant in the game is determined by actions taken by, in general, all players, but each player decides on his action in isolation. If we assume that each player is a purposive and rational player, then he cannot avoid thinking of what the other players will do when he ponders over his own decision, and this applies to all players. This combination of purposiveness, rationality, and mutual interdependence is characteristic of social interaction and very different from anything found in mechanistic sciences. (The difference is somewhat blurred in many presentations of non-cooperative game theory. In applications of the theory one usually seeks a 'non-cooperative equilibrium' where, according to many explanations given in the literature, each participant considers the actions to be taken by other players as 'given'; in my view this is a misleading description, since each player is not informed about the actions to be taken by the other players, but must consider the full situation and try to analyse somehow what the other players will do. For a detailed discussion, see L. JOHANSEN [1982].)

The theory of cooperative games adds new distinguishing features to game theory as compared with natural sciences. In addition to the elements of mutual interdependence and purposiveness it contains communication, coalition formation and agreements between players involved. (Bargaining theory can be seen as a subdivision of, or an extension of game theory. For the role of bargaining in economics, see L. JOHANSEN [1979].)

On the basis of applications of game theory to economics, it can perhaps be argued that cooperative game theory has less convincing results to show for itself than non-cooperative game theory. This may be so, but in any case cooperative game theory asks many of the relevant questions in a social context, and the fact that it is difficult to achieve strong results in terms of firm predictions, may in itself be indicative of some inherent and important differences between social sciences and natural sciences.

These brief considerations are, I think, sufficient to make the point that game theory is something entirely different from mechanistic sciences. If we compare with biology, or organismic analogies more in general, then the picture is perhaps somewhat different.

In the first place, there are now some tentative applications of game theory in biology. This suggests that there may be some relationship between social sciences and biology in addition to the earlier analogies. However, this is not an analogy in the sense of H. THOBEN's discussion. The applications of game theory in connection with biology are few and tentative, and if they lead to fruitful approaches, then the direction of influence is from game theory and social sciences to biology, not the other way around.

In the second place, like in game theory, purposiveness plays a part in the 'organistic theories' referred to by H. THOBEN (and perhaps also in biology in the more narrow sense). H. THOBEN writes that 'it is the organismic analogy that can deal best with the purposive aspect of the economic process'. This is the main reason why he prefers the organismic analogy to the mechanistic one. Furthermore, H. THOBEN refers to 'the new fields of general system theory and cybernetics' and suggests the hope that these developments 'may provide the organismic approach with the analytical tools so as to make it a workable alternative instead of the traditional method'. One might go along with this argument if drawing on analogies from other sciences were the only possibility for the development of economics. However, it seems to me that game theory offers an alternative which will serve much more directly the purpose which H. THOBEN's organismic analogy should serve. In fact, as suggested above game theory has been constructed and developed precisely to serve that purpose. Now perhaps one might argue that game theory is a branch of 'general systems theory' which H. THOBEN mentions. If so, then there is not much disagreement between us. However, it would then be simpler and more informative to refer to game theory directly, since 'general systems theory' is very vaguely defined and contains many things which are less convincing and less relevant to economics.

Let me also add a final remark referring to A. W. COATS' survey article mentioned above. On the basis of his survey of recent contributions to the discussion of the methodology of economics A. W. COATS points out that these contributions 'have led to the reopening of hitherto supposedly settled questions about the similarities and differences between the natural and the social sciences'. I think it follows from what I have suggested above that it would be a serious omission if this reopened discussion should evolve with-

out taking into consideration the approach based on game theory as an alternative essentially different from the other ones. If not before, then at least to the extent that economics absorbs concepts and ideas from game theory it can claim to possess an approach and a methodology of its own, based on essential principles of social interaction instead of analogies with natural sciences.

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