SYSTEM DYNAMICS VERSUS ECONOMETRICS--AN APPROACH FOR SYNTHESIS

Heino Apel, Werner Fassing and Werner Meissner

University of German Federal Republic

Frankfurt/Main

Repeating the well-known statement system dynamics--in short SD--has been characterized as a unique tool for analyzing data-deficient social systems. Whether SD in fact amounts to greater realism in modelling social systems has, however, been questioned. To the econometrician the typical SD approach in tackling problems of social research must seem suspect, too, less emphasis being placed on empirical validity of SD models. Instead validity is the central theme in econometric research. Differences between econometrics and SD are, at first, fundamentally methodological. They are also due, however, to basically different scopes in modelling social processes.

Aims for modelling in social science

There has always been a double intention for applying quantitative methods in social research: Analysis and Control. SD like other methods of systems analysis and systems engineering is strictly application-oriented. More precisely, it aims at controlling social processes, regardless of whether the problem area is that of military logistics, management decisions or the stabilization of global ecological processes. Econometrics, on the other hand, is primarily directed towards analysis, at least according to the original program pronounced by the econometric society. To be sure, econometric research is application oriented, too, namely as an aid in forecasting economic developments but also as an instrument in policy planning. Nonetheless econometrics has stayed on a firm methodological basis, aiming at strictly empirical investigations [8].
In contrast, SD is rather loosely concerned about the question of how close the correspondence between a model and the system, of which it is a model, should be. According to Forrester's position an exact description of system structures and the ability to forecast precisely future states of a system is not what a model is called for. The primary purpose of modelling is, instead, to improve decision making. A model serves its purpose when it actually gives raise to better decisions, the case for better or worse being judged on some simple performance criteria. Critical objections are twofold: At least within the realm of political decision making it seems hardly appropriate that planning processes may be based on rather uncertain information as supplied by typical SD models.

Forrester's arguments in favour of SD modelling are not convincing in this respect. That simulation experiments may broaden our understanding of complex systems is true, but only in a limited sense. When prior information is scarce and empirical evidence is largely missing, the output of a computer run is uncertain too [5].

No doubt situations do exist where social science research has to cope with highly deficient informations so that modelling techniques like econometrics cannot be applied. It is in such areas of research that SD comes to its core. But there are also situations where a higher level of aspiration for model building is justified. Up to now econometrics has contributed more to our understanding of the economic system than any other research strategies. Forrester's view that social science research in general is hampered by a lack of appropriate a priori information and adequate empirical data seems hardly understandable. We shall further comment on that point below.

A second objection against Forrester's position, though not independent of the first, is with regard to his pragmatic understanding of the political decision process itself. His repellence against optimization approaches is quite sound. But within SD the problem of political decision making is completely reduced to a technical matter. No concern is given to the question of who determines goals and targets and whether they are in accordance with societal wants. "Father knows best" seems to be an apt description of Forrester's attitude toward planning. Another more technical point is that actual problems of measuring political achievements are much stronger than Forrester claims. Performance criteria are seldom, if ever, of a simple kind. Suffice it to bring to mind the discussion about social indicators, measuring welfare achievements. However we shall not pursue that point any further.