EXOGENOUS FACTORS IN ECONOMIC THEORY

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Economists have frequently treated technological change as exogenous, as having important economic consequences but not being controlled by economic forces. This justifies reporting a current attempt to develop an international, interdisciplinary discussion of exogenous factors in economics.

Keywords: exogenous factors, economic theory, interdisciplinary research, technological change

INTRODUCTION

The treatment of exogenous factors in economic theory has special relevance to the objectives of *Prometheus*. For example, there is the changing extent to which technological change is treated as exogenous. Some ten years ago Rosenberg reported that economists had become more confident of their ability to deal with technological events in economic terms: "Whereas technological change was once regarded as an exogenous phenomenon moving along without any direct influence by economic forces, it is now coming to be regarded as something which can be entirely explained by economic forces".[1]

There are, of course, doubts about the accuracy of this economics success story: doubts that would be shared by Rosenberg,[2] who has consistently stressed both the importance of technological change in economic growth and the need to move beyond the narrow boundaries of traditional economics to achieve deeper understanding of the process of technological change. Those doubts are reflected too in significant efforts to develop an evolutionary theory of economic change,[3] and in renewed emphasis upon organisational and institutional aspects of technology.[4] Those doubts are also linked with vital questions about social futures. For example, Kasson concluded that not only had American technological development and republican values profoundly shaped one another, but from their interaction emerged "the difficulty — ultimately leading to failure — of achieving a technological society consonant with republican ideals".[5]

These are big questions and it therefore seemed worthwhile reporting a current attempt to develop an international, interdisciplinary discussion of exogenous factors in economics. The

progress report and the exposition of the method of successive dissection that follows are drawn from IDEA *Newsletter*[6] with the permission of Ulf Himmelstrand in order to bring the project to the notice of a wider audience. It is to be hoped this will, first, lead some readers to send their comments to Himmelstrand[7] and, secondly, stimulate some discussion within Australia.

THE IDEA PROJECT

IDEA is the acronym for 'interdisciplinary dimensions of economic analysis'. The project grew out of a decision in 1982 by the International Social Science Council (ISSC) to start an interdisciplinary discussion on economics. The time had come, it was felt, for a serious attempt to create a breakthrough in this area. Ulf Himmelstrand, Vice-President of ISSC and Professor of Sociology at Uppsala University, launched the project in his capacity as Chairman of the ISSC Programme Committee. Himmelstrand and the other members of the ISSC Executive Committee felt that a project of this type could succeed only on two conditions. First, the work had to grow out of a truly collaborative effort between economists and representatives from the other social sciences. And secondly, certain guidelines for the debate had to be established to make contributions truly comparable.

A good focus for the project, it was thought, would be the notion of 'exogenous factors' in economic theory. It was decided at a workshop in Paris at the Maison des Sciences de l'Homme in March 1982 to invite prominent economists to discuss the role of exogenous factors in different schools of economic theory. Social scientists who were not economists would then be asked to comment on these papers, and in this way an interdisciplinary discussion would get started. A few well-chosen case studies would round off the project. Himmelstrand, who felt the need to formalise and to focus the discussion, developed the method of 'successive dissection' for this purpose. This method was adopted as a useful framework for the whole project. All the participants are thus expected to relate their ideas to a more formalised scheme of how exogenous factors can be 'plugged into' economic analysis.

The IDEA project is funded from two sources, ISSC and the Bank of Sweden Tercentenary Foundation. That the latter institution could be brought into the picture was a happy coincidence, due to the fact that Himmelstrand over some years had been planning a larger research project which encompassed the IDEA project, and for which support was received from the Swedish foundation.

The status of the project as of December 1983 was the following. Most of the scholars who will be discussing the role of exogenous

factors in economic theory have been located and have agreed to participate. These are: monetarism — Alan Walters (American Enterprise Institute, USA); neo-marxian thought — Samuel Bowles (University of Massachusetts, USA); institutionalism — Gregory Hayden (University of Nebraska, Lincoln, USA); neo-classical economics — Keith Hartley (York University, England); marxian economics — Ernest Mandel (Vrije Universiteit, Brussels, Belgium); and classical economics — Samuel Hollander (University of Toronto, Canada). In addition a special case study of a high technology project will be authored by Michael Intriligator (University of California, Los Angeles, USA). Background research on earlier contributions to the topic from economists and from representatives of the other social sciences has been carried out. A small supporting committee, consisting of prominent Swedish economists, such as Goran Ohlin of the Brandt Commission and Ragnar Bentzel of the Nobel Prize Committee, has been established. Work has started to plan a two-day symposium in Paris in the fall of 1984 on the basis of papers submitted to the project.

THE METHOD OF SUCCESSIVE DISSECTION

The economy is not a closed system. In order to find out what kind of inputs other disciplines than economics can contribute to economics as a discipline, and what kind of outputs of economics can be made useful in non-economic disciplines, let us first try to locate the openings of the economy seen as a system. The simplest, or at least the most manageable, way in which we can conceive a system is to represent it as a system of equations. Economic 'laws' are frequently formulated in the form of equations. Such equations can take many forms — for instance as differential equations at various levels, equations including stochastic processes or ordinary functional equations. It turns out that already a close look at a functional equation can help us to identify at least the main types of links between economic and non-economic disciplines, in very abstract terms, of course:

$$y = a + b \cdot x \qquad (1)$$

Conditions and processes covered by non-economic disciplines can be seen as plug-ins and spill-overs and mediated feed-backs in relationship to the ordinary functional equations of economics, such as equation (1). These relationships have been represented on this page in the form of numbered arrows which indicate two types of plug-ins (I and II), spill-overs (III), and two types of feed-backs mediated through non-economic processes (IV and V). In addition, we have indicated the existence of more profound exogenous structural impacts (VI):

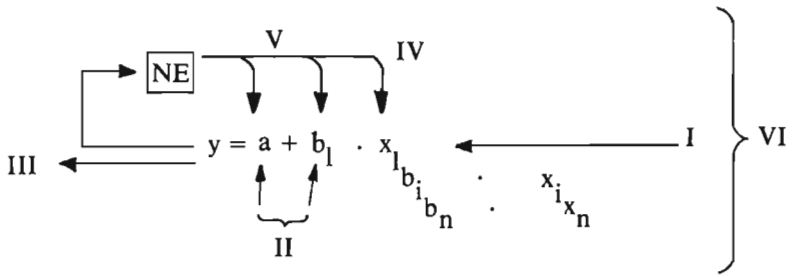

FIGURE 1

In our case the method of successive dissection implies that specialists from various schools of economic thought first of all specify the theoretically most important assertions of each school, in equation form, adding perhaps also those equations which have proved to be most practically relevant. Thereafter comes the identification of those kinds of exogenous non-economic factors which may influence the independent variables or parameters of these equations, or which may become involved on the side of dependent variables, with or without feed-backs to the economic independent variables involved. This kind of dissection will reveal the main types of exogenous plug-ins, spill-overs and feed-backs only. The contributing economic specialists cannot be expected also to be specialists in the non-economic disciplines which deal with the exogenous factors involved. Therefore, non-economic specialists must succeed where our economic specialists leave off.

The parts of Figure 1 will now be explained in more detail:

I. Social processes, psychological processes, political decisions, geographical openings or constraints, legal rules, etc. may influence the magnitude or possible range of independent variables, and in that sense plug into the economic system. Since these processes and conditions are exogenous, let us call this type of relationship between economic and non-economic disciplines exogenous independent variable plug-in. From the example mentioned above, it is obvious that these plug-ins may originate from several different disciplines: sociology, psychology, political science, geography and law, for instance.

II. Similarly, various conditions and processes specified and explained in non-economic disciplines may plug into economic systems by influencing the magnitude and sign of parameters in equations of type (I). Parameters are usually seen as constants, but over time, and as results or precursors of changes in the overall system, parameters and not only variables may change.

The kind of relationship between economic and non-economic disciplines envisaged in this case could be called exogenous parameter plug-in. Price elasticities, for instance, may change as a result of changes in the socio-cultural definition of relevant commodities.

III. On the side of dependent variables in economic equations we may discern more or less direct or indirect psychological, social, political or legal, and even geographic or environmental effects of economic changes. If there is no feed-back on the economy we simply speak of spill-overs. So-called 'externalities' may be considered to be spill-overs, as long as they do not entail any financial costs or do not furnish inputs without costs to the economy in a strict financial sense.

IV. Feed-backs are quite common in economic systems. Many of them — so-called multiplying effects, forward and backward linkages, and certain processes of growth, including the growth of oligopolistic and monopolistic structures — can be accounted for purely in terms of economic variables. Other feed-back loops are mediated through non-economic processes (NE) which can be accounted for only within other disciplines than economics. Here we will consider only those NE-mediated feed-backs. However, purely economic feed-backs may also become interesting in the present context if the parameters which characterise such feed-back processes are affected by non-economic processes or conditions. But the focus will then be on parameter plug-ins. As indicated in Figure 1, there are several types of feed-backs. Type IV is a feed-back affecting the 'independent' variable input. In contrast to type I — exogenous variable plug-in — we are here dealing with endogenous variable input, or more precisely, with NE-mediated variable feed-back. Feed-backs are by definition endogenous.

V. It is also conceivable that NE-mediated feed-backs affect the parameters of our equation(s). For this the label NE-mediated parameter feed-back is suggested.

VI. Wherever a dependent variable is affected by a number of independent variables, it may be necessary to introduce a clause of *ceteris paribus* when studying the effects of one particular independent variable. However, even though such a clause is easy to apply in numerical experiments or in laboratory experimentation, it may be quite difficult to apply in a real-life situation.

As a result of the given social structure and other non-economic conditions, certain combinations of economic variables may be virtually ruled out in reality. The given social structure may similarly

force certain combinations of economic variables to occur as more or less permanent fixtures, whereas such combinations in idealised models of rational economic behaviour would occur only as transient disturbances of equilibrium. Market imperfections in market economies, or administrative imperfections in planned economies, may be attributable to such exogenous structural impacts. Structural contradictions, such as those described by marxist analysts, could quite possibly be subsumed under the same label.

As Hernes, a Norwegian sociologist, has shown, it is possible to characterise social structures and various types of structural change or constancy by looking at profiles of changes or constancy in those equations, several parameters, and variables which characterise a given system. For instance, if all the equations (processes) needed to describe a system, and the parameters of these equations remain unchanged over time, whereas the output (the dependent variables) exhibits incremental change, then we can speak of an extended reproduction of the social system thus described. If the parameters change as well, then the system is involved in a transformation.[8] We hope to make use of this typology of structural change and impact as a method of assessing some of the structural qualities and attributes of societal wholes which must be brought into the picture in the last stage (VI) of our exercise in successive dissections.

NOTES AND REFERENCES

1. Nathan Rosenberg, 'Science, invention, and economic growth', *Economic Journal,* 84, 333, 1974, reprinted in N. Rosenberg, *Perspectives on Technology,* Cambridge University Press, Cambridge, 1976, p. 262.
2. See Nathan Rosenberg, *Inside the Black Box,* Cambridge University Press, Cambridge, 1982.
3. E.g., R.R. Nelson and S.G. Winter, *An Evolutionary Theory of Economic Change,* Belknap Press of Harvard University Press, Cambridge, Mass., 1982.
4. As reflected in the contributions to S. Macdonald, D. McL. Lamberton and T.D. Mandeville (eds), *The Trouble with Technology,* Frances Pinter and St. Martin's Press, London and New York, 1983.
5. John F. Kasson, *Civilizing the Machine — Technology and Republican Values in America, 1776-1900,* Penguin, Harmondsworth, 1977, p. ix.
6. IDEA *Newsletter,* 1, December 1983. A similar presentation was made at the 7th World Congress of Economics, Madrid, 1983.
7. Box 513, S-751 20, Uppsala, Sweden.
8. Gudmund Hernes, 'Structural change in social processes', *American Journal of Sociology,* 82, 1976, pp. 513-47.