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A Model Of An Export-Propelled Economy: Comment

By

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I shall confine my discussion firstly to some general remarks about models as both of the papers by Best and Hein make explicit use of them, and then I shall centre on a brief critique of Mr. Hein's paper.

I

Before I can say intelligently what I have to say about Hein's paper, and in so far as Best's paper concerns a mathematical model this would apply to that paper as well, I must outline briefly some clarifying remarks on the methodology of model-making.

Mathematical model-building has become in recent years one of the main activities of economic and other analysts of society. Unfortunately, no clear conception as to the methodology of models has emerged in this period and this has caused great confusion in the minds of many social scientists, including both the mathematically naive and the mathematically sophisticated. There is, on the one extreme, the simplistic view that every equation has the pomposity of unqualified and absolute truth. On the other extreme, we have the simplistic view that all mathematics is a tautology, that it tells us nothing we did not know before or could not find out by using other methods. These extreme views enclose between them various degrees of clarity and confusion which I hope will emerge as I proceed.

Economic and social analysis is concerned with the study of the consequences of human motivation, its conflicts and its methods of resolution. All of economic theory, as it now stands, is concerned with certain axiomatic rules about the goals of human beings — the consumer is assumed to want to maximize something called utility, the producer is assumed to want to maximize something called profit. With these axioms, certain theorems are then derived as to what is rational behaviour for the individual under certain postulated restrictions such as a budget for the consumer, and the resource or factor endowment for the producer. But how does this theory help us in our understanding of the real world in general, and the various regions which may interest us in particular?

First of all, if one is attempting to predict what human beings will actually do, one of the last things one will do is to apply the theorems of economic theory¹. All the cases are special cases. (We should not have needed to be told this, and especially as late as 1962). To predict, then, what human beings

¹Dudley Seers, "The Limitations of the Special Case", *Bulletin of the Oxford University Institute of Economics and Statistics*, May, 1962.

will actually do, and it is very easy to do so, despite the myth to the contrary, one of the first things one would do is to look at what they did in the past. What they have done in the past, it has been found, they are highly likely to do in the future. We, of course, do not need to know why they did what they did, or why they will do what they will do, in order to make this prediction. The use of mathematics in this kind of exercise is familiar to us.

On the other hand, if one is attempting to prescribe (as a social scientist)² what *should be done* by individuals or groups of individuals, then it would be a necessary, though not sufficient condition, that one knows why individuals actually do what they do. Axiomatic postulates about human behaviour only gets us as far as conditional statements rather than moral imperatives — e.g. “if consumers want to maximize utility, then they should do so and so”. The use of mathematics in the derivation of what should be done, i.e. theorems which follow from the behaviour postulates, are also more or less familiar to us.

But when one is attempting a mixture of these and more, as Hein and Best have done, one has to watch very carefully one's p's and q's, x's and y's.

Hein and Best are trying to build models of what they respectively call “export-propelled” economy and “pure plantation” economy. The former relies on the intuitive background of the Mauritian economy for his one-to-one correspondence to the reality. The latter spends most of his paper trying to develop *our* intuition about *his* “pure plantation”, and quite correctly too, as no attempt is made anywhere in the paper (briefly read and once only) to set up any such correspondence.

A model of this general nature would contain five main ingredients:

- (1) axioms or postulates about the motivation of certain sub-groups within the economy, usually in the form of equations;
- (2) resource and other constraints on behaviour;
- (3) consistency conditions which further circumscribe behaviour, usually in the form of identities;
- (4) assumptions as to the production techniques available to the economy;
- (5) conclusions as to what would or should happen given rational behaviour on the part of the decision-makers in the economy, usually given in the form of theorems.

There is always a clear distinction between an assumption and a conclusion which follows from the assumption. There is always a clear distinction as to what behaviour patterns are determined by the workings of the model (endogenously determined variables) and those which the model takes as given (exogenously determined variables). There is always a clear distinction between testable hypotheses on which the model is validated or falsified, and assertions which are taken as given for the purposes of the analysis. Very few of these basic methodological conditions have been fulfilled by Best and Hein.

²One can attempt to prescribe as an ordinary citizen, as a member of a government etc. The rules here would be different.

A model which reflects the total reality is not a model but the reality itself. As such, therefore, simplifying assumptions are made which, in theory, detract minimally from the reality while making the model workable. When one is building a model of a whole economy as opposed to a group of individuals drawn from it, e.g. slaves, exporters, the simplifying assumptions sometimes come to dominate the reality.

II

This is how I have reacted to Mr. Hein's model, on which I shall concentrate my remarks for the remainder of my discussion. Two (and latterly three) sectors are used to describe, predict and prescribe the workings of the Mauritian economy. In fact, if one examines the model carefully, it is simply a two-sector (and latterly three) matrix multiplier with exports as the exogenously determined variable. As such, there is nothing "special", in the Seersian sense, about the model. As in the general case,³ the sectors react mechanistically and in fact linearly to an increase in exports. None of the usual parameters of the Keynesian system such as the marginal propensity to save and invest is present since the model does not recognize savings or investment. Growth is generated purely by exports and the parameters relating to trade.

These idiosyncracies of the model, designed as they were to reflect the idiosyncracies of the reality of the "export-propelled" economy, are almost identical with those of Seers' "open-petroleum" economy. The only new introduction is a productivity parameter, an aspect of the Seers' model dealt with at length by Brewster.⁴ The rest of my remarks apply then equally to Seers' model as to Hein's.

Neither of these models introduces new theoretical features. Both are essentially matrix multiplier models with zeros in certain places. I have cast the social accounting of the Seers' model into the more familiar matrix form below, and the structure of zeros is clearly demonstrated. Notice the zeros all down the investment column. With this lack of investment, growth can only be generated by the current account transactions. This is essentially the structure of the Hein model.

But a set of social accounts does not constitute a hypothesis about how an economy grows. The social accounts matrix is a form of double entry book-keeping of inter-sectoral transactions and does not by itself constitute a hypothesis about the way an economy works. Leontief, by introducing the idea that something called "final demand" drives the economy by means of a set of inter-industry technological coefficients, mobilizes the social accounts matrix in a hypothesis-testing situation. But this is not the only hypothesis that can be formulated around a set of inter-sectoral accounts.

³The literature on the multiplier as matrix is well known.

⁴"Exports, Employment and Wages: Trinidad-Tobago and Mr. Seers' Model of the Open Petroleum Economy" *C.S.O. Research Papers*, Trinidad and Tobago, April, 1968, cited by Hein in his footnote 4.

HEIN'S MODEL: SOCIAL ACCOUNTS

| Producing Sector Purchasing Sector | Business | Govt. | Exports | H'holds | Gross Investment | Total Receipts |
|---------------------------------------|---------------------|--------------|---------|----------------------------------|------------------|----------------|
| Business | — | — | X | $\Pi_D + L_X + L_D + (1-m_2)TGE$ | — | — |
| Government | $aX + c\Pi_X + bM$ | — | B | — | — | — |
| Imports | M | m_2TGE | — | — | — | — |
| Households | $\Pi_D + L_D + L_X$ | $(1-m_2)TGE$ | — | — | — | — |
| Total Payments | | | | | | |

SEERS' MODEL: SOCIAL ACCOUNTS

| Producing Sector Purchasing Sector | Business | Govt. | Exports | H'holds | Gross Investment | Total Receipts |
|---------------------------------------|-------------------|-------|---------|-------------------|------------------|----------------|
| Business | — | — | X | $L_G + L_X + L_D$ | — | — |
| Government | T_X | — | — | — | — | — |
| Imports | $M + P_X$ | — | — | — | — | — |
| Households | $P_D + L_D + L_X$ | L_G | — | — | — | — |
| Total Payments | | | | | | |

What both Seers and Hein have done is to assert that exports alone (i.e. no investment therefore no capital accumulation) drives the economy forward. Without the empirical data (i.e. the numbers) it remains but an assertion in so far as the model assumes that growth is generated in this certain way. If this latter is a self-evident truth, then the whole point of the model is lost, as one does not need a model to discover self-evident truths. On the other hand, if it is not, then the hypothesis must be tested.

But because of the model's simplicity and its relative lack of essentially new concepts it may not be worth the while. On the theoretical side, it is simple in so far as the theorems of the multiplier as matrix have been developed in the '50s by Chipman, Goodwin, Debreu and Herstein. On the empirical side, it is simple in so far as it mobilizes far fewer sectors than are usually handled by modern computing equipment. Hugh O'Neale has already modified input-output models of the Caribbean economies to mobilize this "export-driven assertion" using variously five to twenty sectors, by pushing households and government out of the final demand sector, leaving exports only there (investment is zero).⁵

But the ultimate test of a hypothesis about growth is whether it can explain a time series of the actual pattern of growth, i.e. income, employment, wages. We have yet to see this from most model builders.

⁵See, for example, Hugh O'Neale, "An Evaluation of the Significance of the Commonwealth Preferential System for the Economies of the Commonwealth Caribbean", unpublished M.Sc. thesis, McGill University, April 1966.