

INPUT/OUTPUT ANALYSIS—AN APPRAISAL IN THE CONTEXT OF AS YET AN UNFINISHED EXPERIMENT IN KENYA

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The paper discusses the relevance of input/output tables as a tool for economic analysis and planning in developing countries. It contends that this is so only to the extent that the input/output tables enable consistency of production accounts to be verified while providing a suitable basis for macro projections at the same time. As a by-product, such input/output tables, the paper adds, also provide a convenient framework for estimating the needs for extensions and improvements in basic statistics.

All these requirements, it is stated, can be fulfilled by a relatively aggregated format of an input/output table—which some of the developing countries are in a position to compile. However, the paper states, it is feared that the case for input/output analysis is not based on these requirements. The main force of arguments is in fact based on the uses of input/output tables for more detailed sectoral analysis and projections. The current state of basic statistics on some key sectors, it is stated, is not sufficiently sound to yield an end-product which is reliable. In the case of sectors where this is so the input/output analysis is not relevant either because of concentration of production in a relatively few establishments or because of limited amount of inter-sectoral interaction. It is further felt that if such arguments were to be accepted by developing countries the result would be a distorted disposition of statistical resources. Immediate needs of the developing countries require concentration of effort in development of more reliable and relevant series on basic statistics.

This paper attempts to appraise some of the highlights of the experience so far gained in attempting an input/output analysis of production in Kenya. The title of this paper makes it clear that the experience is derived from as yet an unfinished experiment. The exercise currently underway on establishing an input/output matrix has not yet taken a finally agreed shape. Input/output matrices are currently coming increasingly into vogue and are beginning to be considered more and more as an essential tool for economic analysis. If it is felt that the initial impressions being put forward now stand to be amended, after the exercise has been accomplished and its results digested, this shall be done and put on record. The problem is of special importance to the developing countries like Kenya, which are faced with acute shortage of skilled and experienced personnel who can undertake such intricate exercises. These personnel have other demands on their time and as such it does become a matter of priority as to what importance should be placed on the need for an input/output analysis. This paper, therefore, makes no pretension at making an academic contribution as such in the field of input/output analysis. It instead merely attempts to present impressions derived from a working experience in a field where cost-benefit analysis of such an exercise is essential in view of the limited resources which are available to undertake such an exercise.

In a recent questionnaire the United Nations Economic Commission for Africa detailed the following possible uses of input/output tables:

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- (a) as a framework for estimating the needs for extensions and improvements in basic statistics for integrating and checking the whole internal statistical system,
- (b) for checking the consistency of National Accounts estimates,
- (c) as a basis for short-term preliminary National Accounts estimates,
- (d) for supplying weights for index numbers of price, volume of production, consumption, etc.
- (e) for analysis of the internal structure of the economy, e.g. estimation of direct and indirect requirements for production in the various industries, labour, capital, etc., associated with specific sectors in final demand, e.g., private consumption,
- (f) for analysis of cost and price relationships,
- (g) for analysis of foreign trade,
- (h) for building general and partial models of the economy,
- (i) for economic forecasting and planning.

This is by no means a fully comprehensive list of all the possible uses to which input/output analysis can be put. However, within the context of developing countries like Kenya, it is more or less adequately representative. The uses are broadly speaking of two categories: those that help macro analysis and those that come in handy for sectoral analysis. Both these types of analysis form a part of the necessary information required to undertake economic planning, and to that effect the planning requirements from input/output analysis are also taken into account.

As far as the uses of input/output tables for macro analysis are concerned these would be essentially for checking the consistency of national accounts estimates as well as providing the basis for macro projections in the context of economic planning requirements using partial or general models for the economy. There can be no denying that within this context input/output analysis has a very relevant function to perform. It is of central importance in enabling the basic aggregates to be verified. Without this the basic National Accounts estimates can yield misleading results when used for macro projections to establish the parameters within which more detailed sector planning is undertaken. Such uses for input/output tables require basically a simple and compact matrix worked sectorally to a level of disaggregation between the one and two digit International Standard Industrial Classification. In developing countries with a statistical background like Kenya, statistical development has reached a stage where such an input/output matrix can be put together as a by-product of the major statistical series being currently compiled. These series relate to production accounts within the revised United Nations System of National Accounts. These production accounts are quite rightly given the priority they deserve as basic statistical information considered vital for economic analysis and economic planning. The pressing problem is not so much one of the distribution of resources but more fundamentally one of scarcity of resources. In any case any policy decision on the former must await a quantified evaluation of the latter. The countries in question have their priorities right on this score and have in

the past decade or so undertaken statistical development which has led to compilation of production accounts—which are by and large stable and consistent. These accounts are based on internationally agreed conventions and can be disaggregated sectorwise quite broadly to a level of a combination of one and two digit International Standard Industrial Classification. Output, input and value added are the main aggregates to which these production accounts work. Both direct and indirect sources of information are used to collect the basic data. Direct sources would consist of straight-forward production surveys which are in most cases limited in scope and time series, while indirect sources of information are the import, export and income tax statistics—to name just a few. By and large a broadly aggregated version of input/output matrices can be put together from the basic data collected from these sources of information. These would adequately verify the consistency of production accounts and also highlight the gaps in statistical coverage of production. Furthermore, they would provide a reliable basis for macro projections.

However, the most pressing demands for input/output tables do not come from this quarter. These demands are essentially for input/output tables compiled at a far more disaggregated level. As a minimum these demands expect an input/output analysis sectorally disaggregated to the three-digit and in some instances even four-digit level of the International Standard Industrial Classification. Such requirements put an entirely different dimension on statistical development in countries which are on the one hand considerably handicapped by shortage of skilled personnel and on the other faced with data requirements which could be given a higher priority rating than a detailed input/output analysis.

The most significant proportion of the production matrix in a detailed and disaggregated input/output table is accounted for by sub-groups on agricultural and industrial production. Almost a third of the total output is contributed by agriculture alone and the two sectors put together would account for as much as 50 percent of total production. It is, therefore, but natural for these two sectors of production to be predominant in a detailed input/output matrix.

As far as agriculture is concerned it is doubtful in the first place whether all the countries in question have in fact satisfactorily managed to compute reasonably accurately the magnitude of agricultural production. These countries have a large proportion of agricultural production consumed directly by the producers with a minimal amount of monetary exchange. One sure way to estimate such production is to conduct household budgetary and production surveys in rural areas which are sustained by such production. Not many countries have resources to do this and instead alternative means are widely adopted to make such estimates of production. Sometimes these are based on consumption coefficients related to caloric requirements derived from surveys conducted in countries with similar background. In other instances use is made of production yield coefficients derived from the country itself or from another country with a comparable ecology, and these are then applied to estimates of acreage under particular crop usages. Both these methods in many cases make use of data which is mostly out of date and which does not reflect rising living standards or technological changes. They assume subsistence standards for

consumption and static levels of yields accompanied by a presumption of continuing additions of land areas to sustain rising population and subsistence levels of living. These assumptions are not right and changes in consumption and production standards could have a significant effect over a time-span like a decade. In some countries such production could account for as much as 50 percent of total agricultural output which either goes through limited monetary exchange or in many cases the only transaction that it may give rise to is of a barter nature. In any case the spatial transposition of the goods in question is confined to the immediate vicinity of the area of production. In circumstances such as this it is therefore rather presumptuous to incorporate any estimates of this type of production into a detailed input/output matrix when one isn't even sure of their order of magnitude.

This becomes a complex problem for the statistician because such production is increasingly taking place in areas which practice a mixed form of agriculture, essentially of a peasant farming nature, which consists of both cash and non-cash production. A significant proportion of the non-cash production none-the-less does consume fair proportions of monetary inputs in the form of for example hybrid seeds and fertilizer. A good example of this is the introduction of hybrid maize in Kenya. Any meaningful disaggregation of agricultural production in an input/output matrix has in this context to be based on a crop production breakdown. Unfortunately there is not yet available the necessary basic data on inputs and outputs which would enable this to be done in a reasonably accurate manner at the disaggregated level of individual crops and commodities of production.

Included in this set of countries which are faced with such problems are those which in addition to peasant agriculture undertaking cash and non-cash production also have a significant part of agricultural production based on a completely modern technology. This would consist of the so called large farm sector of agriculture. A detailed input/output analysis of agricultural production to be of any use should reflect this difference in technologies since the input/output coefficients for the two could vary to an extent which would be misleading if not taken into account.

While in agriculture the problem is one of lack of sufficiently detailed basic data the problem in industrial production is of "relevance". It is true most of the industrial production in countries like Kenya takes place in the modern sector of the economy and in attempting its input/output analysis the problem of differing technologies does not have to be given the same prominence as in the case of agricultural production. However, a large proportion of industrial production in these countries takes place in relatively few establishments. In Kenya, for instance, 80 per cent of total manufacturing production is undertaken by 240 enterprises each employing more than 50 people. It is this particular feature of industrial production which brings up the question of relevance of input/output analysis at a detailed sectoral level for such production. Besides, benefits that may accrue from such an exercise in terms of cost incurred in having to account for the remaining 20 percent of industrial production, in the detail required, are disproportionately small. In the context of countries like Kenya it is therefore questionable whether a detailed input/output analysis does facilitate sectoral analysis any further beyond what can be achieved by using

directly the information that is already available—having been obtained from surveys of industrial production covering for instance the larger enterprises in conjunction with the information derived from censuses of industrial production conducted in benchmark years only. In addition, industrial production does not go through a significant amount of intra-sectoral exchange. Consequently an input/output matrix while convenient to have is not of an overriding importance in undertaking intra-sectoral analysis. Lastly, another feature in these countries which undermines the usefulness of input/output analysis in reference to industrial production is the fact that this analysis is essentially static in character. As such the input/output coefficients derived from such analysis will not take into account the changes in such coefficients which do take place in such countries very frequently and are the result at times of single new enterprises coming into operation in particular sectors of production. In such cases input/output matrices which could take anything from two to three years to be put together could be obsolete even before they have been made ready for “board room” consumption.

All in all the experience would seem to suggest that while more broadly aggregated input/output matrices can be put together and are of specific use to countries handicapped by limited manpower and material resources, the more ambitious versions of input/output analysis are not vitally necessary for purposes of detailed sectoral analysis—for which they are essentially demanded. This, however, is not to deny that if an input/output matrix were to be put together it would have additional uses such as providing a framework for estimating the need for extensions and improvements in basic statistics for integrating and checking the whole internal statistical system. The extent to which such a contribution could prove useful would depend on the precision with which input/output analysis is undertaken. However, this is an incidental use and the decision to undertake a detailed input/output analysis cannot be justified on this consideration alone from a cost-benefit point of view.

Input/output tables have been listed in the beginning of this paper as being useful in the analysis of foreign trade. This is indeed quite so. Going back once again to the problem of basic data, it assumes the availability of reliable foreign trade statistics. A number of countries like Kenya have given special priority to compiling reliable trade statistics. However, in the cases of some of these countries, the problems posed by open land frontiers have not as yet been overcome. In fact, in some cases, even before the statisticians have overcome this problem, they are being overtaken by the creation of economic and trading unions which pose still more problems of a special nature from a statistical point of view. These problems have to be given higher priority ratings due to their obvious implications of a more immediate nature on policy matters. Be that as it may, given the availability of foreign trade statistics, input/output analysis of foreign trade can be undertaken as a special *ad hoc* exercise without having to fit it into an overall production matrix. Such an analysis would cater adequately for analysis of foreign trade and its policy implications. Provided the trade statistics are compiled on basis of the Standard International Trade Classification, the input/output analysis of foreign trade can be undertaken quite conveniently at an extensively detailed sectoral level.

It has been contended in this paper that in reference to countries like Kenya, detailed input/output analysis is in the main, in view of the quality of basic data available, not an essential requirement, as a link between effective macro and sectoral analysis. Secondly, in time, adequate data can be generated and by then of course it is expected that complexities of the economic structure may also warrant input/output matrices as a tool to appraise both intra and inter sectoral relationships. These it is expected may then have also become more interdependent and complex than is the case at the moment.

For the time being other "basic" data requirements for more pressing purposes of evaluation of economic and social policies of governments such as statistical support for appraisal of rural development programmes and assessment of unemployment problems, to name just a few, must take priority. In the meantime planning has of course got to continue and such analytical problems as may more conveniently be solved by detailed input/output matrices should be alternatively resolved from other available or more readily available sources of information.

The pressing problems are perhaps less subject to quantitative techniques and consequently of lower theoretical interest. Essentially their solution requires an approach oriented to problem solving as against an approach primarily oriented towards the discipline of the professionals concerned. Gustav Papanek's experience noted in his paper on "The Economist and Change in the Less Developed World" is rather pertinent. He states that when the Harvard Advisory Group first began work in Pakistan, there was strong sentiment to concentrate on the preparation of an input/output table, then one of the most modern techniques, as a basis for a planning model. The few foreigners in the group who were policy-oriented economists, he states, made one major contribution. This was convincing their more modern academic colleagues, and especially the inexperienced, that the more sophisticated techniques were then inappropriate. He states that everyone involved learned from experience how techniques, approaches and policies developed for the Marshall Plan and for the developed countries needed to be modified to be useful in the context in which the group was placed. Initially, however, he states the clinching argument against the input/output analysis had to come from the father of this technique, Leontief, who himself argued against its use under the circumstances!