

Leontief input-output model in the real world

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Introduction

Wassily Leontief's name is associated with a particular type of quantitative economics: input-output analysis (The New School, Profile of Wassily Leontief). The application of the dynamic input-output analysis serves as a guide in reviewing Leontief's contributions in two of the most important aspects of economic development and structural change: the raising of standards of living and the effects of the mechanization of production processes on labor. The purpose of this work is to familiarize the reader with the theoretical framework, construction and use of regional input-output models in the real world.

The description of the analytical framework of an input-output model includes a discussion of the components of the model, an analytic measures derived from the model, and the assumptions of the model. The work presents the phases of model planning, construction and use, including some of the inherent limitations and problems. Finally, some suggestions for effective use of the model will be provided.

Leontief went to Harvard in 1937, where, with the help of a few graduate student assistants, he completed the construction of the first input/output model for the 1939 U. S. economy, which, despite its primitive nature, proved to be an important planning tool during World War II. For example, it showed that President Roosevelt's rash promise to deliver 50,000 planes to the Allied forces was unrealistic, and the model indicated the bottleneck obstacles that must be first overcome.

The Leontief input-output systems takes the form $(I - A)X = F$ where F is the vector of final demand by sector, I is an identity matrix, A is the matrix of technical coefficients, and X is the vector of gross output by sector. The main purpose of the input-output model is to explain the magnitudes of the interindustry flows in terms of the levels of production in each sector. The Leontief input-output model also makes several special assumptions which are not necessarily made in other interindustry models. The most important of these are (1) that a given product is only supplied by one sector; (2) that there are no joint products; and (3) that the quantity of each input used in production by any sector is determined entirely by the level of output of that sector (Leontief Input Output Model 2000).

The integration of the input-output model based on equation $(I - A)X = F$ with the final demand model based on national income accounting poses three problems immediately. First, the input-output accounting involves gross output concepts, while the national account data published for most developing countries deals with value added concepts. The second problem in the transformation, is the lack of time series data on final demand deliveries by each sector unless input-output tables exist for all years. Third, it is not to be expected that such a simple system will prove useful for all kinds of problems. A given aggregation into sectors may be valid for one purpose but not for another.

The dynamic input-output analysis allows economists to develop a general equilibrium system that, moving from the known economic conditions of the base year, traces different possible development paths of the economy, depending on the assumptions made on the proportions in which the

national product is divided into consumption and investment, and on the investment coefficients in each sector. In his Nobel lecture, Leontief asserted: " The subject of this lecture is the elucidation of a particular input-output view of the world economy.

This formulation should provide a framework for assembling and organizing the mass of factual data needed to describe the world economy. Such a system is essential for a concrete understanding of the world economy as well as for a systematic mapping of the alternative paths along which it could move in the future" (Leontief1973). Leontief s analysis focused on the consistency between the targets and the distribution of resources around the world. Among the most important conclusions and policy implications of the analysis are the necessity to increase the target rates of growth of gross products in the less developed countries, if the objective of increasingly closing the gap between North and South has to be fulfilled; the identification of political, social and institutional, more than physical, limits to sustained growth for the developing world; and the important indication that the costs of pollution abatement do not necessarily represent a threat for economic development.

Input-output analysis is a useful and productive tool for regional analysis. It can provide important and timely information on the interrelationships in a regional economy and the impacts of changes on that economy. Thus, it can provide pertinent information about the impacts of economic growth and/or decline and the relative benefits and costs of alternative development strategies. Recently, the combination of a wealth of economic development issues to which input-output analysis can be applied and increased

availability of computerized input-output models have led to an increased interest in this technique. The major contribution that input-output concepts and data have made to the analysis of economic development was reflected both in the large number of Conference participants from developing countries and in the generous sponsorship provided by UNIDO. Jacob Kol considers the probable effects on employment in the European Community and a group of (relatively industrialized) developing countries of a balanced increase in trade in manufactures (McKinley 2000).

Conclusion

Leontief is one of the first economists who was deeply concerned about the impact of unabated economic activities on the global environment. In his Nobel lecture, he outlined a simple input-output model where pollution was treated explicitly as a separate sector. His input-output analysis has become a classic technique of economic behavior, and some go as far as comparing him with John Maynard Keynes. One would never want to conclude a review of the contributions that Leontief offered to economics, any possible list would always fall short of the overall message to the reader, a message of search, even more than research, for some pattern, some code hidden behind the surface of social and economic appearances, able to explain what happened and why, and what to expect, a message that springs from the synthesis of an immense and reasoned background which melts history, anthropology, philosophy, and certainly all the possible economic knowledge at the service of the humanity.

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