A Transportation and Price-Sensitive Interregional Input-Output Model

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ABRIDGMENT

•THIS paper presents a modified form of a Leontief-type input-output model whose technological coefficients are sensitive to changes in transportation costs and factory prices of commodities. A theoretical framework is developed to derive a set of relationships that may be estimated statistically and used to compute revised technological coefficients whenever there are changes in delivered prices of commodities. The model developed is proposed as a device for forecasting interregional commodity flows as a first step in forecasting transportation demands throughout a region.

The implementation of the Leontief-type model requires that economic data for a base year be collected and arranged in an input-output table to reveal the interregional flow of commodities among the various industries situated in the study area. The table is thus a kind of "still" picture of the interrelationships among regions and industries.

If technology and relative prices remain unchanged but, for any reason, there is some change in the pattern of final demand for goods and services, there will be commensurate shifts in the flows of commodities among industries and regions. The interrelationships revealed by the base year input-output table can be used to predict the shift that might be expected to occur as a result of a given change in demand.

The flows of commodities described by the input-output table must be accomplished by the transportation system. Hence, any changes in these flows represent changes in the demands for transportation. Input-output analysis can therefore be used as a tool in the prediction of changes in the demand for transportation when these are a consequence of changes in final demand.

An important deficiency of the input-output analysis has been the absence of a methodology by which the technological coefficients might be made sensitive to changes in delivered prices of commodities. The need for some sensitivity is demonstrated by empirical findings that technological coefficients do change over time. Economics theory also suggests that such sensitivity should be built into the model.

When the delivered price of some commodity from one region changes while the delivered prices of similar commodities from other regions remain the same, there will be shifts in demands in favor of the relatively cheaper sources and hence in the pattern of commodity flows throughout the area. In this fashion, changes in relative prices lead to changes in the location and growth of industries, and in the distribution of the labor force and of the population. All these changes give rise to a new set of interrelationships among regions and industries. The model developed presents a methodology by which the technological coefficients can be modified from time to time whenever significant changes occur in the delivered prices of commodities.

Because changes in transportation costs may be an important source of variations in delivered prices, the model is designed to be sensitive to such changes. It can therefore be used to predict the changes in demand for transportation that may be expected from a given change in the transportation system itself.

The technique by which the relationships between delivered costs and commodity flows are accomplished is an analytical methodology that assumes industries behave like firms that minimize costs and have linear homogeneous production functions belonging to a specific family of such functions.

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