Dual Entities in a General Problem of Inputâ€“Output Analysis: Some Algebraic Results and Ensuing Conclusions

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For any rectangular supply and use table given, a general problem of inputâ€“output analysis is represented in this paper as a system of equations written in terms of corresponding free variables. This system includes regular linear equations for material and financial balances, a batch of predetermined values for chosen exogenous variables and an additional set of linkage equations that provides the exact identifiability for all unknown variables. General problem becomes nonlinear if at least one of its equations is nonlinear, and it is linear otherwise. The scope of this paper is to study some operational opportunities for constructing a set of identifying linear equations in the cases of evaluating the response of the economy to exogenous changes in final demand vector and value added vector. To this end, one can involve matrix-valued linear production and cost functions of product and industry inputs and outputs as their arguments respectively. Besides, the product-mix and market shares contours of supply matrix and their analogues for use matrix seem to be quite operational and motivated. The paper presents eight different specifications of general inputâ€“output problem under various conditions for exact identifiability of unknown variables. Note that two of them form an underlying algebraic framework of product-by-product and industry-by-industry Leontief demand-driven quantity and relative supply-driven price models, whereas the other two provide an algebraic foundation for compiling product-by-product and industry-by-industry Ghosh supply-driven price and relative demand-driven quantity models. As one more practical result of this study, it is shown that there are some serious "quantity'n'price" doubts about plausibility of underlying background for an industry technology assumption and a fixed product sales structure assumption, which are used in the transformation of supply and use tables to symmetric input-output tables.