Constructing Demand-Driven Input-Output Models by Direct Introducing Quantity and Price Parameters into the Product Balance Identity

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The study starts with the product balance identity according to logical scheme [output 0 = intermediate input 0 + final demand 0] for the base year 0. Formal introducing unknown matrices of quantity and price indices and taking the Hadamar products of them and production matrix 0 and, in turn, intermediate consumption matrix 0 leads to generalized nonlinear input-output model with exogenous final demand. This model comprises an excessive number of unknown quantity and price parameters and is not identifiable itself.
Nevertheless, under simplifying assumption about diagonal form of unknown parameters matrices one can get still nonlinear input-output model with exogenous final demand but written with usual matrix operations and so much more operational. In general, this model could be linearize in four ways: set the matrix of price indices equal to identity matrix (constant prices), allow the quantity parameters matrix being identity matrix (constant levels of production by industries), use price indices for outputs and quantity parameters for intermediate inputs, and, finally, apply quantity indices for outputs and price parameters for intermediates.
Special attention in the study is paid to examining some analytical properties of four linearized input-output models with various sets of price and quantity parameters. All the models turn out to be strictly identifiable under some technical assumptions not so cumbersome. In particular, it is shown that linear model at constant prices is in exact accordance with the formal pattern of product technology assumption widely known in input-output analysis. Second linear model with exogenous final demand at constant levels of production by industries could be appreciate as almost trivial. Other linear models with combined using price and quantity parameters seem to be out of economic sense, have no any mention in special literature but some of their features are of theoretical interest and deserves further exploration.