A quantity output-driven model with heterogeneous intermediate and final outputs

Topic: 716B Methodological Aspects of IO Analysis (3)
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The traditional quantity output-driven (Leontief) model is based on the assumption that outputs are homogeneous. This assumption is considered fundamental for the model to operate properly.

Although the actual heterogeneity of goods can partially be overcome by disaggregating input-output tables, such assumption constitutes a limitation of the modelling exercise. Also, in order to comply to this assumption, secondary production must be reallocated to other sectors instead of counting such production within the same sector, for example as a different (heterogeneous) final good. Thus, reallocation methods have been used to build symmetrical input-output tables according to the homogeneous goods assumption.

This paper aims to explore whether the homogeneous goods assumption can be dropped and, if so, to explore how would a quantity output-driven IO model work.

In this paper, the assumptions required by the traditional quantity output-driven (Leontief) model are reviewed together with the previous methods to account for secondary production. It is found that some methods applicable to physical input-output tables are already able to deal with simultaneously produced heterogeneous final outputs (e.g. disposals to nature).

In the analytical section of this paper, the usage of the homogeneous goods assumption is deconstructed. First, by illustrating how to deal with PIOTs and MIOTs with heterogeneous intermediate production. Second, by illustrating how to deal with PIOTs and MIOTs with heterogeneous final production. Building on the learnings from these sections, a generalised quantity output-driven model is suggested. It is demonstrated that the traditional quantity output-driven (Leontief) model is a particular case of the generic quantity output-driven developed in this paper.

The generic quantity output-driven model makes it possible to build and analyse MIOTs and PIOTs without requiring to reallocate secondary production to the corresponding sector, i.e. secondary products can be considered within the intersectoral matrix and/or as final outputs. This enhances the analytical possibilities of IOA and opens the door to rethink how secondary production should be treated. Finally, this model is particularly interesting for Industrial Ecology, since enables researchers to trace the physical activity of the economy as is, i.e. each sector producing simultaneously different types of disposals to nature (e.g. emissions).