A supply-use approach to capital endogenisation

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Input-output (IO) analysis currently treats capital transactions as exogenous components of the inter-industry system despite that capital goods are ultimately used in the production of further goods and services for final demand. This implies that footprint-type analyses that make use of the Leontief inverse do not take into account the emissions embedded in the capital that is used in the production processes. It has therefore been suggested that capital transactions ought to be endogenised into the IO framework, so that the effects of building up and maintaining capital are included in impact assessment calculations.

Two methods have previously been used to close the IO model for capital transactions: the augmentation method and the flow matrix method. Both methods entail the addition of capital flows into the inter-industry matrix. In Leontiefâ€™s demand-pull model, the calculation of multipliers requires an inversion of the requirement matrix, which implies that the differentiation between capital goods and non-capital goods can no longer be made when associating stressor intensities to the multipliers. Moreover, the inversion requires that the tables be symmetric, and the conversion from supply-use tables (SUTs) to IO tables (IOTs) therefore entails the use of a construct that decides upon the resolution of the IOTs (e.g. product-by-product or industry-by-industry) as well as the method used to handle e.g. by-products.

In this paper, we follow the supply-use formalism that Lenzen and Reynolds (2014) used to develop their Waste Supply-Use Tables (WSUT), but rather than endogenising waste flows, we endogenise capital flows. We introduce the capital supply-use tables (KSUTs) that allow us not only to keep full transparency throughout the process of calculating multipliers, but also to differentiate between products and industries when performing impact analyses as well as separating between capital goods and current intermediate goods. Hence, the results will enable a more specific interpretation of results, and ultimately, we are able to resolve the dilemma of assigning different stressor intensities to goods belonging to different age cohorts. We demonstrate the relevance of our contribution by providing a small-scale numerical example of our KSUT framework using data from the EXIOBASE 3.3 and EU-KLEMS databases and end by showing how the framework could be extended to large-scale MRIOs as well.