Understanding the energy metabolism of World economies through the joint use of Production- and Consumption-based energy accountings

Topic: (1.1) Energy Input-Output Modeling (1)
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Understanding, quantifying and representing the global primary energy supplied and demanded by sectors of national economies is nowadays crucial for policymakers in order to define effective policies and to properly set energy efficiency and saving targets.
Energy accountings based on the traditional Production-based paradigm allows to understand how primary energy is directly extracted, traded, transformed and used within each economy. On the other hand, Consumption-based energy accountings allows to understand the ultimate economic purposes of such energy flows. Therefore, the information provided by the joint application of these approaches may provide useful and complementary insight on the global energy economics, allowing to identify hotspots for potential interventions from both the supply and demand side.
This paper analyzes and represents the energy metabolism of the World economy based on a Multi-Regional Input-Output framework, taking into account non-renewable fossil energy, namely raw coal, crude oil and natural gas. The research is based on IEA energy data and on the EORA26 database, considering year 2013.
Starting from the results of a conventional Production-based analysis (IEA data), a method is here proposed to decompose the energy embodied in final goods and services: from the supply side, it allows to quantify the energy directly and indirectly invoked by the sectors of all the economies to produce the final demand of the others. Conversely, from the demand side, traditional Leontief impact model allows to account for the energy embodied in products consumed as final demand by each economy. The results of both the analyses are finally reconciled in order to provide one unique Sankey diagram.
The main novelties of the paper resides in (1) the definition of a unique Sankey diagram through the joint use of Production- and Consumption-based approaches, and (2) the differentiation between embodied energy supply and demand in Energy Input-Output analysis.