

Multinational enterprises in multi-regional input output analysis

Topic: Methodological aspects of input-output analysis IV

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Global multi-regional input-output (GMRIO) models have become indispensable tools for the value-added analysis of international trade and the consumption-based re-attribution of remote environmental impacts. The concept of global supply chains underlies both these areas of research: a 'new wave of globalisation' has seen the disintegration of production processes across national borders as enterprises have strategically outsourced and offshored parts of their business. With 80% of world trade estimated to involve multinational enterprises – either through intra-firm trade or international sourcing and marketing – and growing recognition that certain 'lead' enterprises govern extended international supply networks – either through collaborative relationships or by exerting power over captive suppliers, there is a pressing need to move from analysis at an aggregate industry-level to a more disaggregate enterprise-level. In response, this paper asks: can multinational enterprises be sensibly characterised within GMRIO models.

A methodological approach, based on a stochastic disaggregation technique, is proposed for incorporating enterprises into a GMRIO model. In addition to reflecting the scale and structure of the world's leading companies, the approach deals with uncertainty introduced by incomplete information. As outside observers we are unlikely to know the true input-output structure of a given enterprise, but using Monte Carlo simulation and knowledge of the meta-constraints imposed by the original input-output data we can start to explore the probable role of large companies in the global economy. Further, by creating a framework whereby multiple enterprises can be simultaneously incorporated into the GMRIO system, double-counting issues can also be investigated. For example, simply summing individual enterprise carbon footprints risks double-counting a portion of emissions as the enterprises in question may fall within one another's supply chain. Finally, the description of methodological steps taken is supplemented with numerical experiments that aim to highlight the advantages, limitations and possible extensions of the overall approach.