A MR EEIOA-based framework for identifying synergies and trade-offs of circularity interventions

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Background
Circular economy (CE) scenarios have contributed to understanding the potential economic, social, and environmental implications of a circularity transition on a country and global scale using macroeconomic modelsâ€‹. Furthermore, some researchers have identified potential trade-offs within circularity interventionsâ€‹. For example, an increase in recycling activities in Europe could potentially create more sources of employment in European countries while reducing job creation in middle- and lower-income regions (e.g., in Southeast Asia and Lantin America). Although several CE scenarios point out potential trade-offs and synergies, there is still a lack of understanding about who would be the winners and losers of a circularity transition.
Several frameworks have been developed to identify trade-offs and synergies. For example, the application of multi-criteria, data envelop analysis, and triple-bottom line approaches has facilitated the identification of trade-offs between socio-economic and environmental impacts of multiple interventions. Within this context, Multi-regional environmentally-extended input-output (MR EEIO) analysis has been used as a quantitative tool for exploring potential trade-offs and synergies.

Research Question and Aim
However, to the best of my knowledge, there is no systematic way to identify and assess trade-offs and synergies of the ongoing development on circularity transition between the Global North and South (e.g., between the EU and Latin America), including their potential socioeconomic and environmental impacts. This raises the question: â€œHow can the potential trade-offs and synergies of different CE scenarios be systematically identified to facilitate the interpretation of CE modeling in MR EEIO?â€•
In this paper, I aim to develop a novel MR EEIO-based framework for identifying trade-offs and synergies of circularity interventions. The framework provides three key dimensions - geographical, impacts, and sectoral - that allow for the identification of â€˜win-winâ€™ and â€˜win-loseâ€™ situations from a multi-dimensional perspective.

Method and Data
I will review the existing literature on frameworks for trade-offs and synergies analysis, such as cost-benefit, multi-criteria, data envelop, and triple-bottom-line analysis. Then, I will define the key dimensions of trade-offs and synergies within circularity interventions and develop algebraic expression for quantifying each dimension in an MR EEIO system. Finally, I will illustrate the use of the MR EEIO framework with a case study focusing on the potential trade-offs and synergies between the European Union and Latin America if both regions implement circularity interventions simultaneously. For this example, I will use the MR EEIOA implemented by Donati et al. (2020) using EXIOBASE v3 for 2019. I will then apply the proposed framework including the dimensions (i.e., geographical, impact, and sectoral).

Novelty
This is the first MR EEIOA-based framework that allows for the identification and assessment of trade-offs and synergies of multiple circularity interventions in a systematic way. This will contribute to facilitating the interpretation of CE modeling and support decision-making in CE policies, which are in ongoing development worldwide.