

Assessing ecosystem dependence and environmental impact for the Latin American economy: explorations with an MRIO database

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Although the extended and continuous process of urbanization makes it appear as if contemporary societies are increasingly separated from ecosystems, it has been long stated in ecological economics and related disciplines that economic systems are not to be described as independent from the limits and determinations of nature. Understanding the links between the concrete functioning of economic production and the conditions of its ecological sustainability is, however, a complex task, for the ways in which particular activities relate with nature are by no means homogeneous, and are further entangled throughout the increasingly multi-national technological interconnections describing contemporary production networks. One emerging concept navigating this complexity is that of ‘the double materiality,’ organizing ecological-economic relationships into two main categories: ecosystem dependence and environmental impact. The former is intended to distinguish economic activities by their dependence on several ecosystem services, whereas the latter describes them in terms of different types of environmental impact. This paper contributes to the empirical understanding of this double materiality by implementing a multi-regional input-output approach for Latin America. The approach is able to analyze the double materiality simultaneously, that is, to describe a given economic activity both in terms of its dependence on ecosystems and of its environmental impact. Notably, the input-output approach is instrumental in explaining how dependence and impact are also transmitted throughout the region’s network of supply chains.

Methodologically, our approach is based on a correspondence between the ENCORE database, which features sector-specific categorical scores for both direct dependence on 25 ecosystem services and direct impact on 13 environmental categories, with a multi-regional input-output database, comprising 40-sector descriptions for 18 Latin American countries. While direct scores from ENCORE are generic, we construct ‘total’ scores with input-output economics adding to each sector’s direct scores the indirect effects as diffused throughout the region’s network of supply chains. While the assessment of dependence and impact is limited to ecosystems located within the Latin American region, we observe that indirect effects increase the scores for all sectors in all countries. In fact, even those sectors appearing in the ENCORE database as independent of particular ecosystem services or having a null impact on particular environmental categories end up exhibiting some degree of indirect dependence and impact when considering their reliance on the regional production network. Furthermore, for each sector in each country, we are able to distinguish between the indirect effects explained by the domestic supply chains and those from the international supply chains.

Our results indicate differentiated patterns of ecosystem dependence and environmental impact throughout the 18 Latin American countries included in the MRIO. Regionally, the highest scores of dependence in the region concentrate in water-related services, particularly for agriculture and

manufacturing, whereas the highest scores of environmental impact concentrate in the generation of local pollutants for soil and air, solid waste, and greenhouse gasses, particularly for agriculture, mining and most of manufacturing. The Latin American MRIO describes different patterns of economic integration, with two clearly discernible groups: countries in South America are more integrated among themselves, whereas Central American countries exhibit weaker degrees of integration among themselves, with very scarce interaction among the two sub-groups. Interestingly, we observe the Mexican economy as some sort of interface, for it maintains important trade flows with both South and Central America. Higher economic integration translates into higher scores of ecosystem dependence and environmental impact for countries in South America, whereas these scores for Mexico and Central America are relatively weaker. We accompany our analysis with an assessment of the strengths and limitations of the methods and procedures followed, with recommendations for both the ENCORE database and the Latin American MRIO.