



Economic modelling of the international wood trade for an assessment of its economic and environmental impact: a new approach focused on Asia

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Thematic action concerned: WP4 - Forest Bioeconomy: Actors, Territories, Resources and Economic Sectors

Context — Trade in wood products is a complex network of global trade and local supply and demand. The task of the modeler is to understand how wood trade flows are organized on a global scale in order to propose a simplified and comprehensive representation. Currently available models struggle to represent wood trade flows realistically. Based on this observation, the thesis project asks two questions. A technical and methodological question: What are the limitations and perspectives of the current modeling of the global wood economy? A more fundamental question: How are global wood flows organized and how can they be represented?

Objectives — The goal of this thesis is to propose new approaches to model the global wood economy based on (1) new methodologies of data analysis and (2) the assumption of a strong link between the urban world and wood consumption. We assume that the Asian urban world, which is now highly dynamic, is a center of gravity of the global wood trade.

Approaches — To date, we have conducted a meta-analysis of 499 publications on wood trade flow modeling and conducted a study of international roundwood trade using a network analysis approach.

Key results —

- Wood trade flow models use a limited set of factors to simulate flows and rarely use factors considered for other products or sectors, particularly urbanization.
- The industrial roundwood trade network is not very sensitive to major disruptions and tends towards a situation of Chinese monopsony, i.e. Chinese domination of the roundwood purchasing market.

Main conclusions including key points of discussion — - Our results show that the current body of work on modeling wood trade flows has relied on a narrow set of factors, neglecting other possible factors that could have important implications if taken into account. This is particularly true of urbanization.

- China's growing market power, the polarization of the trade network around a few highly connected countries, and the current geopolitical situation explain the current trade tension over wood resources and raise questions such as the supply of countries with limited market power.

Perspectives —

- Compared to the perception of what the driving forces of the forest sector economy have been in recent decades, new questions arise that require the integration of new factors.
- Other literature identifies cities as the major focus of wood consumption: urbanization is a determinant to be explored and tested.
- New mathematical modeling approaches, such as network theory or machine learning, can bring new perspectives to the modeling of wood trade flows.

Valorization — (scientific: publications, book chapter, presentation at conferences,...); economic: Soleau envelope, patent, license,...; distribution: press release, interview,...)

- **Scientific:** Presentation of the work at scientific conferences (French Association of Environmental and Resource Economics (FAERE), Journée de Recherche en Sciences Sociales (JRSS), DeepSurf International Conference, Journée Docs-Postdocs du LabEx ARBRE), including two prizes for the best presentation (DeepSurf, Journée Docs-Postdocs du LabEx ARBRE); publication of the meta-analysis in the peer-reviewed journal Forest Policy and Economics (to be published in April 2023).

- **Distribution:** Participation in several scientific mediation events (Experimentarium, Nuit Européenne des Chercheurs de Dijon 2021, Nancy 2022).

Leveraging effect of the project—

- Collaboration with the Master Sciences du Bois of the University of Montpellier: teaching in forest economics and carbon economics at a master level.
- Collaboration with CIRAD: co-direction of the thesis by Jean-Marc Roda, economist at CIRAD's UMR Forests and Societies in Malaysia-Indonesia.