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Where does the wood come from? A matrix model for tracing the origin of wood-based products

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Abstract

Globally, timber trade flows have increased in recent years. While value is generally added along the entire value chain, certain environmental impacts, such as deforestation and forest degradation, are intrinsically linked to the origin of the roundwood.
Bilateral trade statistics are of limited help in providing insights about the location of impacts caused by consumption of wood-based products elsewhere. This is mainly because wood-based products are often imported from countries other than the one from which the roundwood originated.
We present a novel method that makes it possible to relate the consumption of wood-based products to the origin of roundwood. Thus, the method helps to provide information on distant environmental impacts of wood consumption.

Background and objective

- Global trade of wood-based products is complex, with trade between many countries at different processing levels.

Fig. 1: Examples of wood-based products
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- Main challenge: bilateral trade statistics only provide information about immediate trading partners.
- Yet, wood-based products imported from e.g. China may not stem from wood harvested or processed in China.
- Objective: to develop a method that accounts for the country of origin of imported wood-based products

Innovative approach

- Existing studies mainly focus on the direct imports of wood-based products, provide only geographically aggregated information and/or consider only semi-finished products.
- Our novel method (“tracing”) uses matrix algebra and provides detailed information on where the wood-based products consumed in a specific country originate from.

Fig. 2: Roundwood transport by truck
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Main results

Table 1: Origin of finished solid wood products consumed in 2018 (in million m^3(f))

	USA	RUS	CHN	BRA	CAN	IDN	SWE	FIN	DEU	ROW
USA	87.087	0.092	12.020	0.014	0.347	0.024	0.107	0.026	0.735	13.839
RUS	1.191	18.375	22.648	0.005	0.084	0.015	0.175	0.688	1.717	17.766
CHN	3.179	0.144	104.664	0.008	0.006	0.046	0.051	0.011	0.383	7.778
BRA	1.936	0.007	0.673	12.604	0.006	0.004	0.022	0.011	0.323	3.884
CAN	11.519	0.022	4.855	0.001	33.999	0.006	0.031	0.007	0.214	5.658
IDN	0.646	0.005	1.072	0.001	0.002	0.349	0.011	0.002	0.150	3.370
SWE	0.363	0.020	0.564	0.001	0.004	0.003	3.902	0.044	0.842	10.136
FIN	0.232	0.026	0.837	0.001	0.005	0.003	0.208	1.646	0.730	7.630
DEU	0.793	0.095	0.942	0.003	0.004	0.006	0.198	0.055	14.277	14.191
ROW	6.483	1.020	39.031	0.046	0.082	0.109	1.949	0.386	14.349	199.753
∑	**113.429**	**19.808**	**187.305**	**12.682**	**34.538**	**0.566**	**6.653**	**2.877**	**33.718**	**284.005**

- Each column shows where the wood-based products consumed in the country listed at the top originates from.
- For instance, out of the 113.429 million m^3(f) solid wood products consumed in the USA, 11.519 million m^3(f) originate from Canada and 6.483 million m^3(f) from ROW (“rest of the world”).
- The reference unit wood fiber equivalent (m^3(f)) is defined as the equivalent volume of the wood fibers at the fiber saturation point that are contained in a product.

Why it matters

- Our research:
  - helps to better understand trade flows of wood-based products and to identify countries of origin.
  - makes linking consumption patterns to environmental impacts of primary products easier and clearer.
  - provides a basis to account for unintended consequences on local people in countries where roundwood is produced.
  - is a first step towards a monitoring system for the sustainable use of forest products (“forest footprint”).

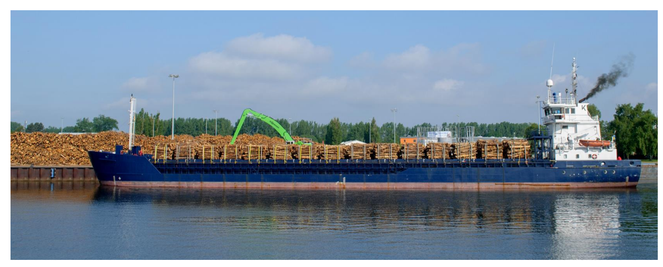

Fig. 3: Cargo ship with roundwood
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