Can any possible combination of modes improve intermodal attractiveness?

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1. Problem and research questions

With the opening of borders and the always greater decentralization of production, the transportation of goods increased a lot in the last decades. The transportation by road remains the most used mode in Europe (Eurostat, 2016). Even if it is appreciated for its responsiveness, flexibility, and quickness, road transport is however responsible for negative impacts on its environment like air pollution, climate change or congestion. In order to reduce these damages of road transport, more and more effort is done by public authorities to sustain alternative transport. Among these solutions, a combination of road with another less harmful mode, like rail or IWW is currently a solution that is evaluated and promoted.

Intermodal freight transport is defined as the transportation of goods, using two or more modes of transport, in the same loading unit, without handling of the goods themselves (United Nations, 2001). Intermodal transport is seen by Europe as an interesting solution for limiting the negative impacts of road transportation (European Commission, 2011).

In the classical conception of intermodal transport, pre- and post-haulage travels are supposed to be short, and to be performed by road transport, whereas the long-haul travel is done using rail or IWW. The combination of these modes allows reducing the negative externalities of the whole travel, i.e. the negative impacts that are generated by the transport operators, but which are not directly supported by them. These externalities mainly consist in congestion due to the high number of trucks on road, and air pollution and climate change, provoked by the release of emissions that are disturbing or polluting the atmosphere, potentially leading to human health problems.

The objective of this study is to determine the impact on intermodal attractiveness of allowing other combinations of modes than the classical road-rail/IWW-road combination, during an intermodal travel. Indeed, when leaving port nodes for instance, barge or train transport could be used directly to bring the goods to an intermodal terminal, where another mode could then take over the transport. This work aims at identifying whether, when allowed, different combinations than the classical road-rail/IWW-road one are used, in order to reach an economic or an environmental optimum.

2) Methodology

The research is based on the tools of the operations research domain and proposes the development of an allocation model for freight transport at the strategic level of decision. The objective is to determine the flow distribution of goods between direct transportation by road, rail or inland waterways, and any combination of these modes using intermodal transport. The novelty consists in taking into account three modes of transport in a mixed integer programming model, and to allow the transfer from any mode to any other at intermodal terminals where these modes coexist.

3. Major findings

This work is still in progress but results of the model are expected to determine the optimal flow distribution between three different potential options:

- A direct door-to-door transport using one single mode (road, rail or IWW)
- An intermodal transport passing through one intermodal terminal, and thus using two different modes of transport
- An intermodal transport passing through two intermodal terminals, and thus using at most three different modes of transport.

The restriction of intermodal transport passing through maximum two terminals reflects the reality of intermodal transport, where transshipment activities require time and money, and are thus not repeated too many times, in order to remain efficient and competitive regarding a direct transportation mode.

Intermodal transport is generally considered as viable and interesting on medium to long distances. For this reason, the model is applied to experimental data at the European level. The network is based on the TEN-T core corridors highlighted by Europe as the main transportation facilities to focus on, in order to remove bottlenecks, build missing cross-border connections, and promote modal integration and interoperability (European Commission, 2016). The model takes into account the flow exchanges between NUTS 2 regions on these corridors, as well as the existing intermodal terminals in Europe.

4. Takeaway

The general lessons that are expected to be retrieved out of this work concern the global interest, in terms of economic or environmental perspective, to use other combinations of modes than the classical road-rail/IWW-road combination. The objective is also to determine if specific conditions favor the use of direct transport, or the use of intermodal transport with one or two terminals. In this way, general recommendations regarding intermodal competitiveness could be formulated for public authorities, but also for shippers and transport operators.

5. Keywords

Intermodal allocation model, road-rail-IWW combination, intermodal competitiveness, environment

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