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Longer and heavier vehicles in Belgium: A threat for the intermodal sector?

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ABSTRACT

To achieve transport cost reductions and to reduce the environmental impact of road transport, different European countries are allowing or testing longer and heavier vehicles on their road network. In Belgium, the Flanders region started a trial in 2015 allowing a limited number of longer and heavier vehicles on a selection of approved routes. A concern among intermodal operators is however that an allowance of longer and heavier vehicles could trigger a reverse modal shift away from rail and inland waterways container transport. Starting from experiences in other European countries, this paper discusses the potential spatial impact of allowing longer and heavier vehicles on the market areas of intermodal transhipment terminals using a geographic information systems-based location analysis model. In a second step, external transport costs are incorporated in this model, to quantify the spatially diversified societal costs of a potential reverse modal shift.
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1. Introduction

Countries that are suffering heavily from road congestion are triggered to come up with several innovative solutions. Belgium, located in Western Europe, is such a country that despite its extensive road network, with a density of 508 km roads per 100 km^2 in 2010 (FOD Mobiliteit en Vervoer, 2011), suffers heavily from road congestion. In 2013, Belgium topped the INRIX (2014) national traffic scorecard with an annual time loss of 58 h for an average driver. Besides its contribution to congestion, freight traffic also generates other negative impacts such as emissions, accidents, infrastructure damage and noise, causing considerable societal costs (Delhaye et al., 2010). Belgium nevertheless has an extensive rail and inland waterways network and different national and regional policies aim to shift freight transport from the road to these alternative transport modes (see e.g. Pekin, 2010), by for instance facilitating the setup of new transhipment terminals or by granting subsidies to intermodal transport operations (Macharis and Pekin, 2009).

The societal impact of road freight transport can be reduced, by for instance increasing the load factors of vehicles. Another efficiency gain in road transport can be achieved by using longer and heavier vehicles (LHVs) instead of the heavy goods vehicles (HGVs) that are currently used, by increasing the loading capacity. This larger type of vehicle aims to reduce the transport cost per unit transported, while simultaneously reducing the emissions per unit of transported cargo. Following the rationale of freight transport cost elasticities, cost reductions in road transport can, however, enhance a reverse modal shift from intermodal rail and inland waterway transport to unimodal road transport (Beuthe et al., 2014), although the effect will be partly compensated when LHVs can also be used to reduce the cost of pre- and/or post-haulage transport

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(Jourquin et al., 2014). The environmental impact of intermodal transport is in many cases smaller than the one of road-only transport (e.g. Janic and Vleugel, 2012; Kreutzberger et al., 2006; Ricci and Black, 2005), so a reverse modal shift might reduce or even nullify the environmental gains of replacing HGVs by LHVs when intermodal transport chains are also replaced by unimodal LHV transport chains. The risk on a reverse modal shift should be investigated prior to the allowance of LHVs, to estimate the net environmental and societal impact.

This paper focuses on intermodal container transport, as it is a market segment where different transport modes are heavily competing. In Belgium, the main domestic market for intermodal transport is in transport operations to and from the Port of Antwerp, which is by consequence also the focus of this paper. LHV allowance could, however, also affect competition with direct and single wagon load train transport. Avoiding a reverse modal shift should not be a goal as such, unless its negative societal impact can be shown. The aim of this paper is therefore to investigate the impact of introducing LHVs on the current market areas of intermodal transhipment terminals, using a location analysis model, assuming LHV allowance on the whole Belgian territory. In a second step, the societal impact of a potential reverse modal shift is estimated for transport operations within Belgium by calculating changes in the marginal external costs due to a potential reverse modal shift. Bickel and Friedrich (2005:9) argue that *"an external cost arises, when the social or economic activities of one group of persons have an impact on another group and when that impact is not fully accounted, or compensated for, by the first group*". The external costs are thus calculated to estimate the societal and spatially diverse impact of shifting transport operations from one mode to another.

The following section of this paper discusses foreign practices and model simulations of LHV introductions, with a focus on reverse modal shift and external transport cost calculations. Section 3 discusses the location analysis model that is used to assess the spatial impact on intermodal terminals' market area when prices for road transport decrease as a consequence of the introduction of LHVs. The model also allows calculating the external transport cost difference when replacing intermodal by unimodal transport chains. In a fourth section, the methodology is tested for the case of Belgium. A final section presents conclusions and research challenges.

2. Literature

In Europe, most countries allow HGV combinations on their road network with a maximum length of 18.75 m and a total weight of 40 or 44 tonnes (ITF, 2013a, 2013b). A number of countries however has eased regulations, allowing longer and/or heavier vehicles on (parts of) their road network. The basic rationale for allowing LHVs with a maximum length of 25.25 m and a weight of 60 tonnes, is that more goods can be transported at the same time, decreasing the transport costs per transported unit of cargo. According to De Ceuster et al. (2008), the fuel consumption can be decreased by approximately 12.45% per tkm by replacing HGVs by LHVs, although the authors report fuel consumption savings within a broader 10–26% range in their review. Also the average labour costs can be decreased, as less drivers are required to transport a same amount of goods, assuming a sufficient loading rate.

Also society can benefit from the replacement of HGVs by LHVs. When the loading capacity of LHVs is efficiently used, the external transport costs per tkm can be decreased, as was researched on a macro-scale by De Ceuster et al. (2008) for a European-wide introduction of LHVs. To gain insight in the societal and spatially diverse impact of a shift from HGVs to LHVs on a more detailed level, an external transport cost analysis can be performed, including effects of emissions, accidents, congestion, noise, infrastructure wear and tear etc. To quantify the total societal impact of the allowance of LHVs, it is crucial to gain insight on how modal choice decisions will be impacted. Which transport flows will shift from one mode to another, and how will possible freed up network capacity be used (or not)? A reverse modal shift from rail and inland waterway transport to LHVs might decrease or even nullify the societal gains of a shift from HGVs to LHVs. Even when only small volumes shift away from intermodal transport, this might enhance a domino effect when critical transport volumes can no longer be transhipped in a terminal, jeopardizing the competitiveness of intermodal transport connections (De Ceuster et al., 2008). These critical volumes depend on local conditions and are thus case-specific.

2.1. Reverse modal shift

In Belgium, the Walloon and Flanders regions are considering the allowance of LHVs on their territory. The Flanders region started a trial with LHVs in 2015. This trial is limited to a few routes which are evaluated prior to allowance on criteria such as safety and infrastructural requirements. The trial does not allow goods that were previously transported by other transport modes (such as rail and inland waterways) to be transported by these LHVs, to explicitly avoid a reverse modal shift. This, together with the limited extent of the trial, implies that no profound insights can be gained on the risk for a reverse modal shift when LHVs would be allowed on a larger scale. Therefore, experiences with LHVs in other European countries are discussed next and some countries where studies on LHVs have been commissioned but not tested are examined. These foreign experiences and studies help in estimating the potential of a reverse modal shift when LHVs would be widely allowed in Belgium, but as these countries differ in inter alia spatial planning, market conditions and transport networks, the allowance of LHVs might have different effects. Therefore, a specific Belgian case study is elaborated in this paper.

In Sweden and Finland for instance, 25.25 m long vehicles with a maximum weight of 60 tonnes are allowed when the European Modular System (EMS) is used. The length regulations in Sweden have never been as stringent as in most other

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