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North–South container port competition in Europe: The effect of changing environmental policy

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ABSTRACT

This article examines environmental policy impacts on competition between the European container ports in the Hamburg–Le Havre range on the one hand and the Mediterranean ports on the other. More in particular, two scenarios are considered: the internalisation of external cost on the European hinterland and the establishment of a Sulphur Emission Control Area (SECA) in the North Sea region. Geographically, applications are made for container loops from both Asia and South America to Europe. A total chain model is applied that incorporates the maritime, port and hinterland legs of the supply chain. The calculations show that the effects of either policy option would not significantly impact on the theoretical captive hinterland of respectively the Hamburg–Le Havre range and the ports of the Mediterranean, as the effects measured are smaller than the error margin of the model applied. Additionally, it is found that the impacts of the two policy options on competition between ports in the Hamburg–Le Havre range and the Mediterranean ports would differ for the two container loops considered.

1. Introduction

The underlying assumption in port competition analysis used to be that ports essentially vie among each other. More recently, however, port competition has come to be seen as unfolding between logistics chains, in which ports are merely links. These chains have an origin in a hinterland region, from where goods are moved to a port by a hinterland transport company. Next, a shipping line carries the cargo to another port. And in the final leg of the journey, the freight is again transported to its final destination by a hinterland operator (Meersman, Van de Voorde, & Vanelslander, 2010). These consecutive movements are illustrated schematically in Fig. 1, where the chain with the lowest generalised cost will emerge as the most successful chain.

This means that several chains can serve the same hinterland destination. For instance, a chain originating in Asia and with a European hinterland destination could include an Asian port, say Hong Kong, and a European port in either the Hamburg–Le Havre range or in the Mediterranean.

The main advantage of the Northern European ports is their strong historical position, which has allowed them to build a solid reputation and attract substantial cargo flows. Also, these ports were quicker to accommodate the largest vessels (more than 19,000 TEU in 2015). In the Mediterranean ports, draught restrictions have only recently been removed. Today, some Mediterranean ports can also accommodate these largest container vessels.

Table 1 gives an overview of the number of services of container shipping line CMA-CGM on the Asia–Europe and South America–Europe trade lanes. There is no complete set of data available for Maersk and MSC. Hence, the calculations are based on CMA-CGM data only.

This overview also shows the average ship size that is deployed on those loops. On the basis of Table 1, one may conclude that the trade lane between Asia and Europe is characterised by strongly varying ship size depending on whether the loops incorporate Northern or Southern European ports. The larger ships tend to call at ports in the Hamburg–Le Havre range, the smaller ones at ports in the Mediterranean. It is also apparent that larger vessels are deployed on the routes from Asia to Europe than on the trade lane connecting South America and Europe.

To reach Europe from Asia via the Mediterranean ports, one option is to operate smaller container ships (7600 TEU on average) calling directly at the port concerned. The fact that vessels deployed in the Mediterranean region tend to be smaller is in part due to draught restrictions at some of these ports. However, some of the Spanish (Valencia, Barcelona and Algeciras), French (Marseille FOS) and Italian (Genoa) ports are able to accommodate large container vessels. Here, the deployment of smaller vessel sizes reflects a strategic choice on the part of the container shipping companies (due to smaller transport volumes). An alternative option is to sail 17,000 TEU vessels via the Hamburg–Le Havre range and to tranship containers via Marsaxlokk

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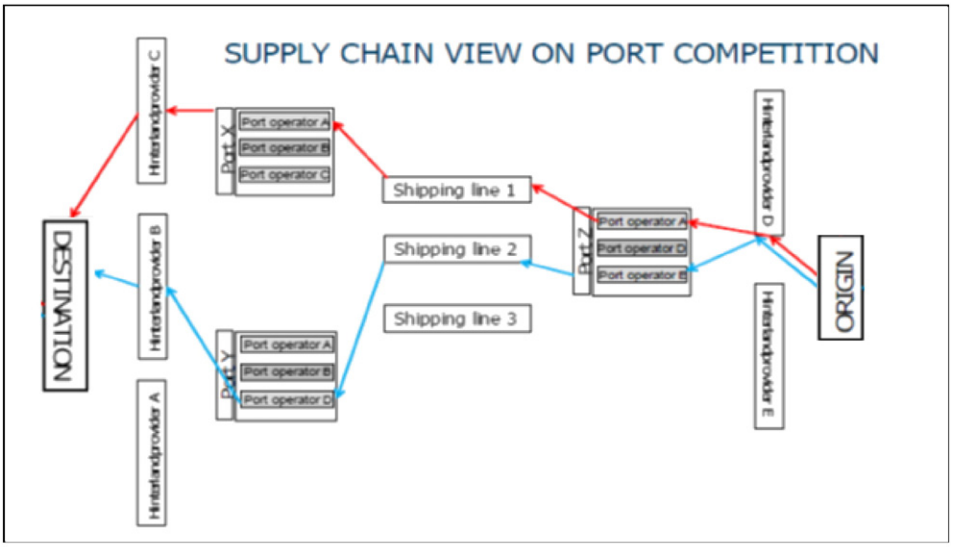

Source: Meersman and Van de Voorde (2012)

Fig. 1. Supply chain view on port competition.
Source: Meersman and Van de Voorde (2012).

(Malta) onto 2200 TEU feeder vessel serving the ports of Southern Europe. On the loops from South America to Europe via the Hamburg–Le Havre range, ships of 6000 TEU are typically deployed. Similar ship sizes are used on loops from South America to Europe via the Mediterranean.

This paper examines the impact of two policy scenarios on the competitiveness of container ports in the Hamburg–Le Havre range and the ports of Southern Europe:

- The internalisation of external costs in the hinterland;
- The introduction of a Sulphur Emission Control Area (SECA) in the North Sea.

The analysis takes into account the maritime aspects of ship size and shipping distances, port characteristics such as physical dimensions, port dues, pilotage, handling cost etc., as well as road, inland waterway and rail connections between port and hinterland. Different total logistics chain analyses are performed whereby we calculate how the relative competitive positions of the ports in the Hamburg–Le Havre range and in the Mediterranean changes and which ports are affected most strongly by the aforementioned scenarios.

Competition between the ports in the two regions is considered for two existing container loops:

- From Asia to Europe via the ports in the Hamburg–Le Havre range (with a 17,500 TEU ship) on the one hand and via the Mediterranean ports (with a 9600 TEU ship) on the other;
- From South America to Europe via the ports in the Hamburg–Le Havre range (with a 6000 TEU ship) on the one hand and via the Mediterranean ports (with a 6000 TEU ship) on the other.

Fig. 2 represents the European leg of the two container loops analysed for both alternatives. It also highlights two origins/destinations, Basel and Vienna, which are used in the detailed generalised chain cost calculations in the next sections. These cities were selected for the analysis because of their location in a key hinterland area, where most North-European port authorities indicate there is a strong competition between the ports in the Hamburg–Le Havre range and the Mediterranean ports.

In order to quantify the cost-competitiveness of the different chains that run via the ports in the Hamburg–Le Havre range or via the Mediterranean ports, a model is applied that allows one to calculate the total generalised chain costs for different container loops. This model, which was first developed in Van Hassel, Meersman, Van de Voorde, and Vanelslander (2015a), incorporates the entire supply chain, including maritime transport, the port process and hinterland transport. To account for the uncertainty in respect of the impact of some of the input parameters on the model outcome, we also perform sensitivity analyses.

This paper is structured as follows. First, Section 2 presents a literature review. Section 3 elaborates on the updated chain model, which allows one to calculate the generalised cost of several chains, and on its extensions. In Section 4, the model is applied to two container loops (Asia–Europe and South America–Europe). In Section 5, sensitivity analysis is performed in order to assess the impact of some of the main input parameters of the model applied. Finally, in Section 6, conclusions are drawn and contributions to scholarly knowledge and managerial practice identified.

2. Literature review

Much research has been conducted on the question of port competition. Aronietis, Van de Voorde, and Vanelslander (2011) presented an extensive literature review in which they identify the port choice

Table 1
Overview of number of loops serving Europe from Asia and South America in 2015.

		Number of loops	Number of ships	Average ship size (TEU)
Asia–EU	Via Hamburg–Le Havre	8	75	14,500
	Via Mediterranean ports	6	70	7600
South America–EU	Via Hamburg–Le Havre	3	21	6000
	Via Mediterranean ports	1	8	5600

Source: Based on data from CMA-CGM (2015a, 2015b, 2015c, 2015d, 2015e).