



Competition or complementarity in Dutch inland port development: A case of overproximity?



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ABSTRACT

The port economics literature is extensive, but does not address well the economic effects of inland ports development. This paper explores the extent to which spatial proximity of inland ports vis-a-vis each other influences agglomeration externalities. Spatially lagged regression models are employed to analyse whether spatial dependence between proximate inland ports can be observed or, alternatively, whether the density of the inland port network in the Netherlands is leading to diseconomies of scale because of overproximity. The conclusions indicate that especially in the context of the dense fluvial network of the Netherlands inland ports development involves much competition among inland ports; being proximate to strong neighbouring inland ports is not necessarily beneficial to the growth prospects of an inland port. This indication of overproximity highlights a need for reflection on the possibility of an integrated and coordinated regional governance approach towards inland port development in the Netherlands and North-West Europe. The relationship between inland ports and regional development is obviously present, but ambiguous since it involves a multiplicity of interactions among a diversity of actors.

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1. Introduction

The development of inland port facilities has been a particular dimension of deep-sea port development in recent decades (Ng et al., 2014). The port economics literature is extensive (see Pallis et al., 2010 for an overview), but does not address well the economic effects of inland ports development. The same observation applies to the literature that specifically deals with inland ports (Wiegmans et al., 2015). This shortcoming is particularly due to the fact that inland ports were mostly considered from an operational and planning perspective (see Monios and Wilmsmeier, 2012), since their core role is to support the hinterland access of deep-sea ports. The economic effects of inland ports are often uncertain, leading to difficulties for the administrative units where inland ports are located to develop accurate governance strategies for their future development (Witte et al., 2016). Also, data availability regarding inland ports is and often remains a problematic aspect of studying inland port development. As a result, the possible

economic relationships among inland ports themselves, and between inland ports and maritime deep-sea ports,¹ often remain vague.

Another underlined effect relates to the principle of co-location, where the setting and operation of inland port terminal facilities are jointly planned with the setting of adjacent logistical activities. There has been some research delving into the issue of co-location in logistics, but this research is especially focused on the firm/establishment level (see e.g. Sakai et al., 2015; Van den Heuvel et al., 2013, 2014). Little is however known on the extent to which spatial proximity in and among inland ports (as a more aggregated level of analysis compared to the firm level) influences agglomeration externalities, and on how this relates to different inland ports types at different scale levels. For expanding our understanding of the relation between logistics and related theories of agglomeration and clustering, this is an important research gap to address.

This paper aims to fill part of this research gap, by analysing the relation between spatial proximity of inland ports, agglomeration externalities and the characteristics and development of inland ports in the case of the Netherlands. Because of its dense fluvial network with many inland ports located relatively close to each other in a confined

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¹ Although the relation between inland ports and maritime deep-sea ports is highly interesting, due to data limitations the empirical analyses in this paper are limited to spatial proximity in and among inland ports.

space, agglomeration externalities are expected to be especially important in the context of the Netherlands. Based on national register data and additional own desk research, a dataset has been developed covering 135 municipalities in the Netherlands with inland navigation transshipment of over 100.000 tons/year. Spatially lagged regression models are conducted that are sensitive to different inland port types. The following research questions are developed: *how does spatial proximity of inland ports vis-a-vis each other influence agglomeration externalities, and how does this differ between inland port types?*

To answer these questions, first, the existing body of literature on inland ports is analyzed, particularly as it relates to their spatial and economic impacts. In the analytical framework, inland ports are related to agglomeration externalities by linking up inland ports with existing theories and concepts stemming specifically from economic geography. This results into an analytical framework for studying inland ports. Section four contains a description of the data and methodology. Section five presents the results of the analyses. Section six contains the conclusions of the paper, a discussion of limitations and suggestions for future research.

2. Inland ports as an emerging field of research

2.1. The multi-level nature of inland ports

There has been considerable debate on defining inland ports in various geographical contexts. This paper focuses especially on the European understanding of an inland port as an inland waterway facility (see Wiegmans et al., 2015), which is distinctively different from the American understanding of inland ports as inland terminals that are linked to ports by rail (Rodrigue et al., 2010), or the European and Asian understanding of dry ports (Roso et al., 2009; Beresford et al., 2012; Qiu et al., 2015). A thorough discussion of the different definitions of inland ports is however beyond the scope of this paper; here, we are mainly interested in the multi-level nature and different scales of inland ports (Fig. 1).

The lowest level is the intra-inland port level, where the operations of firms and relations between firms can be observed (cf. Van den Heuvel et al., 2013, 2014). This is the level at which co-location between inland port terminal facilities and adjacent logistical activities can occur. Many inland port facilities are developed as co-location projects between a terminal operator and a commercial real estate developer. The next level is the inter-port level, both within and between different hosting municipalities (Wiegmans et al., 2015). A city or municipality can host multiple inland port locations that are either competitive or complementary to one another. However, different municipalities can

host an inland port that competes or complements other inland ports. Complementarity takes place when two or more inland terminals service a different customer base (supply chains) and are able to benefit from their respective proximity. This can involve the setting of some joint services such as drayage. The third scale level concerns the positioning of inland ports relative to deep-sea ports, forming an inland load centres network (Notteboom and Rodrigue, 2005). It could be argued that either the proximity of a deep-sea port impedes inland port development, or that inland ports can benefit from deep-sea ports' facilities and network positions, in this way providing an enhanced accessibility relative to the congested deep-sea port areas, notably through the setting of satellite facilities. The inland ports offer the opportunity to more efficiently service the hinterland through modal shift (through rail or barge services) while satellite facilities support of a level of freight diversion away from congested areas.

2.2. Inland ports: towards an analytical framework

A systematic discussion of the various transport, spatial, economic and governance dimensions which are relevant for the analysis of inland ports is lacking, in particular, the economic dimension. An analytical framework that can capture the variety of dimensions of inland ports and their economic dimension could provide valuable insights. Witte et al. (2014) developed an integrated framework for the analysis of inland port governance strategies, consisting of four dimensions: infrastructure, spatial structure, governance structure and economic structure. This framework can also be used for structuring the current body of literature regarding inland ports development (Table 1), because it captures well the variety of and the gaps in the debate regarding inland port development.

Most authors relate the emergence of inland ports as a field of study to the process of port regionalisation (Notteboom and Rodrigue, 2005) in the evolution of port systems. The main focus is either to the implications for the *organisation and functioning of the wider transportation network*, or to the implications for the *spatial and institutional structures of inland ports themselves*. With regard to the network implications, Rodrigue and Notteboom (2009) reviewed the role of inland terminals in supply chains and Wilmsmeier et al. (2011) investigated the position of inland ports within hinterlands and corridors. With regard to the spatial and institutional implications, Monios and Wilmsmeier (2012) have

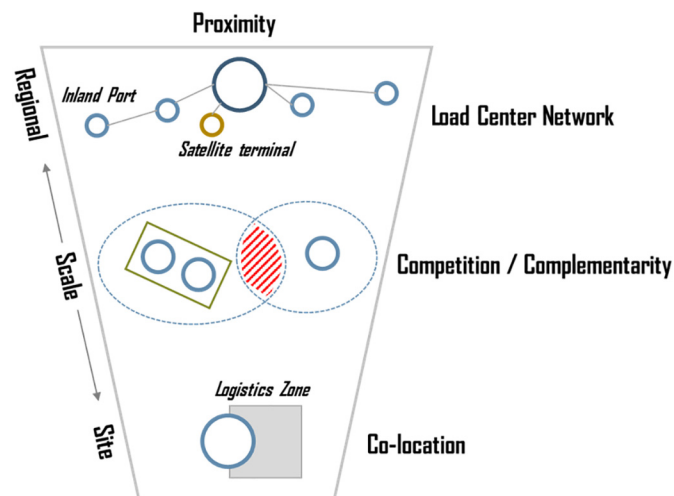


Fig. 1. The scale effects of inland ports.

Table 1

Four analytical dimensions of inland ports.

Infrastructure	Spatial structure
-Port system evolution (position of inland ports in supply chains, hinterlands and corridors)	-Different geographical settings (North-America vs. Europe; variety of scales and modes involved)
-Variety of functions (service, warehousing, distribution, handling, customs, etc.)	-Multi-level port-city challenges (different land-use claims, fragmented ownership structures, externalities, etc.)
Sources: e.g. Rodrigue and Notteboom (2009), Wilmsmeier et al. (2011), Rodrigue et al. (2010)	Sources: e.g. Rodrigue et al. (2010), Wiegmans et al. (2015), Witte et al. (2014)
Governance structure	Economic structure
-Variety of actors (port authorities, terminal operators, real-estate managers, municipalities, etc.)	-Spatial proximity (how does spatial proximity of inland ports vis-à-vis each other influence agglomeration externalities?)
-Variety of institutions (formal governance structure, laws and regulations, development orientations)	-Agglomeration externalities (how do agglomeration externalities differ between different inland port types?)
Sources: e.g. Monios and Wilmsmeier (2012), Raimbault et al. (2015), Witte et al. (2016)	

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