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Dynamic green portfolio analysis for inland ports: An empirical analysis on Western Europe

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ABSTRACT

This paper offers a dynamic green portfolio analysis of a range of European inland ports, based on an adapted model of the BCG-matrix and traffic volumes generated in the period 1999–2010. Based on the analysis, we draw conclusions on how the inland port strategies reflected in changing competitive positions have changed over time, as well as the drivers of economic and environmental performance. We differentiate between metropolitan supporting and industry supporting ports, because the relevant sample of ports to include in the analysis is crucial for a green port portfolio analysis for inland ports. The results show that there is no relationship between the economic and environmental performance on the individual inland port level. However, metropolitan supporting ports mostly show poorer economic and environmental performance in comparison to industry supporting ports, mainly due to their specific position within logistical chains and the absence of specific factor conditions. The paper provides recommendations for managers of both types of inland ports, and opens up an interesting research agenda to improve the use of the green port portfolio analysis tool as a basis to support port strategy.

1. Introduction

Port activities have a considerable environmental impact not only at the local level but also on an entire region. Research on port regionalisation (Notteboom & Rodrigue, 2005) and various studies on the economic and social impacts of ports (Bryan, Munday, Pickernell, & Roberts, 2006; Chang, Cui, Almodovar, & Mahoney, 2012; Ferrari, Merk, Bottasso, Conti, & Tei, 2012; Gripaios & Gripaios, 1995) indicate that the geographical distribution of the various impacts of port activities has become highly important for port management and policy and, particularly, for attracting public investment funds.

The concept and implementation of corporate social responsibility (CSR) at the international business level has evolved in a relatively short period of time, together with an increasing need for organisations, especially ports, to comply with more and increasingly complex regulation, increasing pressure from stakeholders and decreasing government funding while safeguarding economic conditions and financial performance (Devinney, 2009; McWilliams & Siegel, 2001; Porter & Kramer, 2006; Werther & Chandler, 2011). In addition, ports, as part of a network or supply chain, are considered responsible for a wider set of impacts and seek to reconcile short- and long-term views, private and public interests and commercial and social objectives. A large variety of stakeholders have entered the port business arena together with their several and sometimes diverging strategies to influence corporate behaviour; meanwhile, ports are constrained in their CSR policies by the ever-increasing need for economic performance, efficiency and supply chain integration. Overall, the nature of the port business is being challenged, thus encouraging the development of new value-creating objectives for ports and port operators. To remain highly competitive, ports should, together with their economic prerogatives, account for their ecological effects and pursue green strategies.

Several instruments for supporting port strategy that allow the simultaneous inclusion of economic, social and green dimensions have already been developed (see, for example, Haezendonck, 2001; Haezendonck, Dooms, & Coeck, 2006; Lam & Notteboom, 2012). In particular, Haezendonck (2001) introduced a green port portfolio technique (or eco-portfolio) as part of strategic positioning analysis (SPA) for ports to help seaports think in terms of minimising the external costs they generate and to seek strategic alternatives where environmental actions are not potentially in conflict with economic prerogatives. This green port portfolio analysis uses available data on external costs of hinterland transport to and from the seaport for its green dimension and offers, in combination with cargo data, direct information for strategy formulation. The extension of Haezendonck (2001) to the earlier developed portfolio analysis (Henderson, 1979; Verbeke, Peeters, & Declercq, 1995) focussed on implementation issues such as the meaning of the quadrants for seaport positioning, the strategic value of the positions and the inclusion of new important parameters for port strategy. This approach resulted in positioning SPA as a useful component of a more comprehensive appraisal of port competitiveness.

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While SPA cannot itself explain which resources or competences contribute to observed competitive advantage, a dynamic or comparatively static SPA may provide insight into changing competitive advantages leading to changes in the positing of ports. Therefore, in Haezendonck (2001, 2006), it was suggested that to gain insights into the sustainability of an observed competitive position, SPA could be combined with an investigation of underlying port specific advantages and with a dynamic or at least comparatively static analysis to observe how positions of ports have changed due to strategic investment decisions. In this paper, we focus on the latter specifically for the purpose of inland port competitive analysis.

From an empirical perspective, the green port portfolio analysis was earlier applied to a range of inland ports in Europe (Dooms & Haezendonck, 2004; Haezendonck et al., 2006), albeit based on a limited dataset (1997–2001). This preliminary application raised some methodological issues in terms of its interpretation and relevance. For example, it was suggested that in addition to the type and functionality of a port, its ecological performance also depends largely on its position in its network and, more particularly, on the environmental interdependency between seaports and inland ports. The ecological performance of a seaport may indeed rely heavily on the presence of an inland waterway network, a dense railway network and/or dry ports in the immediate hinterland of the seaport. In addition, when considering the green port portfolio of seaports in relation to eco-portfolios of the inland ports to which they are connected through important flows, it could be argued that a trade-off could occur between the environmental friendliness of a seaport and its connected inland ports. In fact, if a seaport for example succeeds in extending the inland navigation link into its hinterland for specific traffic flows and as a result becomes 'greener' according to the green port portfolio analysis, it is likely that the inland port, in such cases often close to the final destination or market of the goods, relies heavily on post road haulage. The inland port then might become 'dirtier' according to a green port portfolio analysis. Given these issues, it was argued that it is more appropriate to benchmark separate networks of seaports and inland ports to draw conclusions on the real environmental competitive position of ports and to best exploit their possibilities of an environmentally friendly hinterland transport. This network or corridor approach is also suggested by the SuperGreen project, an on-going research project under the European Union's 7th Framework Research Programme (http://www.supergreenproject.eu/). However, the analysis of environmental competitive positions at the network or cluster level of organisations is highly complex due to factors such as data asymmetries, potential trade-offs, a lack of information on cluster or network synergies.

Therefore, although suggestions at the level of analysis (terminal, port, port network or cluster) for green port portfolio analysis have not been further developed, we choose to return to the application of the technique to ports or traffic units or specific categories within ports and substantially enlarge our dataset obtained from the initial range of inland ports in the previously mentioned analysis. Instead of a relatively static dataset covering only 5 years of traffic (1997–2001), we have enlarged the dataset encompassing 12 years of data (1999–2010), allowing the execution of a dynamic green portfolio analysis for inland ports over three periods of 4 years. As Haezendonck (2001) suggested, a "dynamic" or in fact comparatively static analysis adds substantially to green competitive positioning analysis or, collectively, green portfolio analysis because such an approach allows port managers, and by extension external stakeholders, to observe how ports succeed in migrating to other quadrants or potentially more favourable positions. This ability may be linked to strategic decisions or investments in different periods preceding the new positions and thus significantly increases the strategic support value of the analysis. In fact, in the context of the port industry, and given its infrastructure-related nature and the complex funding and stakeholder involvement, it may require more than 5 or sometimes even 10 years for strategic decisions or investments, such as new terminals, locks or even port energy or waste management programmes, to have their full effect in terms of an improved economically or environmentally competitive position. As a result, it may cost more time than in other industries or markets to alter or build port competitive advantages reflected in other positions in the port portfolio analysis. A 12-year period may well cover most impacts of strategic decisions, whereas shorter periods are less likely to do so.

Although the value added in this paper is mainly of an applied nature, the paper also provides three more methodological or theoretical contributions. First, through the empirical applications, we demonstrate that inland port portfolio analysis reveals insightful information for strategic decision making in inland port management and that economic positions may change independently from ecological performance. Second, by enlarging the dataset, we are able to observe changing positions over a period where important strategic port investments were possible and port projects could be implemented or have their effect. More specifically, the performance of a hypothetical range of inland ports is put in the context of last decade's evolution, highlighted by the emergence of subharborisation (characterised by the increased delegation/relocation of logistics activities from seaport areas to inland locations; see Notteboom & Rodrigue, 2005) and the interest of both researchers and practitioners in the dry port concept (Cullinane, Bergqvist, & Wilmsmeier, 2012; Padilha & Ng, 2012; Veenstra, Zuidwijk, & van Asperen, 2012). As a result, we find support that competitive advantages may have changed due to strategic decisions, leading to altered competitive positions, at least for some inland ports studied. Third, we suggest, based on our extended analysis, some methodological advances, such as the port network perspective and the inclusion of more ecological parameters in the green dimension, which would benefit future competitive analyses of ports.

The paper is structured as follows. In Section 2, we provide a literature review, discussing the main scientific insights on the functioning of sea- and inland port networks and the challenges they face from both an economic and environmental perspective. Section 3 discusses the methodology applied for the dynamic green portfolio analysis and the inland port environment within which the analysis was conducted. Section 4 presents the results and discussion of the analysis. Sections 5 and 6 conclude the paper and provide managerial and practitioner-oriented conclusions, as well as directions for future research.

2. Literature review

2.1. Intermodalism, containerisation and the challenges for inland ports

The growth in trade over the last decades brought significant changes to the transportation infrastructure. Particularly, growing trade volume and the introduction of the container led to the growth of intermodalism (Fan, Koehler, & Wilson, 2011). The advantages of intermodal trade are crucial to the economy: it reduces overload on the roads, enables environmentally friendly transportation and is more reliable, efficient and safe (Macharis & Verbeke, 2002). van Klink and van den Berg (1998) elaborate the hypothesis that gateways are uniquely well positioned for the enhancement of intermodal transport. Inland locations offering intermodal infrastructure play an important role in the competitiveness of port gateways, leading to various initiatives by stakeholders (seaport authorities, port operators, shipping lines, governments and regional development agencies) to select and develop the most appropriate inland platforms to ensure a sustainable, i.e., economically efficient and environmentally friendly, distribution of port traffic to the hinterland (Charlier, 2010; van der Horst & van der Lugt, 2009). Adams, Quinonez, Pallis, and Wakeman (2009) suggest that creating, enhancing and promoting 'green logistics' has been viewed as an important driver for gaining a competitive advantage and increasing port competitiveness. Sathaye, Li, Horvath, and Madanat (2006) argue that green logistics may be considered an approach for planning freight logistics systems that incorporates sustainability goals with a primary focus on the reduction of environmental externalities.