Journal of Transport Geography 64 (2017) 158–173

Contents lists available at ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo

The relationship between port choice and terminal involvement of alliance members in container shipping

Theo E. Notteboom[a,b,c,d,*], Francesco Parola[e], Giovanni Satta[e], Athanasios A. Pallis[f]

[a] Center for Eurasian Maritime and Inland Logistics (CEMIL), China Institute of FTZ Supply Chain, Shanghai Maritime University, China
[b] Maritime Institute, Faculty of Law, Ghent University, Belgium
[c] Faculty of Applied Economics, University of Antwerp, Belgium
[d] Antwerp Maritime Academy, Belgium
[e] Department of Economics and Business, University of Genoa, Italy
[f] Department of Shipping, Trade & Transport, University of the Aegean, Greece

ARTICLE INFO

Keywords:
Port choice
Vertical integration
Strategic alliance
Container shipping

ABSTRACT

This paper examines in which ways the changing organizational routines of shipping (i.e., alliance formation and vertical integration in container terminal operations) are affecting the selection of ports of call in intercontinental liner service networks. It first provides a conceptual analysis of the interplay between changes (a) in the organizational routines of shipping lines as part of alliances, (b) the organizational routines at the level of terminal operations (i.e. direct carrier equity involvement in terminal operations) and (c) in port calling patterns. The empirical part examines the relationship between port choice of alliance members and the direct involvement of shipping lines in container terminals in North-West European ports. It does so using binary and non-binary data on the evolution of calling patterns on the North Europe-Far East trade from 2006 to 2017. In addition, the changes in both alliance formation during that period and in the container terminal involvement of carriers in North West European ports are addressed. By examining the relationship between port calling patterns of alliances and the terminal interests of alliance members, the paper addresses an under-researched theme in the extant literature on port choice/selection by carriers. The paper is also of value to port managers and shipping professionals in view of port strategy and planning decisions, as well as shipping strategy formulation.

1. Background and rationale of the study

The demand for container handling in seaports has seen strong growth in recent decades. Worldwide container port throughput increased from 88 million TEU in 1990 to approximately 535 million TEU in 2008. After a volume dip in 2009, caused by the economic and financial crisis, growth resumed at a lower growth rate to reach an estimated 691 million TEU in 2016 (Drewry, 2016a). The development of containerization went hand in hand with the creation of global container hubs. The 20 largest container ports handled 312 million TEU in 2015 or almost 45% of the world total (data port rankings compiled by Rotterdam Port Authority). The emerging worldwide container shipping networks reshaped global supply chain practices, supporting the globalization in production and consumption. Containerization has been a key driver of modern economic globalization (for a quantitative approach: Bernhofen et al., 2016; for a qualitative one: Levinson, 2016) and the adoption of new supply chain practices (Notteboom and Rodrigue, 2009; Fransoo and Lee, 2013).

The growing demand for maritime container transport has been met via vessel upsizing. Larger vessels allow shipping lines to benefit from economies of scale at sea, but terminal operators and port authorities are pushed into making significant investments in equipment and nautical accessibility in view of reducing or eliminating potential diseconomies of scale of such large units in port (Tran and Haasis, 2015). The high requirements in terms of the adaptive capacity of ports and terminals (Notteboom, 2016) has triggered a debate on the (fair) distribution of costs and benefits between shipping lines and port operators when deploying ever-larger vessels (Merk et al., 2015). At the same, the number of weekly liner services on the North Europe-Far East trades, the most important East-West route in volume terms, evolved from 35 in 2006, 26 in 2012, 21 in 2015 to only 17 in the second quarter of 2017. Furthermore, the average ship size increased from 6164 TEU in 2006 to over 14,000 in 2017 (data compiled by authors based on online carrier schedules).

The combination of fewer services and larger ships has led to increased competition among container ports to act as a port of call

* Corresponding author at: Center for Eurasian Maritime and Inland Logistics (CEMIL), China Institute of FTZ Supply Chain, Shanghai Maritime University, China.
E-mail addresses: theo.notteboom@ugent.be (T.E. Notteboom), parola@economia.unige.it (F. Parola), giovanni.satta@economia.unige.it (G. Satta), apallis@aegean.gr (A.A. Pallis).

http://dx.doi.org/10.1016/j.jtrangeo.2017.09.002
Received 28 February 2017; Received in revised form 12 July 2017; Accepted 10 September 2017

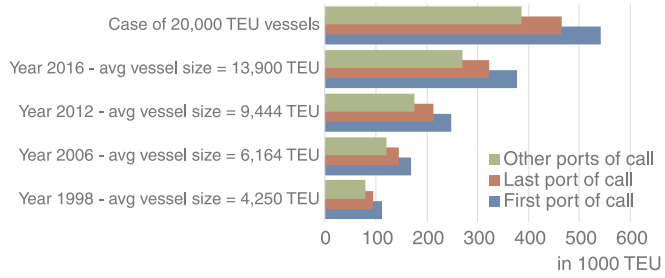

Fig. 1. Liner services on the North Europe – Far East trade, average yearly volume per liner service per port of call in North West Europe (in TEU).
Source: author compilation.

within one or more of these limited number of intercontinental liner services (also called *loops* or *strings*). The stakes are high: a weekly call in one of the services between North-Europe and the Far East now typically generates an annual container volume per port of call of about 300,000 TEU (Fig. 1). A liner service using only ships of 20,000 TEU, i.e. currently the largest container vessels, could bring this figure to an average of some 450,000 TEU per year per port of call.

Meanwhile, market consolidation and alliance formation in container shipping have resulted in a market characterized by a small number of large shipping groups offering joint services on key trade routes. Not only do ports vie for fewer services serviced by larger vessels, they also have to deal with a few carrier groups with a strong bargaining power to play off one port against the other.

Given that the stakes are high, container ports are actively taking several measures to strengthen their competitive position as ports of call in the global container shipping networks. Such measures include investments in infrastructure (e.g. nautical accessibility, quay walls, etc.); "info-structure" (e.g. Port Community Systems); the implementation of commercial strategies in port pricing and land management; and actions aimed at improving the port-hinterland connectivity. Since the late 1990s, several port authorities have developed strategies allowing shipping lines to develop dedicated or semi-dedicated terminals aiming to secure ship calls and the associated maritime container volumes (Notteboom, 2002; Parola and Musso, 2007).

Container shipping lines have become major players in the container terminal market by entering key ports, using shareholdings, joint ventures with local or global terminal operators, sister companies or subsidiaries focused on terminal operations (Parola et al., 2013; Satta and Persico, 2015). The formation of strategic alliances has resulted in a more complex relationship between the terminal involvement of these alliance members and actual port calls (Parola et al., 2014; Satta et al., 2014).

It is thus worth studying how the changing organizational routines of container shipping (i.e., alliance formation and vertical integration to include direct involvement of shipping lines in container terminals) are affecting the selection of ports of call in intercontinental liner service networks. The role of inter-carrier dynamics, and in particular the involvement of carriers in alliances and in container terminals, is an under-researched theme in the extant literature on port choice/selection by carriers. This paper tests empirically to what extent terminal involvement by one or more alliance members influences the decision of the members belonging to the same alliance to include the port as a port of call in one, or more, liner services of that alliance.

First, a conceptual framework is presented assessing the interplay between changes in the organizational routines of shipping lines as part of alliances, changes in the organizational routines at the level of terminal operations (i.e. direct carrier equity involvement in terminal operations and the dedication of terminal services to carriers) and changes in port calling patterns. The empirical part examines the actual relationship between port choice of alliance members and the direct involvement of shipping lines in container terminals in North-West European ports, using data on the evolution of calling patterns on the Europe-Far East trade from 2006 to 2017 in the light of changes in alliance formation during that period and the changes in the container terminal involvement of carriers in North West European ports.

The results draw attention to the role of inter-carrier dynamics and the terminal interests of carriers in explaining the calling pattern behaviour of these shipping lines. In this sense, the paper also has value to port and shipping professionals in view of port strategy and planning decisions, as well as shipping strategy formulation.

2. A literature review on the role of terminal ownership and alliance formation by carriers in port choice

2.1. Factors affecting port and terminal selection

Port selection/choice is a complex process, which has been studied from various perspectives. Most studies dealing with the choice behaviour of shippers and third-party logistics service providers focus on modal choice and carrier selection, instead of port selection (Lam and Dai, 2012). These market players, however, have an impact on port selection, as changes in supply chains force ports and terminals to seek effective integration into these supply chains (Mangan et al., 2008). Song and Panayides (2008) provide a conceptual contribution to the measurement and quantification of such integration efforts. From previous studies, the main selection criteria of logistics companies and shippers can be identified (see e.g. Nir et al., 2003; Tiwari et al., 2003): a competitive price of port services, reliable services, low time costs for goods, cargo security and damage prevention, facilitation through the use of information platforms and good intermodal connectivity to the hinterland.

The direct impact of shippers and other cargo interests on terminal operations depends on the commodity and type of terminal activity. Typically, in the container business, there are no contractual arrangements between terminal operators and shippers (or their representatives such as freight forwarders). The market demand is exerted indirectly via the shipping lines that have contractual arrangements with the terminal operators.

The port choice criteria used by shipping lines are well documented (see literature overviews provided in Lirn et al., 2004; Tongzon and Sawant, 2007; Chang et al., 2008; Wiegmans et al., 2008; and Lam and Dai, 2012), with four distinctive groups of selection factors relevant to shipping lines distinguished in the extant literature; these factors are related to the demand profile of the port or terminal, the supply profile, the market profile and carrier dynamics linked to carrier operations and cooperation.

Fig. 2 conceptualises the port selection process by container lines, combining these four groups of selection factors. The shaded areas refer to decision variables in liner service design. They include the choice on the liner service type (e.g. direct service vs. transhipment), the number and order of port calls, vessel speed, service frequency and vessel size and fleet mix.

From a conceptual point of view, the terminal ownership of shipping lines (or their affiliate companies) and the strategic alliance dynamics among shipping lines belong to the fourth category of port selection factors (see textbox at the bottom right of Fig. 2).

However, existing studies offer limited insights into the impact of the involvement of carriers in alliances and in container terminals on port choice/selection by carriers. A decade ago, Wiegmans et al. (2008) demonstrated that strategic considerations at the company level play a role in port and terminal selection. These strategic considerations include alliance developments and the location of container terminals of the carrier or alliance. Other strategic factors include the fit of the port in the trade (or string), the location of key customers, present contracts with independent terminal operators, and the location of decision makers (head office vs. more regional offices). Along the same lines, Slack et al. (2002) noted that port choice was subject to negotiations among