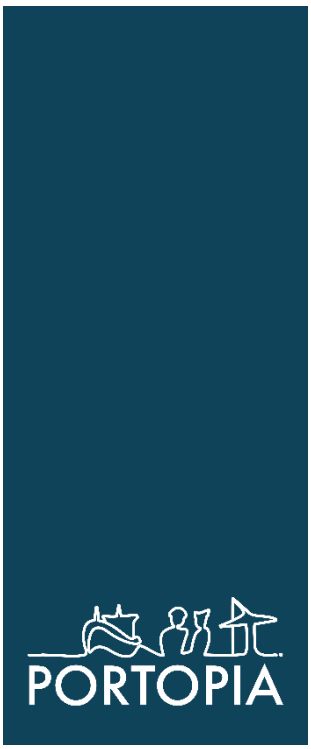

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Deliverable 1.1: State of the European Port System – market trends and structure update

Partim transshipment volumes

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DELIVERABLE 1.1: STATE OF THE EUROPEAN PORT SYSTEM – MARKET TRENDS AND STRUCTURE UPDATE

Partim transshipment volumes

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DELIVERABLE 1.1: STATE OF THE EUROPEAN PORT SYSTEM – MARKET TRENDS AND STRUCTURE UPDATE

Partim transshipment volumes

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DELIVERABLE 1.1: STATE OF THE EUROPEAN PORT SYSTEM – MARKET TRENDS AND STRUCTURE UPDATE

Partim transshipment volumes

Summary Report

Introduction

Deliverable 1.1 (D1.1) is focused on the state of the EU port system and an update on the market trends and structure. This includes four specific tasks:

(1) an update of the traffic forecast of the EU Ports Policy impact assessment

(2) a synthesis of the information regarding container transshipment volumes

(3) the modal split figures of the core TEN-T ports

(4) an approach to integrate intra-European dynamics into the Market Trends and Structure

This deliverable report focuses on (2): a synthesis of the information regarding container transshipment volumes.

DELIVERABLE 1.1: STATE OF THE EUROPEAN PORT SYSTEM – MARKET TRENDS AND STRUCTURE UPDATE

Partim transshipment volumes

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1 POSITIONING OF THIS REPORT IN WP1

The aim of WP1 within the PORTOPIA project is to further develop the PPRISM indicators on market trends and structure and to seek meaningful expansions. The specific objectives of the work package include:

- Improving data availability and comparability of PPRISM indicators
- Collecting and presenting data at a more disaggregated level in terms of goods types and time periods
- Developing new indicators (ratios and indexes)
- Develop forecasts on short, medium and long term developments in port activities in Europe using a combination of techniques (modeling, meta-analysis and survey)
- Incorporation in a European Port Observatory (EPO) with a link between indicators and specific policy targets in the EU transport policy.

Deliverable 1.1 (D1.1) is focused on the state of the EU port system and an update on the market trends and structure. This includes four specific tasks:

(1) an update of the traffic forecast of the EU Ports Policy impact assessment

(2) a synthesis of the information regarding container transshipment volumes

(3) the modal split figures of the core TEN-T ports

(4) an approach to integrate intra-European dynamics into the Market Trends and Structure

This report deals with task (2).

2 DEFINITION OF TRANSSHIPMENT

From a network perspective, the location and function of container terminal facilities is not always guided by the proximity of the terminal/port toward a local/regional hinterland region. Also in Europe, the cargo distribution patterns of container ports not only rely on connecting maritime flows to inland transport modes (road haulage, rail and barge). In a growing number of ports, container shipping lines send their deepsea vessels to intermediate locations between origins and destinations where containers are transshipped between vessels. Thus, container cargo is transshipped by combining/linking two or more liner services. These intermediate nodes are added to a network when considered appropriate by the network operators in view of overall performance of the network. Shipping lines, in fact, aims at increasing the average utilization rate of vessels (i.e. to minimize empty slots onboard), in order to achieve economies of scale and go to break-even.

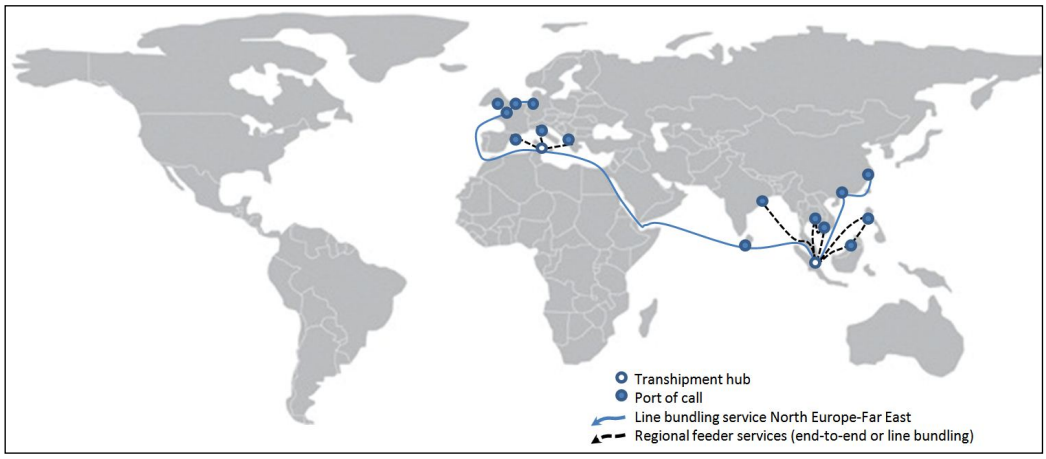
Three forms of sea-sea transshipment exist: hub-and-spoke (hub/feeder), interlining and relay (Figure 1). In all three cases a deepsea vessel discharges containers in the transshipment terminal which is later on (typically 1 to 3 days) picked up by a smaller container ship (feeder) or another large deepsea vessel (relay and interlining). Drewry (2010) estimates that 85% of the global transshipment market is connected to hub-and-spoke operations and 15% to relay/interlining. As we will discuss later in this report, these figures can vary significantly between individual transshipment ports, also within Europe. Originally, transshipment operations were introduced by shipping lines by

adopting the above mentioned hub-and-spoke scheme, for serving small ports holding an insufficient nautical accessibility (e.g., river and/or terminal depth, canal and tidal constraints, etc.) and/or endowment of infra- (e.g., quay length, yard space, etc.) and supra-structures (number and type of cranes, warehouses, rail marshalling yards, etc.). Later on, given the increasing feedering costs, shipping lines progressively introduced other forms of transshipment, i.e. relay and interlining, which do allow to "multiply" the destinations (ports) served, without necessitating the deployment of additional (small) vessels.

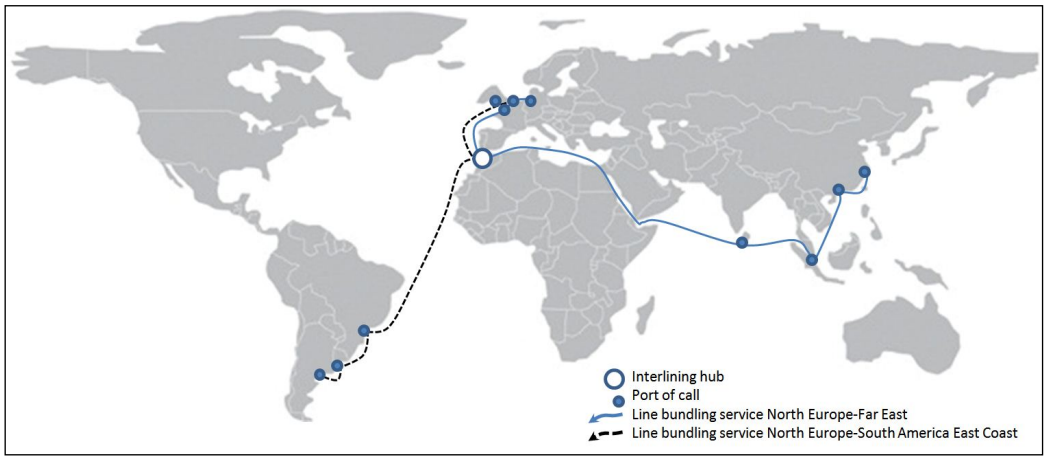
The early transshipment ports started developing in the Far-East since the 1970s/1980s for connecting those countries and regions not directly served by main-haul shipping services. Singapore, Kaohsiung (Taiwan), Busan (South Korea) and, to a lesser extent, Hong Kong (China SAR) were the pioneering ports extensively used by major ocean carriers for transshipping containers. Later on, almost pure transshipment terminals/ports (i.e. with a transshipment incidence of 75% or more) emerged primarily since the mid-1990s within many global port systems: Freeport (Bahamas), Salalah (Oman), Tanjung Pelepas (Malaysia), Gioia Tauro, Algeciras, Taranto, Cagliari, Damietta and Malta in the Mediterranean, to name but a few.

Figure 1: Types of sea-sea transshipment (Source: Ducruet and Notteboom, 2012)

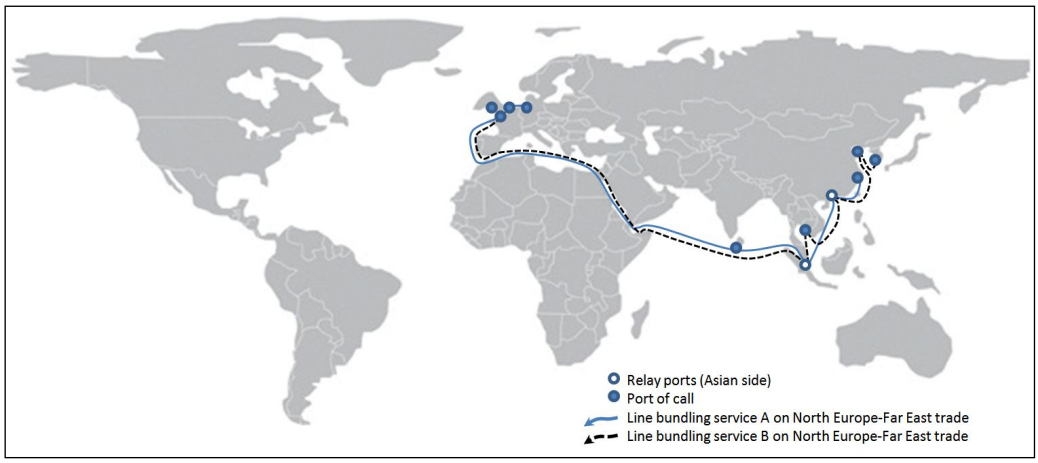
Hub/feeder (hub-and-spoke) network



Interlining



Relay



Source: Ducruet and Notteboom, 2012

These transshipment hubs have a range of common characteristics in terms of nautical accessibility, proximity to main shipping lanes (i.e. low diversion distance from the trunk routes) and ownership, in whole or in part, by carriers or international terminal operators. These nodes multiply shipping options and improve connectivity within the network through their pivotal role in regional hub-and-spoke networks and in cargo relay and interlining operations between the carriers' east–west services and other inter- and intra-regional services. Next to the 'pure' transshipment hubs, there are many ports combining significant gateway cargo flows with a hinterland orientation with transshipment flows. The situation and figures for the European port system will be provided later in this report.

3 A GLOBAL PERSPECTIVE OF THE TRANSSHIPMENT MARKET

The shipping industry has witnessed spectacular growth in container trade, fuelled by the globalization process and the large-scale adoption of the container. Worldwide container port throughput increased from 36 million TEU in 1980 and 88 million TEU in 1990 to about 528 million TEU in 2008 and 623 million TEU in 2012. Around 79% of the world port throughput involved laden containers, about 21% are empty containers. In addition, about 28% of the total throughput consists of transshipped containers. Sea-sea transshipment shows the strongest growth and more than tripled in the last 15 years (Table 1).

Table 1. World container port throughput and its components (million TEU)

Year	Total port throughput	Port-to-port full	Port-to-port empty	Transshipment	Port-to-port full (% share)	Port-to-port empty (% share)	Transshipment (% share)
1990	87.9	70.3	17.8	15.5	80.0%	20.3%	17.6%
1995	145.2	118.8	26.8	31.2	81.8%	18.5%	21.5%
2000	235.4	185.0	50.4	57.9	78.6%	21.4%	24.6%
2005	400.3	319.0	81.3	106.4	79.7%	20.3%	26.6%
2009	481.8	376.9	104.9	137.0	78.2%	21.8%	28.4%
2012	622.6	493.1	129.5	174.6	79.2%	20.8%	28.0%
Incremental growth 2012 vs 1995	328.8%	315.1%	383.2%	459.6%			
Incremental growth 2012 vs 2005	55.5%	54.6%	59.3%	64.1%			

Source: Drewry (2006 and 2013), ITMMA/ESPO (2007).

In particular, South East Asia, Far East, Mid East, Latin America, and North and South Europe appear the most dynamic geographic areas where transshipment operations take place (Table 2).

The world container traffic, the absolute number of containers being carried by sea, has grown from 28.7 million TEU in 1990 to 152 million TEU in 2008 or an average annual increase of 9.5%. The ratio of container traffic over container throughput evolved from 3 in 1990 to around 3.5 in 2008, i.e. a container on average is handled (loaded or discharged) 3.5 times between the first port of loading and the last port of discharge. The growing sea-sea transshipment market is at the core of the rise in the average number of port handlings per box.

Table 2. Estimated container transshipment activity by region (transshipment volumes and incidence)

Region	2000		2007		2012	
	000 TEU	%	000 TEU	%	000 TEU	%
North America	1,908	3.3%	2,774	2.0%	2,670	1.5%
North Europe	6,376	11.0%	13,276	9.6%	14,739	8.4%
South Europe	7,071	12.2%	15,525	11.3%	18,956	10.9%
Far East	14,405	24.9%	37,917	27.5%	48,917	28.0%
South East Asia	16,413	28.4%	35,217	25.5%	44,107	25.3%
Mid East	4,653	8.0%	12,794	9.3%	16,761	9.6%
Latin America	3,970	6.9%	10,926	7.9%	15,181	8.7%
Oceania	160	0.3%	469	0.3%	542	0.3%
South Asia	1,186	2.0%	2,816	2.0%	3,560	2.0%
Africa	1,716	3.0%	4,896	3.6%	8,199	4.7%
Eastern Europe	7	0.0%	1,283	0.9%	1,016	0.6%
World	57,865		137,893		174,648	

Source: authors' own elaborations from Drewry (2008 and 2013).

Container shipping lines have been the key players in setting up liner services centred around transshipment hubs. Liner shipping networks are developed to meet the growing demand in global supply chains. Shippers demand direct services between their preferred ports of loading and discharge. The demand side thus exerts a strong pressure on the service schedules, port rotations and feeder linkages. Shipping lines, however, have to design their liner services and networks in order to optimize ship utilization and benefit the most from scale economies in vessel size. Their objective is to optimize their shipping networks by rationalizing coverage of ports, shipping routes and transit time. Shipping lines may direct flows along paths that are optimal for the system, with the lowest cost for the entire network being achieved by using transshipment nodes in the network.

The establishment of global networks has thus given rise to hub port development at the crossing points of trade lanes. Most of the pure transshipment hubs are located along the global beltway or equatorial round-the-world route (i.e. the Caribbean, Southeast and East Asia, the Middle East and the Mediterranean), see Figure 2.

Figure 2: Global transshipment markets in 2008

Source: Rodrigue and Notteboom, 2010

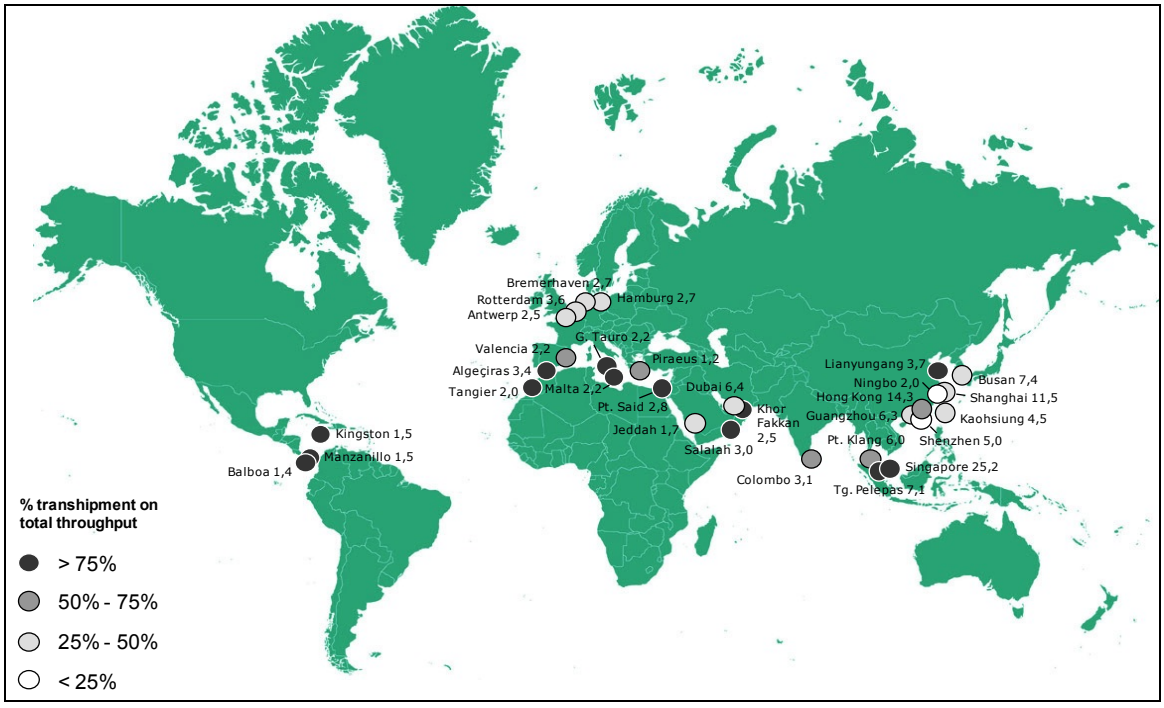
Port sites situated close to strategic passage ways such as the Straits of Gibraltar, the Suez Canal, the Panama Canal and the Malacca Straits act as magnets on the development of transshipment, relay and interlining activities. The creation of

transshipment hubs does not occur in all port systems, but around specific regions ideally suited for maritime hub-and-spoke distribution patterns, thanks to geographical, nautical and market-related advantages.

Some markets seem to offer the right conditions for the emergence of more than one transshipment hub (like the Mediterranean), while other port systems do not feature any transshipment. For example, the port region near the Malacca Straits (Singapore, Port Klang, Tanjung Pelepas) primarily acts as a sea-sea transshipment platform (i.e. mainly hub function not gateway function), whereas for instance the seaport system in the Yangtze Delta (Shanghai, Ningbo, etc.) is a gateway region giving access to vast service areas in the Delta and along the Yangtze River and with a long transshipment incidence. In the US, many impediments in American shipping regulations gravitating around the Jones Act have favored a process of port system development with limited (feeder) services between American ports and the absence of US-based transshipment hubs (Freeport and other ports in the Caribbean to a limited extent take up this role), see Brooks (2009). The hubs have a range of common characteristics in terms of nautical accessibility, proximity to main shipping lanes and ownership, in whole or in part, by carriers or multinational terminal operators.

Most of these intermediate hubs are located along the global beltway or equatorial round-the-world route (i.e. the Caribbean, Southeast and East Asia, the Middle East and the Mediterranean). These nodes multiply shipping options and improve connectivity within the network through their pivotal role in regional hub-and-spoke networks and in cargo relay and interlining operations between the carriers' east-west services and other inter- and intra-regional services. Figure 3 clearly shows the positioning of major hubs along East-West services in the major port regions across the globe.

Figure 3. Main transshipment hubs worldwide: container volumes transshipped in 2011



Source: authors' own elaborations from Drewry (2012).

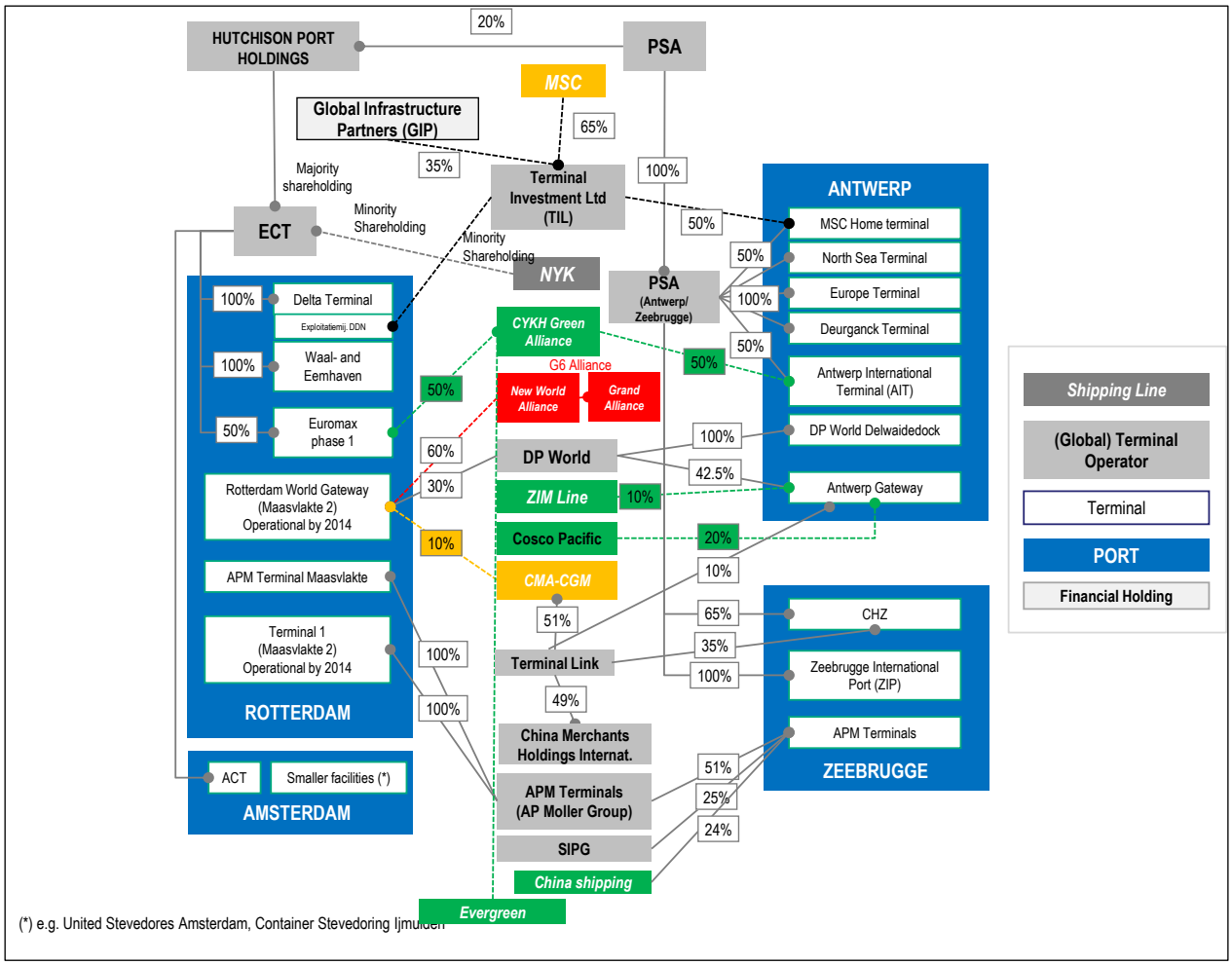
The black dots refer to pure transshipment hubs (transshipment incidence above 75%), the dark grey refers to mixed ports, whereas the other symbols indicate gateway ports having a considerable portion of transshipment traffic. In this regard, in Asia clearly emerge the dominant position of some important gateway ports holding a strong transshipment share (in most cases below 50%), such as Hong Kong (SAR), mainland Chinese ports, besides Pusan (South Korea), Kaohsiung (Taiwan).

Analogously, in North Europe, "historical" load centers like Rotterdam, Antwerp, Bremerhaven and Hamburg hold a key role in transshipment operations for serving UK, Baltic, and Scandinavia. Finally, we find pure transshipment ports, which are strategically located along the trunk routes and therefore minimize the diversion distance: Kingston, Manzanillo and Balboa in Central America, Tangier, Algeciras, Gioia Tauro, Piraeus and Port Said in the Mediterranean, Salalah, and Khor Fakkan in Mid East, and Singapore, Tanjung Pelepas in South East Asia. Some of these pure transshipment hubs were realized as greenfield projects (e.g. Tanjung Pelepas, Salalah, for satisfying the growing demand of container handling in specific geographic areas).

To support the development of transshipment activities in liner service networks the top tier container shipping lines have shown a keen interest in developing dedicated terminal capacity. These dedicated facilities help to better control costs and operational performance and as a measure to remedy against poor vessel schedule integrity (see Notteboom, 2006 and Dullaert et al., 2007 for a discussion on schedule unreliability). Maersk Line's parent company, AP Moller-Maersk, operates a large number of container terminals in Europe (and abroad) through its subsidiary APM Terminals. CMA-CGM (via its 51% share in Terminal Link), MSC (via its 65% stake in Terminal International Ltd), Evergreen, Cosco and Hanjin are among the shipping lines fully or partly controlling terminal capacity around the world. Global terminal operators such as Hutchison Port Holdings, PSA and DP World are increasingly hedging the risks by setting up dedicated terminal joint ventures in cooperation with shipping lines and strategic alliances. Terminal operators also seek long term contracts with shipping lines using gain sharing clauses. The above developments gave rise to a growing complexity in terminal ownership structures and partnership arrangements as demonstrated in Figure 4 for the Rhine-Scheldt Delta.

In academic literature it is often argued that the position of pure transshipment/interlining hubs is vulnerable and that the transshipment market is highly dynamics. First of all, the insertion of hubs often represents a temporary phase in connecting a region to global shipping networks. Hub-and-spoke networks would allow considerable economies of scale of equipment, but the cost efficiency of larger ships might be not sufficient to offset the extra feeder costs and container lift charges involved. Once traffic volumes for the gateway ports are sufficient, hubs are bypassed and become redundant (see also Wilmsmeier and Notteboom, 2010). Secondly, transshipment cargo can easily be moved to new hub terminals that emerge along the long distance shipping lanes. The combination of these factors makes that seaports which are able to combine a transshipment function with gateway cargo typically obtain a less vulnerable and thus more sustainable position in shipping networks than the pure transshipment hubs.

Figure 4. Terminal ownership in the Rhine-Scheldt Delta



Source: Notteboom (2013).

4 DATA COLLECTION ON TRANSSHIPMENT ACTIVITIES IN EUROPEAN PORTS

How can container transshipment data (T/S data) be collected in a meaningful way? During the PORTOPIA workshop with ESPO in Rome on 30 October 2013 it became clear that a number of ports collect transshipment data but long time series are hard to find and methodologies might differ. At a more aggregated level, transshipment data is available via estimates included in studies developed by consultancy firms (cf. Drewry, Dynamar, etc..). Transshipment data per port are rarely ever publicly available per transshipment market (cf. East Med, West Med, UK, Baltic, etc..) and, if figures are available, methodologies (e.g. aggregation of countries) might differ substantially. Also, transshipment data per shipping line are not public. Only liner service routing patterns (supply side) can offer some insight on the relative position of a specific shipping line in the transshipment business of a port.

Participants to the workshop in Rome further made the following observations:

- Sea-sea transshipment data are collected by terminal operators. Most port authorities depend on information from terminal operators to publish T/S data;

- Some port authorities or port organizations publish T/S data on a regular interval. This is for instance the case for Puertos del Estado in Spain;
- The question was raised whether FEPORT could assist in collecting T/S data;
- In general it would be very difficult to get T/S data for hub-feeder and relay operations separately;
- Some workshop participants questioned the relevance of having T/S data: it might be more relevant to collect data on intra-European container flows as a percentage of the total container throughput of a port;
- It was stressed that next to total T/S data you also need to collect data on import, export flows and loaded/empties. The Rapid Exchange System would provide a good basis for the collection of such data;
- It will be very difficult to have a complete picture of the T/S market in the Med as many of the T/S ports are not in an EU member state (Tanger Med, Port Said, Damietta, Ambarli, etc.). This problem would not occur for North European T/S flows;
- Some participants underlined that it would also be useful to collect data on T/S in other cargo groups such as new cars and oil products;
- Data on T/S typically focus on ports that serve as transshipment point. This leads to double counting as each T/S container is counted twice. For many ports it would be interesting to know whether the import or export containers they handle are originating from a transshipment hub or, alternatively, are brought to the port via a direct call. Today these figures are difficult to gather;
- During the discussions it became clear that the e-manifest (linked to the use of Port Community Systems or PCS) could be a great source for getting more information on T/S data.

Based on the above observations, the research team decided to provide a comprehensive picture of the T/S market in the European port system by collecting data from various sources:

- Reports by consultancy firms (Drewry, Dynamar, etc.);
- Academic papers dealing with the T/S market and the role of intermediate locations;
- Data publicly available on websites or publications of port authorities or port organizations.

5 AN OVERVIEW OF THE T/S MARKET IN EUROPE AND IN EUROPEAN PORTS

In Europe, hubs with a transshipment incidence of 85% to 95% can only be found in the Med. Northern Europe does not count any pure transshipment hub. Gateway traffic always goes hand in hand with transshipment activity as the two are combined in each vessel call.

None of the players can look for transshipment in isolation, therefore. Hamburg, one of the North-European leader in terms of sea-sea flows, has a transshipment incidence of about 30% (figure 2012), far below the elevated transshipment shares in the main south European transshipment hubs. Barcelona and Valencia are among the large Med ports combining an important gateway function with significant transshipment flows.

According to MDS Transmodal (2006), sea-sea transshipment in UK ports represented only 7% of total lolo throughput in 2004. All Scottish ports together only handle about 300,000 TEU, a situation leading to significant container flows by truck and rail coming from gateway ports in the south and southeast of the United Kingdom.

5.1 The environmental and business transformations

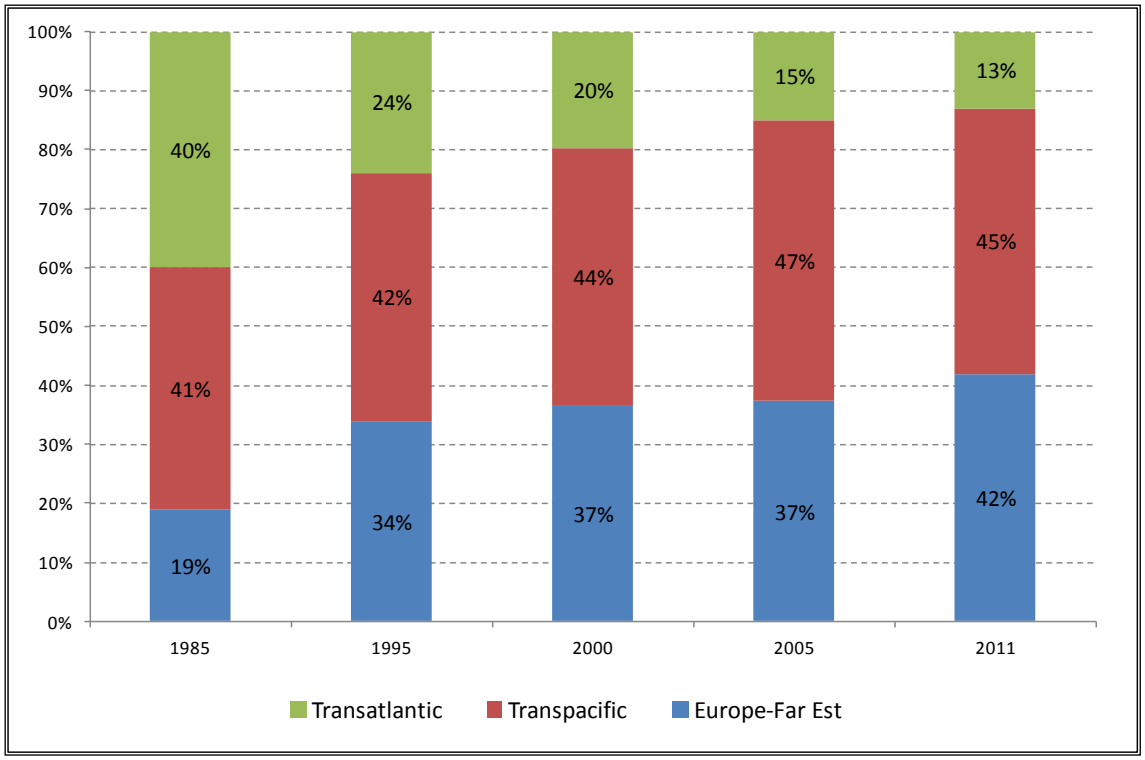
The last few decades have been characterized by profound transformations in the container shipping business as well as in port governance settings and operations. In addition, the changes occurring in the economic environment and in world trade dynamics determined a repositioning of traffic flows and imposed a "re-tuning" of carriers' strategies, in terms of geographic deployment of vessels, achievement of increasing economies of scale, and resort to inter-firm cooperative schemes.

In particular, the transshipment business in Europe has been subject to numerous factors, which progressively changed the geography of trade and provoked new operational and organizational challenges to shipping lines. In essence, the main transformations affecting the transshipment business in North and South Europe can be summarized as follows:

Dramatic traffic growth along the Europe-Far East trade lane; over the last 20 years the economic growth of Far East and the delocalization of production processes in those countries, triggered the growth of trade flows from China, South Korea, Japan, Taiwan, etc. to major European countries. Within the three main deep sea East-West shipping services the Europe-Far East progressively gained traffic raising its share from 18% in 1985 to 42% in 2011 (Figure 5). In 2012 the Europe-Far East and the Transpacific are definitely the two biggest trade lanes, accounting for 20 and 22 million TEUs of traffic (full containers) respectively. As a result of this growth, the Mediterranean basin and its ports recovered their own "centrality" within deep sea trade patterns, thanks to the transit of (almost) all mother vessels via the route Suez/Gibraltar. In this regard, since the late 1980s-early 1990s the development of transshipment operations (and the rise of new hubs like Gioia Tauro and Taranto) had the objective to capture a portion of the growing traffic flow coming from Asia and directed to North European markets.

Expansion of the European (hinterland) market; the progressive enlargement of the EU to other countries and in particular towards East favoured the entry of new markets within international trade lanes. The scarce infrastructural endowment in the ports of those emerging EU countries (e.g., Romania, Bulgaria, Poland, etc.) and in bordering countries (Russia, Ukraine, Turkey, etc.), and the relatively lower (international) trade volumes generated in the initial stages of development in such nations, required the massive introduction of transshipment operations by shipping lines in order to be able to serve the rising markets. Constantza in Romania, Ambarli in Turkey, Gdynia in Poland are just some examples of the greenfield ports acting as transshipment hubs for connecting via feedering a number of minor ports with major deep sea service.

Figure 5. The emergence of Europe-Far East long-haul shipping services: New "centrality" of the Mediterranean



Source: authors' own elaboration from Containerisation International, Drewry (various years).

Emergence of North African ports; differently from gateway port operations (i.e. import/export), which strongly reply on hinterland transportation and the effectiveness of inland transport modes (road, rail and barge) and, ultimately, of the overall transport chain, transshipment volumes present a much higher degree of "contestability". In other terms, a hub port can base its own competitiveness just on a few critical factors, e.g. the geographical position, the operational performance (fast and reliable) and pricing strategy. This is why transshipment volumes can be "delocalized" by shipping lines rather easily from one port to another, even 500/1,000 nautical miles away. More specifically, looking at the situation in the Mediterranean Sea, the pure transshipment hubs are those, which are much more exposed to the volatility of traffic (transshipment) flows, which in turn derives from the potentially easy delocalization of transshipment operations elsewhere. In this regard, since a few years, the hub ports of EU countries in the Mediterranean are experiencing the fierce competition of newcomers located in North Africa, which found their competitive advantage on the following factors: a) cost advantages (lower cost of space and very low wages); b) "legislative" advantages (simplified administrative procedures for FDIs, governmental incentives, etc.); c) geographical position advantages (lower diversion distance respect to the trunk route Suez/Gibraltar); d) physical advantages (deep-water terminals with large backyard spaces). Table 3 provides more details on the major new hub terminals arising in North Africa. Some of them are already fully operational (Tangier), while others are under construction or just in planning (Enfidha). The emergence of these African hubs, of course, is determining a restructuring of transshipment flows within the Mediterranean and it is feeding an "inter-generational" competition between the traditional hubs (born in the 1980s and 1990s) and the latecomers which recently entered into the market (Figure 6).

Growing resort to economies of scale by carriers; as widely known major carriers, given the instability of freight rates and the scarce financial margins, undertook aggressive cost leadership strategies, in order to minimize the average cost per slot onboard. This choice led to the increase of the maximum vessel size on the mainhaul services: in 1996 the biggest container vessel had a capacity around 6,500 TEUs, in 2003 over 8,000 TEUs, in 2006 around 15,000, and since 2013 even 18,000. As economies of scale can be better exploited on the most crowded (in terms of traffic volumes) and longest (in terms of total distance) shipping trade lanes, i.e. East-West deep sea services. In particular, Europe-Far East services (as "end-to-end" services) are much longer of Transatlantic and Transpacific one and, therefore, Mediterranean and Northern European ports are called (at least potentially) by the biggest vessels in operation. This now offers strong opportunities in South and North European markets, as the deployment of bigger vessels increases the need of transshipment operations both in pure hub ports (in the Mediterranean) and large gateway ports (mostly in Northern Europe).

Table 3. The delocalization of transshipment in North Africa: the building of "competing" port capacity

Ports	Terminal Projects	Shareholders	Opening year	Capacity ('000)
Tangier	APM Terminals (T1)	APTM (90%), Akwa (10%)	Sept 2007	1300
	APM Terminals (T3)		>2012	3000
	Eurogate Tanger (T2)	Eurogate (50%), CMA-CGM (30%), MSC (20%)	Oct 2008	1300
	PSA Terminal (T4)	PSA (50%), Marsa Maroc, SNI	>2012	2000
Algiers	DP World Djazair	DPW (100%)	2009	700
Djen Djen	DP World Djazair	DPW (100%)	2009	1500
Port Said	Suez Canal Container Terminal	APTM (55%), Cosco Pacific (45%)	Oct 2004	3000
	SCCT – Phase 2		>2012	3000
	Port Said Container Terminal	Port Said Container and Cargo Handling Company (100%)	1988	900
Enfidha	Container Terminal	Phase 1 (HPH)	2011-2015	2500-4000
		Phase 2	2016-2021	1100
		Phase 3	2022-2030	2000
El Sokhna	El Sokhna Container Terminal	DPW (90%), Amiral Holdings (10%)	Feb 2008	900
Alexandria (El Dhekila)	Alexandria International Container Terminal	HPH (50%), Alexandria PA (50%)	2007	500
Damietta	Damietta Container Terminal	Damietta Container & Cargo Handling Co (100%)	1986	1500
	Phase 2	China Shipping (20%), CMA-CGM (20%), others	>2013	2500

Source: Ferrari et al. (2011).

Growing resort to consortia and strategic alliances by carriers; for smoothing the effects of a potentially dangerous and destructive competition, since the mid-1990s the major shipping line strengthened their involvement in consortia and strategic alliances. The resort to cooperative agreements represents a key building block within the overall strategic framework of carriers. Thanks to consortia and alliances, in fact, shipping lines aim at aggregating demand flows (and reduce investments in megavessels), with the ultimate objective of maximizing ship saturation and go to break even. The development of a multitude of consortia and the building of 2/3 big and rather "stable" strategic alliances (the P3 Alliance, composed by the three giants Maersk, MSC and CMA-CGM, is becoming operational right now) produced a strong concentration of the

demand of container handling in a handful of players. These big players, indeed, massively resorted to transshipment operations (for filling in their big vessels) in the Mediterranean and in North Europe (as well as in Asia and Central America) and frequently (co-)invested in (hub) terminals for better controlling the ports phase. In Europe, as we will see later, we find many examples of carriers which vertically integrate their activities in ports, by taking stakes in some port facilities.

Table 4 provides an overview of the changes in liner services on the Europe-Far East trade for ports in the Hamburg-Le Havre range and the UK. Overall one can conclude that the P3 alliance has not opted to put all 'eggs in one basket': the portfolio of ports includes three ports in the Benelux, three in northern Germany, two in northern France and two ports in the UK. The last column shows the direct involvement or indirect involvement (via a sister company, e.g. APM Terminals vs. Maersk Line) of the P3 alliance partners in terminals. Most ports will face a decline in the number of weekly calls, but the number of services with ships of over 13,000 TEU capacity will increase. It has to be underlined that the services of the P3 alliance are not static: they are expected to be subject to changes every now and then.

Table 4. Impact of P3 alliance on calling patterns in parts of North Europe and link to direct terminal involvement of alliance partners

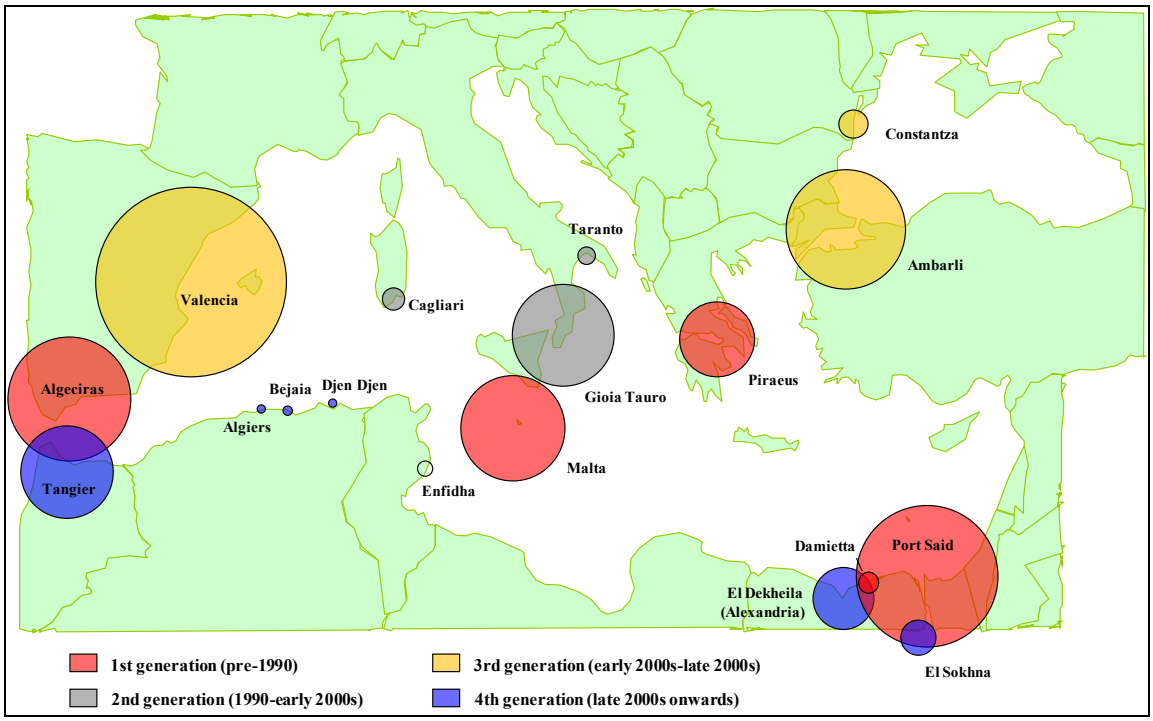
			Total Number of Europe-FE services + (services with ships > 13000 TEU)		
	million TEU 2013	Transhipment incidence (%)	Q3 2014	P3 alliance	Number of alliance partners with terminal ownership or shareholding in port
Antwerp	8.58	29.0%	3 (2)	4 (3)	Two (MSC and CMA CGM)
Rotterdam	11.62	35.9%	8 (4)	4 (4)	All three
Zeebrugge	2.03	25.1%	4 (2)	2 (0)	Two (Maersk and CMA CGM)
Hamburg	9.26	30.0%	4 (1)	3 (2)	None
Bremerhaven	5.83	44.8%	7 (2)	6 (5)	Two (Maersk and MSC)
Wilhelmshaven	0.076	-	1 (0)	2 (2)	None
Le Havre	2.49	16.9%	5 (2)	5 (3)	All three
Dunkirk	0.292	-	1 (1)	1 (0)	-
Felixstowe (*)	3.43	9.1%	6 (2)	5 (4)	None
Southampton (*)	1.56	6.0%	2 (1)	2 (0)	None

(*) = TEU figure for 2012

Source: Notteboom (2014) based on shipping line data.

Economic and trade crisis; as commonly acknowledged the year 2009 was the first "crisis" year within the overall history of the containerization. In 2009 the world throughput collapsed by almost 9%. The weakening of traffic volumes from Far East to Europe (even 20% less) provoked a restructuring of shipping services by carriers in the Mediterranean and in North Europe. As a result, in some cases, direct services (for instance from China to Black Sea) were replaced by indirect services via transshipment hub, thus determining an increase of transshipment activity in some ports. At the same time, however, ocean carriers, because of the strong pressure on their cost structure (which lower profit margins), started to be much more "severe" in the selection of their transshipment hubs. This strategic turn drove some ports to lose important traffic shares (e.g. Gioia Tauro, etc.), suggesting the risk of a progressive marginalization in the long term, also because of the emerging competition from Africa (see Point 3).

Figure 6. The generations of hubs in the Mediterranean basin



Source: Parola (2013).

5.2 The evolution of transshipment operations in North and South Europe

The transshipment incidence for a sample of European container ports for the years 2004, 2008 and 2012 is depicted in Table 5. In the present report we collected data on the major container ports in each EU country, limiting our analysis to those ports showing a substantial and regular transshipment activity over time. As a result, we excluded from the study the ports, which, despite the relevant throughput figures, presented negligible transshipment volumes. Overall, we gathered information (i.e. diversion distance, transshipment incidence, total throughput, transshipment volumes) regarding the main sample of European ports (see Table 5). In a second stage, for performing deeper and more specific analyses, we defined a smaller sample (27 ports), taking into account only the container ports showing a transshipment share above 5% for at least one of the three considered years.

Figures 7 to 9 provide a graphical presentation of the relation between transshipment incidence and the one-way ship diversion distance from the main shipping route to the ports of call in 2004, 2008 and 2012 respectively. First, the analysis of this sub-sample of ports (27) allowed to define a taxonomy based on the distinctions emerging combining the diversion distance of each port with the transshipment incidence. Basically, we defined three types of ports:

(1) the “gateway ports” , which regardless the amount of total throughput values, present a very low transshipment incidence and therefore based almost all their competitiveness on import/export cargo and the commercial relations with the hinterland;
(2) the “mixed ports”, which often unveil rather high throughput volumes (in this category, in fact, we also include the big load centres located in Northern

Europe) and present a valuable, although not dominant, incidence of transshipment activities on the total;

(3) the "pure transshipment hubs", which found almost all their success on sea-to-sea handling operations. Besides, this latter category includes offshore facilities recently constructed in remote and low-cost areas, faraway from populated cities, as for the pure hubs of course there is no need to be connected with a commercial backyard (hinterland).

More specifically, looking at Figures 7 to 9, North Italian ports and UK ports, are predominantly involved in gateway functions. For these ports became therefore critical to achieve a high level of synchronization with the respective hinterland, which may be reached improving and fostering the capacity of inland infrastructure and corridors.

The load centres in the Hamburg-Le Havre range, Barcelona and Valencia act as mixed ports. For this nodes traditional gateway functions did not exclude the development of transshipment activities, which provide further business opportunities for increasing total throughput volumes and provide bundled services (combining gateway handling with transshipment) to main customers. Also in this case, of course, a critical success factor is represented by the availability of reliable and high capacity inland connections, preferably via rail or barge.

Table 5. Transshipment incidence in European container ports (based on throughput in TEU)

Port name	Port range	Diversion distance (nm)	Total TEU 2004	T/S TEU 2004	T/S %	Total TEU 2008	T/S TEU 2008	T/S %	Total TEU 2012	T/S TEU 2012	T/S %
Antwerp	Hamburg-Le Havre Range	135	6063747	1393509	23.0%	8662891	2887881	33.3%	8635169	2504000	29.0%
Zeebrugge	Hamburg-Le Havre Range	65	1196755	293205	24.5%	2209713	575000	26.0%	1953170	490000	25.1%
Rotterdam	Hamburg-Le Havre Range	67	8281000	3296400	39.8%	10783825	2588000	24.0%	11865916	4265000	35.9%
Amsterdam	Hamburg-Le Havre Range	73	51924			436074			68933		
Hamburg	Hamburg-Le Havre Range	85	7003479	2299085	32.8%	9737110	3298000	33.9%	8863896	2659000	30.0%
Bremerhaven	Hamburg-Le Havre Range	10	3469104	1056394	30.5%	5448189	2765000	50.8%	6115211	2750000	45.0%
Wilhelmshaven	Hamburg-Le Havre Range	10	43032			0			23888		
Le Havre	Hamburg-Le Havre Range	95	2131833	645000	30.3%	2488654	750000	30.1%	2303750	390000	16.9%
Dunkirk	Hamburg-Le Havre Range	38	200399			214485			260283		
Rouen	Hamburg-Le Havre Range	215	139200			142035			127528		
St-Nazaire	Atlantic range	330	138854			149281			184838		
Leixos	Atlantic range	65	349495			450026			632673		
Lisbon	Atlantic range	66	514769			556062			485761		
Sines	Atlantic range	66	19211	0	0.0%	233118	115000	49.3%	553063	359491	65.0%
Bilbao	Mediterranean	485	468953	6800	1.5%	557355	13853	2.5%	610131	1134	0.2%
Malaga	Mediterranean	60	245000	225000	91.8%	428623	409759	95.6%	336265	300443	89.3%
Vigo	Atlantic range	100	197269	3700	1.9%	247873	3371	1.4%	198517	8390	4.2%
Sevilla	Mediterranean	167	111092	36	0.0%	130452	0	0.0%	156193	0	0.0%
Bahia de Cadiz	Mediterranean	70	114549	16700	14.6%	126408	1093	0.9%	96215	916	1.0%
Algeciras	Mediterranean	18	2937381	2487609	84.7%	3324364	3164696	95.2%	4070791	3707953	91.1%
Tarragona	Mediterranean	490	17214	1450	8.4%	47415	875	1.8%	188851	102083	54.1%
Barcelona	Mediterranean	555	1910723	571306	29.9%	2569572	997588	38.8%	1749974	435817	24.9%
Valencia	Mediterranean	320	2137137	393921	18.4%	3597215	1578482	43.9%	4469754	2280701	51.0%
Marsaxlokk	Mediterranean	75	1461174	1382819	94.6%	2337000	2174000	93.0%	2540000	2425000	95.5%
Marseille	Mediterranean	650	916277	87000	9.5%	851425	0	0.0%	1062408		0.0%
Genoa	Mediterranean	767	1628594	127030	7.8%	1766605	169560	9.6%	2064806	181128	8.8%
Leghorn	Mediterranean	680	638586	36500	5.7%	778864	41000	5.3%	549047	26506	4.8%
Naples	Mediterranean	463	347500	0	0.0%	481521	0	0.0%	546818	0	0.0%
Ravenna	Mediterranean	1190	169432	0	0.0%	212324	0	0.0%	208162	0	0.0%
Savona	Mediterranean	745	83891	0	0.0%	252837	0	0.0%	75282	0	0.0%
Trieste	Mediterranean	1270	174729	0	0.0%	335943	0	0.0%	408023	0	0.0%
Venice	Mediterranean	1250	290898	0	0.0%	379072	0	0.0%	429893	0	0.0%
Koper	Mediterranean	1270	153347	0	0.0%	353880	0	0.0%	572263	0	0.0%
La Spezia	Mediterranean	730	1040438	72831	7.0%	1246139	85000	6.8%	1247218	91111	7.3%
Gioia Tauro	Mediterranean	473	3261034	2724580	83.5%	3467772	3221000	92.9%	2721000	2548000	93.6%
Taranto	Mediterranean	477	763318	613708	80.4%	786655	677000	86.1%	263461	196398	74.5%
Cagliari	Mediterranean	176	494766	450900	91.1%	307527	217000	70.6%	621536	568705	91.5%
Piraeus	Mediterranean	445	1541563	790822	51.3%	433582	35554	8.2%	2734004	2187000	80.0%
Thessaloniki	Mediterranean	910	336069			238940			317751		
Felixstowe	UK/Ireland	45	2717000	561031	20.6%	3132000	269000	8.6%	3700000	305000	8.2%
Southampton	UK/Ireland	47	1441012	86461	6.0%	1617000	100000	6.2%	1600000	88000	5.5%
Tilbury	UK/Ireland	67	656783			962000			650000		
Thamesport	UK/Ireland	62	632000	34760	5.5%	773000	50000	6.5%	350000	28500	8.1%
Hull	UK/Ireland	290	310000			262000			230000		
Teesport	UK/Ireland	495	133000			155000			260000		
Liverpool	UK/Ireland	640	603000	37386	6.2%	672000	50000	7.4%	650000	52000	8.0%
Aarhus	Scandinavia/Baltic	776	400000			458000			404287		
Gdynia	Scandinavia/Baltic	1340	377236			610767			676349		
Gdansk	Scandinavia/Baltic	1340	43739	2186.95	5.0%	163704	50748	31.0%	928905	560000	60.3%
Szczecin	Scandinavia/Baltic		27680			62913			60000		
Riga	Scandinavia/Baltic	1685	150000			207122			362297		
Tallin	Scandinavia/Baltic	1860	111599			180927			227809		
St-Petersburg	Scandinavia/Baltic	2175	776576			1983110			2524680		
Helsinki	Scandinavia/Baltic	1900	500000			419809			404895		
Kotka (incl. Hamina)	Scandinavia/Baltic	1990	325730			627765			631042		
Gothenburg	Scandinavia/Baltic	660	713439			863881			899628		
Oslo	Scandinavia/Baltic	772	177019			190307			202791		
Constantza	Black Sea	1452	386368	154547	40.0%	1380935	1036000	75.0%	684059	170000	24.9%
Las Palmas	Atlantic range	850	1215277	650000	53.5%	1311745	835094	63.7%	1207962	790232	65.4%

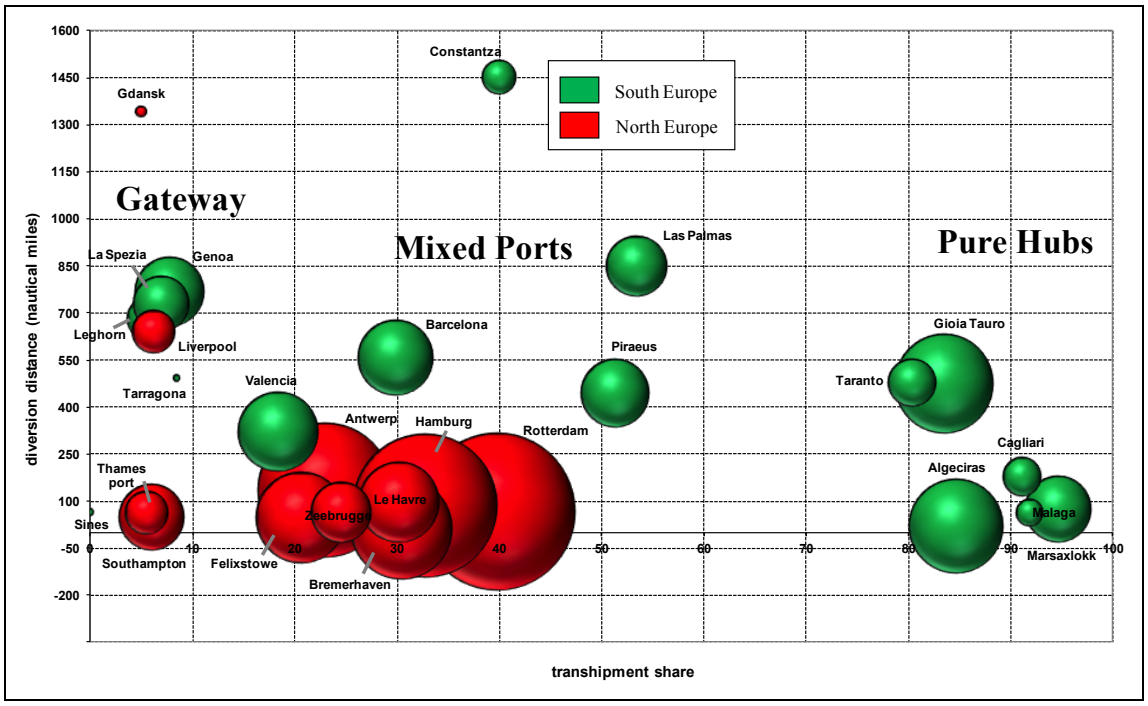
Notes: T/S = transshipment, T/S % = transshipment incidence (share of transshipment in total TEU throughput), diversion distance = one-way distance between main shipping route and port of call

Figures highlighted in red are not confirmed estimates, figures highlighted in yellow are based on secondary sources but not confirmed by the respective ports.

Source: authors' own compilation based on port authority websites, press releases and various specialized reports from Drewry, ITMMA, ISL and Dynamar.

Pure hubs emerge in those places where the hub and spoke and interlining/relay solution ensure competitive advantages respect to direct port calls at mainland ports. In particular, they are located along the trunk route between Suez and Gibraltar, minimizing the diversion distance. Examples of pure hubs in the Mediterranean are Marsaxlokk, Algeciras and Piraeus (started before 1990), Gioia Tauro, Cagliari and Taranto (started in the mid/late 1990s).

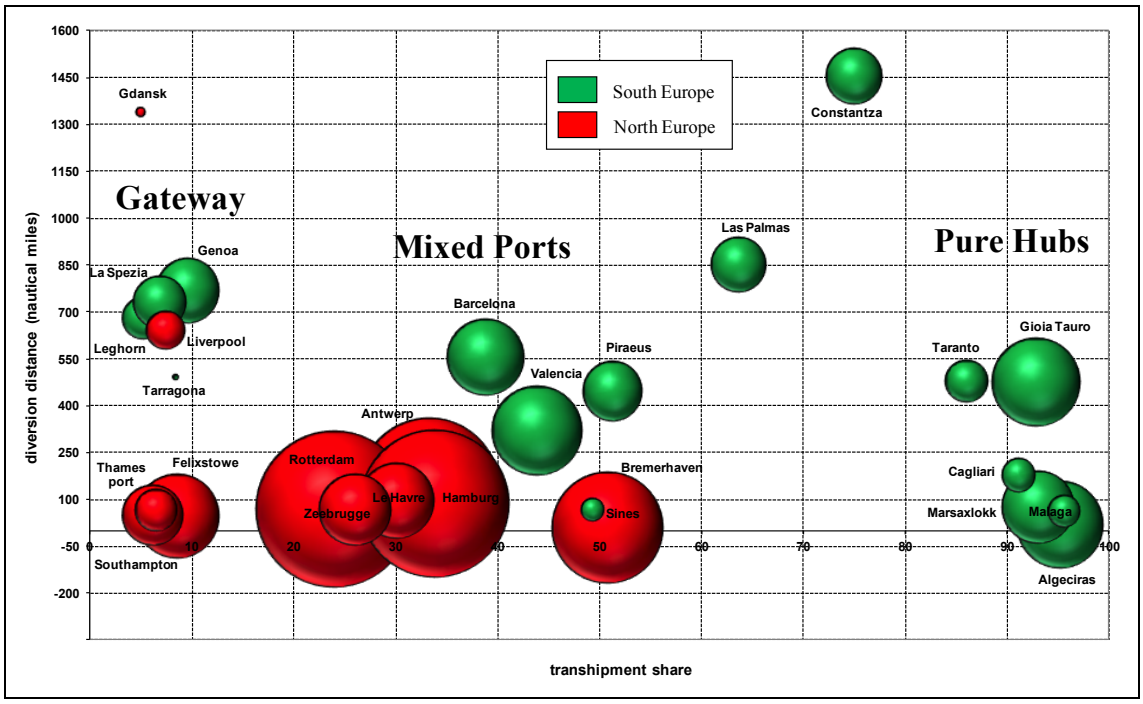
Figure 7. Transshipment incidence vs. diversion distance for a sample of European container ports - year 2004



Source: authors' own elaborations from Drewry (2005), Containerization International, port authority websites and specialized press.

The simultaneous analysis of Figures 7 to 9 allows to investigate the phenomenon assuming a longitudinal perspective, also evaluating main treats and opportunities originating from the transshipment business. Basically, the ports protagonist of transshipment in Europe remain the same within the overall period. Nevertheless, some interesting "shifts" emerge highlighting the active behavior of some new entrants such as Tarragona and Malaga in the South and Gdansk in the North. Transshipment activities, indeed, are proved to be a valuable business opportunities for fostering container traffic and attract additional customers. In this sense, the case of Piraeus is definitely an interesting one. Piraeus' traffic volumes (mostly ensured by transshipment) were decimated by labour disputes over privatisation during 2008, with total throughput falls of 938,000 and 208,000 TEU respectively and an almost total loss of transshipment at Piraeus. Piraeus handled over 900,000 TEU of transshipment traffic in 2003 and over half a million TEU as recently as 2007, but in 2008 that business virtually evaporated. Recovery has been ensured by the privatization of the main container terminal (which opened in October 2009) awarded to Cosco Pacific. In such a way, most transshipment operations of Cosco Container Lines and its partners have been moved to Piraeus. In 2012 the port of Piraeus handled over 2.7 million TEUs, showing a transshipment incidence above 80%.

Figure 8. Transshipment incidence vs. diversion distance for a sample of European container ports - year 2008



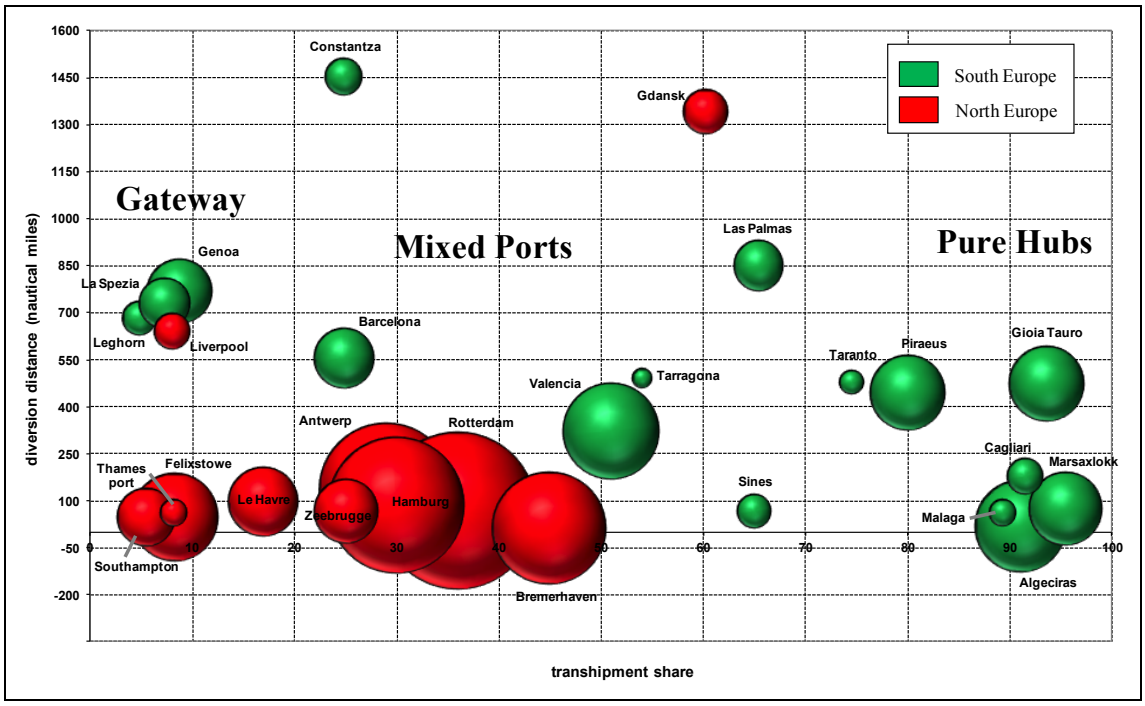
Source: authors' own elaborations from Drewry (2009), Containerization International, port authority websites and specialized press.

Main data provided in this study, indeed, demonstrate how ports relying on a dominant transshipment share seem to be affected by a higher volatility, which originates from "up and down" trends of container growth/decline (2009 trade crisis) as well as the emergence of new entrants to the transshipment market, especially in North Africa (Rodrigue and Notteboom, 2010). See also Section 5.1, Points 3 and 6.

In fact, as the container port system may be triggered to support direct and end-to-end or line bundling service that bypass transshipment hubs the insertion of specific hubs into the overall network may just constitute a provisional stage. In other terms, in specific environmental contexts a hub can even become a redundant node in the network. In addition, transshipment hubs are exposed to changes in traffic volumes, originating from new entrants in the market that inevitably lead to transformations in the distribution of transshipment volumes among an increasing number of players and nodes. Under this perspective, some Italian ports such as Gioia Tauro and Taranto and other ports like Constantza experienced some commercial troubles with major customers and this has been translated into traffic loss, also accelerated by to the new competing hubs from North Africa.

Overall, the main conclusion is that the market is very different in North and South Europe: in the North in fact, transshipment is organized in a different way respect to Mediterranean Sea. In Northern Europe, in particular, no real transshipment hubs exist in the Hamburg-Le Havre range. The main ports of the area, in fact, although they handle very significant transshipment volumes (in TEU terms), they primarily act as load centres. They unveil a lower transshipment incidence respect to the high transshipment share characterizing main South European hubs (Rodrigue and Notteboom, 2010).

Figure 9. Transshipment incidence vs. diversion distance for a sample of European container ports - year 2012



Source: authors' own elaborations from Drewry (2013), Containerization International, port authority websites and specialized press.

Table 6 identifies the main markets served and the main shipping lines involved in the transshipment business in each port (situation 2012). According to their geographic position within global shipping services transshipment ports have diverse foreland markets to be served. Off-shore ports, which do not have any substantial gateway traffic component, are often devoted to relay and interlining operations. Las Palmas, Algeciras and Malta are good examples in that respect, although they still perform important hub-and-spoke operations via feedering services. In North Europe, load centres like Antwerp, Rotterdam, Hamburg and Bremerhaven traditionally have an important hub-and-spoke function in serving a lot of countries, e.g. UK, Baltic and Scandinavia. Conversely, the (smaller) gateway ports located in the Mediterranean Sea, e.g. Genoa, La Spezia, Barcelona serve much more limited and specific geographic areas via feedering and handle modest transshipment volumes. Analogous comments can be made for UK ports, such as Southampton, Liverpool and Felixstowe, whose transshipment function is basically limited to their own country.

Table 6. Main markets served and shipping lines involved in the transshipment business in the major ports.

Port	Range	Transshipment incidence on overall container traffics	Main markets served	Main players involved in transshipment operations
Las Palmas	Atlantic range	65.4%	Relay and interlining	MSC
Sines	Atlantic range	65.0%	Relay and interlining	MSC
Constantza	Black Sea	24.9%	Black Sea	#N/A
Antwerp	Hamburg-Le Havre Range	29.0%	UK and Baltic / Scandinavia	MSC, CMA-CGM, Cosco Lines, Hanjin, K-Line, Yang Ming Line, Zim
Bremerhaven	Hamburg-Le Havre Range	45.0%	Baltic / Scandinavia	Maersk, MSC
Hamburg	Hamburg-Le Havre Range	30.0%	Baltic / Scandinavia	Hapag-Lloyd
Le Havre	Hamburg-Le Havre Range	16.9%	UK	Maersk, CMA-CGM
Rotterdam	Hamburg-Le Havre Range	35.9%	UK and Baltic / Scandinavia	Maersk, Cosco Lines, Hanjin, K-Line, MSC, Yang Ming Line
Zeebrugge	Hamburg-Le Havre Range	25.1%	UK	Maersk, CMA-CGM
Algeciras	Mediterranean	91.1%	Relay and interlining	Maersk, Hanjin
Barcelona	Mediterranean	24.9%	West Mediterranean	#N/A
Cagliari	Mediterranean	91.5%	Central and East Mediterranean	#N/A
Genoa	Mediterranean	8.8%	Central Mediterranean	#N/A
Gioia Tauro	Mediterranean	93.6%	Central and East Mediterranean	Maersk
La Spezia	Mediterranean	7.3%	Central Mediterranean	MSC
Leghorn	Mediterranean	4.8%	Central Mediterranean	MSC
Malaga	Mediterranean	89.3%	Relay and interlining	#N/A
Marsaxlokk	Mediterranean	95.5%	West Mediterranean, interlining	CMA-CGM
Piraeus	Mediterranean	80.0%	East Mediterranean	Cosco Group
Taranto	Mediterranean	74.5%	Central and East Mediterranean	Evergreen
Tarragona	Mediterranean	54.1%	Relay and interlining	ZIM
Valencia	Mediterranean	51.0%	West Mediterranean	MSC
Gdansk	Scandinavia/Baltic	60.3%	Baltic / Scandinavia	Maersk Line
Felixstowe	UK/Ireland	8.2%	UK	#N/A
Liverpool	UK/Ireland	8.0%	UK	#N/A
Southampton	UK/Ireland	5.5%	UK	#N/A
Thamesport	UK/Ireland	8.1%	UK	#N/A

Note: #N/A = no data available or no specific main player in the port's T/S business

Source: authors' elaboration from Drewry (2013), corporate and port authority websites, and specialized press.

The analysis of the main shipping lines calling transshipment ports reveals a certain degree of "specialization" and "fidelization". In other terms, carriers seems to carefully select their "pivot" points along main shipping services and calibrate their effort (e.g. number of calls per week, average vessel size, etc.) in the reason of the relative importance of each specific hinterland market to be served. Maersk Line, for instance, is based in Algeciras, Rotterdam, Bremerhaven, Le Havre and Zeebrugge and therefore show a highly diversified approach. MSC operates, among others, in Antwerp (which "de facto" is the operational main headquarters of MSC worldwide) and Bremerhaven in North Europe, and in Valencia, Leghorn, La Spezia in the Mediterranean. Evergreen operates in Taranto, Cosco in Piraeus, while CMA-CGM in Malta, Marseille, Le Havre and Antwerp.

Table 7 includes data on carriers' investments in hub terminals, showing the entry patterns in each port (year of entry) and the equity throughput currently (2011) handled by each shareholder (i.e. a carrier) in its own terminals.

Table 7. Carriers' investments in hub terminals in Europe.

Ports	Country	Total throughput (2012)	Transshipment incidence (2012)	Entry patterns (carriers investment year)	Current investors (carriers) and equity throughput in '000 TEU (2011)
Algeciras	Spain	4,070,791	91.1%	Sealand (1975), Maersk (1986) and Hanjin (2010)	APM Terminals (3.096); Hanjin (612)
Antwerp	Belgium	8,635,169	29.0%	MSC (2004), APM Terminals (2005), CMA-CGM (2005), Cosco Group (2005), Hanjin (2006), K-Line (2006), P&O Nedlloyd (2005), Yang Ming Line (2006), Zim Ports (2008)	MSC (2.302), CMA-CGM (95), Cosco Group (238), Hanjin (66), K-Line (66), Yang Ming Line (66), Zim Ports (238)
Bremerhaven	Germany	6,115,211	45.0%	Maersk (1999), MSC (2005)	APM Terminals (1.717), MSC (850)
Gioia Tauro	Italy	2,721,000	93.6%	APM Terminals (2002)	APM Terminals (754)
Hamburg	Germany	8,863,896	30.0%	Hapag-Lloyd (2001)	Hapag-Lloyd (693)
La Spezia	Italy	1,247,218	7.3%	MSC (2000)	MSC (428)
Las Palmas	Spain	1,207,962	65.4%	MSC (2000)	MSC (278)
Le Havre	France	2,303,750	16.9%	MSC (2001), CMA-CGM (2003), APM Terminals (2007)	APM Terminals (135), CMA-CGM (529)
Leghorn	Italy	549,047	4.8%	MSC (2001)	MSC (84)
Marsaxlokk	Malta	2,540,000	95.5%	CMA-CGM (2004)	CMA-CGM (984)
Piraeus	Greece	2,734,004	80.0%	Cosco Group (2009)	Cosco Group (1.188)
Rotterdam	Netherlands	11,865,916	35.9%	Sealand (1993), Maersk (1999), Cosco Container Lines (2008), Hanjin (2008), YML (2008), K-Line (2008), NYK (2009), MSC (2011)	APM Terminals (2.371), Cosco Container Lines (234), Hanjin (234), K-Line (234), MSC (400), Yang Ming Line (234)
Sines	Portugal	553,063	65.0%	MSC (2011)	MSC (222)
Taranto	Italy	263,461	74.5%	Evergreen (2001)	Evergreen (245)
Tarragona	Spain	188,851	54.1%	ZIM Ports (2008)	ZIM Ports (96)
Valencia	Spain	4,469,754	51.0%	MSC (2006)	MSC (1.558)
Zeebrugge	Belgium	1,953,170	25.1%	CMA-CGM (2005), APM Terminals (2006)	APM Terminals (432), CMA-CGM (188)

Source: authors' elaboration from Drewry (2012), corporate and port authority websites, and specialized press.

The outcomes unveil a massive presence of Maersk Line, through the sister company APM Terminals (commonly considered a hybrid operator, because it looks for third-party traffic as well), MSC, CMA-CGM and Cosco (either through Cosco Lines or Cosco Pacific). In the Mediterranean Sea carriers mostly invest in terminals for controlling pure transshipment hubs, often via wholly owned subsidiaries (WOS) or partially owned subsidiaries: CMA-CGM in Malta (100% share), Cosco in Piraeus (100% share), Evergreen in Taranto (initially 66% share, later increased up to 90%, and finally progressively reduced to around 40% share), APM Terminals in Algeciras (100% share).

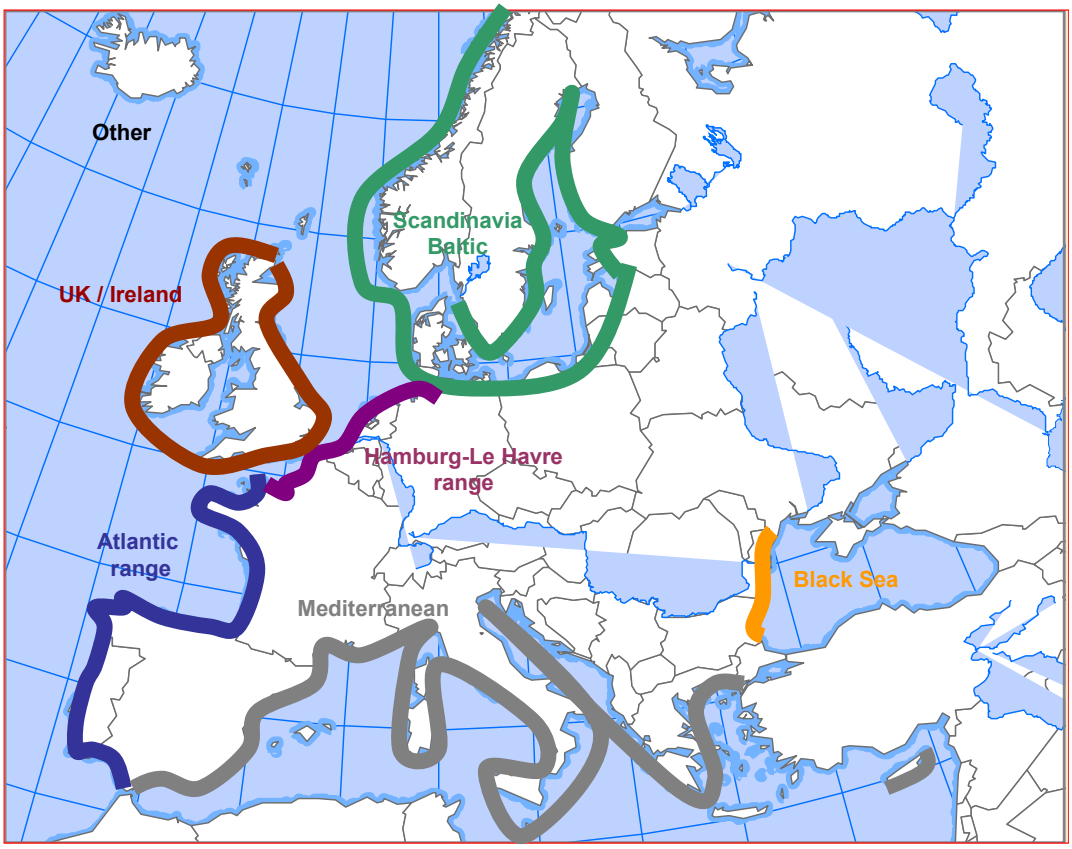
In North Europe, as already mentioned, carriers mostly utilize big gateway ports for transshipment operations as well. In this regard, mega terminals requiring enormous investments are often involved in such kind of "mixed" activities. Indeed, in North Europe the need for handling capacity is much bigger and the space available is scarce, as it is difficult to get offshore areas. As a result, carriers given the above constraints are forced to share the terminal capacity, by co-investing in the same facility. The "consortium" formula (composed by one top pure stevedore plus a handful of carriers) is becoming very common in North Europe for managing big port infrastructures: the Deurgangdock terminals and the new facilities at the Maasvlakte II are clearly an example of the joint commitment of shipping lines in terminal equity and management.

6 DISCUSSION AND EXPECTATIONS FOR THE FUTURE

6.1 Overall transshipment incidence in Europe and European port ranges

In this section we present overall estimates of the transshipment incidence in Europe and European port ranges based on the data gathered and presented in Table 5. The base years are 2004, 2008 and 2012. The figures are somewhat different from the figures presented by Drewry (see table 2) as we only focus on EU ports. Figure 10 presents the port ranges considered.

Figure 10. European port ranges

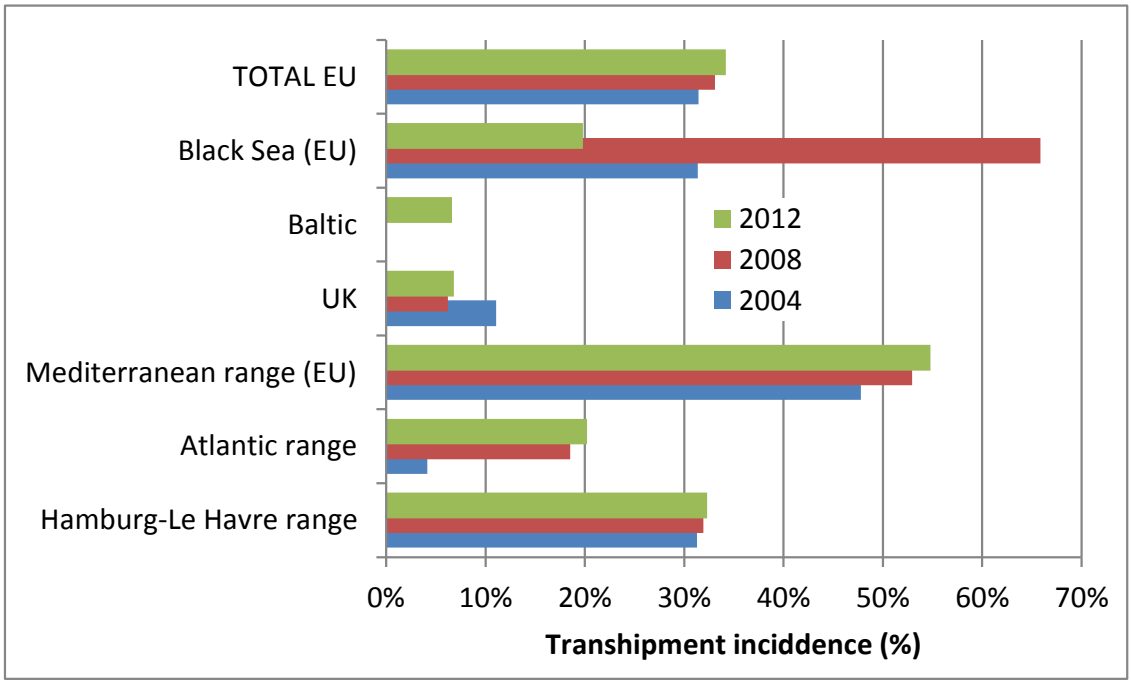


Source: authors.

The total transshipment incidence in the EU port system reached 34.2% in 2012 compared to 31.4% in 2004. Figure 11 confirms the earlier main conclusion that the market is different in North and South Europe. The Med range (we only consider EU ports) has the highest transshipment incidence, i.e. 54.8% in 2012, mainly due to the existence of almost pure transshipment hubs. The transshipment flows in the Hamburg-Le Havre range are generated by ports with very substantial gateway flows. The other port ranges in the EU have a much lower transshipment incidence. The transshipment incidence is growing in all port ranges, except for the UK. The most remarkable growth is observed in the Baltic: the transshipment incidence reached 6.6% in 2012 (almost as high as in the UK), mainly due to the Gdansk effect. Figure 12 presents the shares of the port ranges in total EU transshipment flows. The Med range

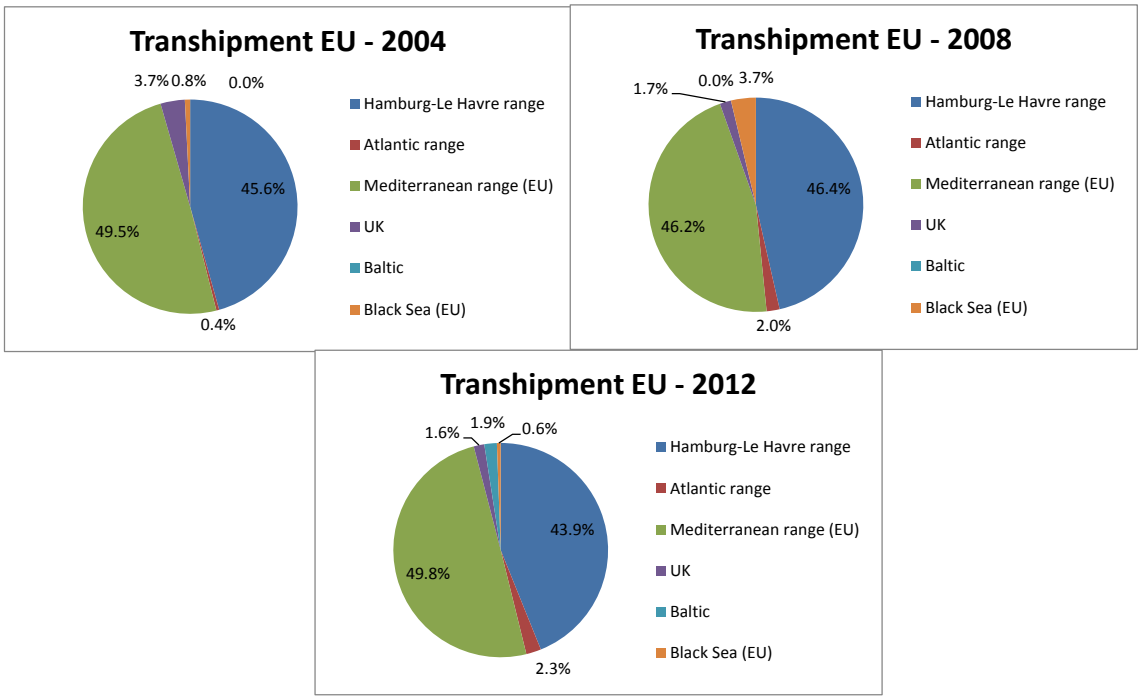
(EU ports only) is the largest transshipment market in Europe closely followed by the Hamburg-Le Havre range.

Figure 11. Transshipment incidence in European port ranges, 2004 - 2008 - 2012



Source: authors.

Figure 12. Share of port ranges in transshipment flows of the European port system, 2004 - 2008 - 2012



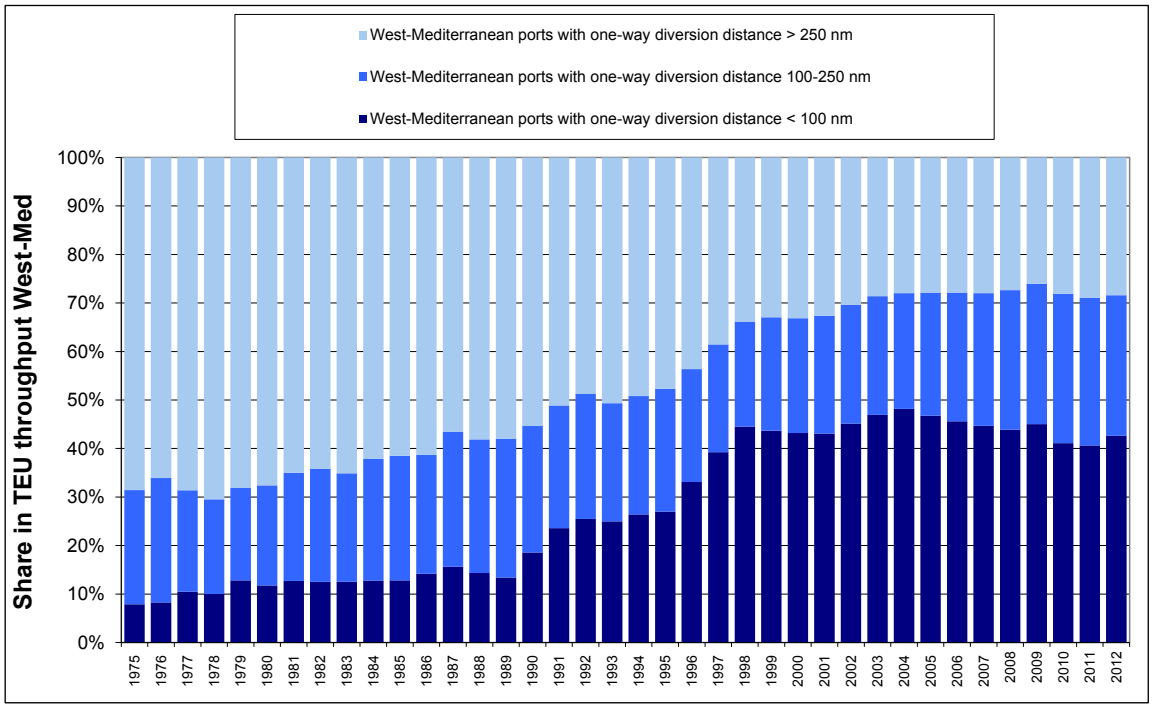
Source: authors.

6.2 The Mediterranean and Black Sea

In the Mediterranean, extensive hub-feeder container systems and shortsea shipping networks emerged since the mid-1990s to cope with the increasing volumes and to connect to other European port regions. Before that time, Mediterranean ports were typically bypassed by vessels operating on liner services between the Far East and Europe. Terminals at the transshipment hubs are typically owned, in whole or in part, by carriers which are efficiently using these facilities. Marsaxlokk on Malta, Gioia Tauro, Cagliari and Taranto in Italy and Algeciras in Spain act as turntables in a growing sea-sea transshipment business in the region.

While quite a number of shipping lines still rely on the hub-and-spoke configuration in the Med, others decided to add new liner services calling at mainland ports directly. In reaction, mainly Italian transshipment hubs have reoriented their focus a bit, now also serving Central and East Med regions. The net result of the above developments has been a slight decrease in the market share of the West Med hubs in recent years and a growth in the market share of mainland ports located between 100 and 250 nautical miles from the main maritime route (Figure 13). The transshipment business remains a highly footloose business. This has led some transshipment hubs such as Gioia Tauro and Algeciras to develop inland rail services to capture and serve the economic centres in the distant hinterlands directly, while at the same time trying to attract logistics sites to the ports.

Figure 13. The market shares of container ports in the West Mediterranean. Ports grouped according to the diversion distance from the main shipping route (1975-2012)



Source: updated from Notteboom (2009) based on aggregation of statistics of the respective port authorities.

Non-European ports have an increasing impact on the European container port system. The non-European competitors of the Italian transshipment hubs (Gioia Tauro, Taranto, Cagliari), Marsaxlokk on Malta and Piraeus in Greece are mainly found in Turkey (Ambarli, Mersin, etc..) and close to the entrance of the Suez Canal in Egypt

(Port Said, Alessandria, Damietta). These ports have developed a strong market position to serve the East Med and increasingly act as turntables for the Black Sea at the expense of Black Sea ports, such as Constantza.

The port of Constantza recorded a throughput of 684,059 TEU in 2012, still far from the record of 1.4 million TEU in 2007. Early on in its development, Constantza was very much seen as the transshipment gateway for the Black Sea and reached a transshipment incidence of some 75% in 2008. However, times have changed quite significantly as traffic patterns in the region have evolved. When the crisis hit, many container lines changed their liner services in search of cost-efficient logistic solutions. A number of direct services from the Far East into the Black Sea region were cancelled, negatively affecting transshipment volumes. As a result, in 2012 almost three-quarters of the volumes handled at the port consisted of local import and export containers, with the remaining quarter being transshipment. Still, Constantza handles the largest vessels operated in the Black Sea (some 8,000 TEU). Terminal productivity plays an important role in the future development of container terminals in the Black Sea region, where operators in both Ukraine and Russia such as Odessa and Novorossiysk are trying to attract both transshipment and import/export business.

The growing container terminal market in the Maghreb countries increases competition in the Med region, but at the same time opens new growth opportunities for existing European transshipment hubs and gateway ports in the Med. Algeciras (stronghold of APM Terminals of the AP Moller Group) relies a lot on east-west and north-south interlining and is facing competition from Tanger Med where APM Terminals has also set up business. Tanger Med is hoping to bring in dividends from factory delocalization movements to Maghreb countries, particularly to Morocco. Other major port developments are planned in Algeria and Tunisia. Cargo activity in the port of Algiers has strongly increased in recent years in line with Algeria's strong oil revenue figures. The Algerian government has developed a policy to upgrade the Algerian ports and improve terminal performance. The port of Djendjen is being positioned as a deepwater port for large container ships. The management of the Port of Algiers and that of Djendjen has been privatized allowing a strong involvement of DP World. There are still plans being implemented to transform the deepwater port of Enfidha in Tunisia into a major Central Mediterranean transshipment hub and a prime economic and logistics activity zone. Construction would be phased. Libya has no ports with dedicated container handling facilities yet. There were some initial ideas to develop a deepwater container terminal in Misurata but these have been halted during the Arab Spring.

As mentioned earlier, North African countries are trying to step in the transshipment business for progressively being an active player in international trade networks. Like what happened in Italy from the mid-1990s thanks to the development of Gioia Tauro, Taranto and Cagliari, the objective is to start "stopping" vessels from Asia for attracting cargo and partially deviating container volumes from traditional European ports. In addition, the launching of Free Trade Zones (FTZ) initiatives like in Tangier (Morocco), might stimulate local economic growth and attract foreign direct investments, thus boosting additional traffic growth. In this respect the aggressive strategic behavior of North African countries seems to go in contrast with the expectations of European gateway ports, which prefer direct calls from Asia instead of indirect services via (foreign) hub. Relatedly, we also have to recognize that the privatization of most ports in the Mediterranean (turning to the landlord system) coupled with the large involvement of carriers in such "low cost" facilities, seems to reasonably reduce to bargaining power of European Port Authorities in affecting the geography of trade and container shipping flows.

6.3 The Baltic

Major ports in the Hamburg-Le Havre range such as Rotterdam, Hamburg, Bremerhaven, Antwerp and Zeebrugge are not only competing amongst themselves to attract Baltic container transshipment volumes. They are increasingly facing competition from Scandinavian and Baltic ports that want to attract more direct mainline ships calls even on the Europe-Far East route. The competition for Baltic transshipment cargo is likely to increase given the moderate growth prospects for the direct hinterlands of the ports in the Hamburg-Le Havre range and significant port capacity additions (Maasvlakte II in Rotterdam, JadeWeserPort in Wilhelmshaven and planned extensions in the port of Gdansk, to name but a few). The transshipment business is a key component of ports' and terminal operators' strategies to fill capacity.

The connectivity of the Baltic region to overseas trading areas still primarily relies on feeder services to hub ports in the Le Havre-Hamburg range. The existing symbiotic relationship between the Baltic port system and the main ports in the Le Havre-Hamburg range (Hamburg, Rotterdam and Bremerhaven in particular) is a prime example of how ports in different regions can actively deploy their mutual dependence. In the last couple of years, terminal development in the Baltic Sea is characterized by scale increases in terminal surfaces and equipment. For example, the port of Gdansk in Poland is equipped to handle large container vessels and receives calls from Maersk Line using 14,000 TEU vessels, notwithstanding the fact that a very substantial share of the ports' container volumes is feedered from the Le Havre-Hamburg range. Also other Baltic ports are gearing up to welcome more direct calls of mainline vessels. This is particularly felt in the port system at the entrance of the Baltic (Kattegat/The Sound) and in St-Petersburg (i.e. the largest and fast growing container port in the Baltic with 2.52 million TEU handled in 2012). Ports like Gothenburg and Aarhus are already acting as regular ports of call on quite a few intercontinental liner services. While these ports have a good position to act as turntables for the Baltic on many trade routes, the insertion of these ports as regular ports of call on the Europe-Far East trade remains uncertain. The large vessel sizes deployed on this route, the associated reduction in the number of ports of call and the additional diversion distance make regular direct calls to the multi-port gateway region Kattegat/The Sound less viable compared to other trade routes. The P3 Network, the alliance between Maersk Line, MSC and CMA-CGM, plans to include Gdansk and Aarhus in its rotation for the BALTIC service with ships of 14,000 TEU while Gothenburg will act as a port of call in the SKAW service with ships of 13,000 TEU. Since August 2013 the 18,000 TEU Triple E vessels of Maersk Line call at DCT Gdansk in Poland. With a throughput of over 1 million TEU in 2013, the port has ambitious plans to ultimately expand the terminal's annual capacity to around 4 million TEU. The port is even challenging the established notion of 'Hamburg-Le Havre range' by proposing the notion of 'Gdansk-Le Havre range'. Also smaller ports in the region are participating in the competitive game: e.g. TIL, partly owned by MSC, recently opened a new deepwater facility in the port of Klaipeda in Lithuania.

Quite a few ports in the Hamburg-Le Havre range continue to focus on the Baltic as a key market for the future. The healthy projected volume growth in Eastern Europe and the increasingly important Russian markets attract the attention from these ports. Hamburg remains the undisputed leader in transshipment flows to/from the Baltic with more than 150 sailings a week. However, Hamburg faced a difficult situation at the start of the global crisis as cargo volumes to the Baltic declined steeply due to a partial move of these feeder volumes to the western ports in the range, such as Zeebrugge and Rotterdam. This partly contributed to Hamburg's container cargo decline of 28% in 2009. Hamburg reacted in early 2010 by introducing a new pricing system, which

rewards carriers with large transshipment volumes. Gradually transshipment volumes moved back to Hamburg, supporting the volume recovery in the port.

Newcomer Wilhelmshaven is actively pursuing transshipment business, given that it can yield volumes more quickly than gateway traffic, which is a much slower to attract to a new port. Note that rail services have been established primarily using in-house rail/intermodal firms, and prices to/from Wilhelmshaven and inland points have been matched with those to/from Hamburg and Bremerhaven to the same inland destinations. The P3 Network has announced that Wilhelmshaven will be served directly on two Europe-Asia loops: the ALBATROS service (vessels of 18,000 TEU) and the SHOGUN service (13,000 TEU). Not only newcomers such as Wilhelmshaven are shaping the competitive battleground for transshipment cargo in North Europe. Massive capacity reserves and extensions in Rotterdam (i.e. two new terminals at Maasvlakte II to come on stream in 2014), Zeebrugge (i.e. PSA's ZIP terminal open since 2012 while APM Terminals still has a lot of capacity available on its facility) and other ports in the region will lead to a strong buyers' market in the foreseeable future with a pressure on transshipment cargo handling rates and high requirements on terminal productivity and vessel turnaround time.

6.4 The UK/Ireland

The above discussion on the hub-feeder option versus the direct call option also applies to the UK port system. The mainland European ports active in this market segment are primarily Rotterdam, Zeebrugge, Antwerp and Le Havre, while Dunkirk and the North German ports play a more modest role. Most shipping lines and strategic alliances among them serve the southeastern part of the UK directly via the ports of Felixstowe, Southampton, Thamesport and Tilbury while Liverpool plays a role in trans-Atlantic services. The rest of the UK including Scotland is mainly served via feeders and intra-European services. Since mid-2013 the combination of bigger ships, larger alliances and the new London Gateway terminal are affecting the UK container port system.

Thamesport has lost virtually all deepsea services partly because of draft restrictions in the River Medway approach channel. Evergreen moved its UK cargo from Thamesport to Felixstowe while other lines such as Hapag-Lloyd, OOCL and NYK moved their transatlantic services from Thamesport to Southampton. The volume drop in Thamesport started already earlier with 'only' 300,000 TEU handled in 2012, compared to close to 800,000 TEU in 2008. Also Tilbury's traffic is likely to be affected negatively by larger ships sizes and the opening of DP World's London Gateway terminal. Both Thamesport and Tilbury, as well as other smaller container ports such as Great Yarmouth, will likely focus more on niche and short sea intra-European services.

The new London Gateway terminal complex will face competition from UK ports Felixstowe and Southampton, but also from mainland European ports such as Rotterdam, Zeebrugge, Antwerp and Le Havre which offer competitive feeder services to the UK. London Gateway received its first vessel in November 2013. The terminal can accommodate vessels with a draft of up to 17m at any state of the tide. Maersk, MOL and Deutsche Afrika Linien already decided to shift their UK port of call on the South Africa service from Tilbury to London Gateway. Rail links are already in place connecting the terminal with the big centres, with DB Schenker Rail UK taking a lead role in the provision of those services. In June 2013, Marks & Spencer confirmed to invest in a new distribution centre within the terminal area to open in 2016.

7 CONCLUSIONS AND RECOMMENDATIONS

The dynamics in the transshipment (T/S) business has implications on freight distribution patterns in Europe. A hub-and-spoke based network means less cargo concentration in mainland destination ports and as such a more dispersed or fragmented inland transport system. Alternatively, traffic growth can lead to an undermining of the position of transshipment hubs in favor of a limited number of large-scale mainland ports, each connected to intermodal corridors.

Based on this report and taking into account the scope and objectives of the PORTOPIA project and WP1 in particular, we make the following recommendations:

- Given the importance of the transshipment market to many container ports in Europe, it is to be explored whether data gathering on transshipment flows can be integrated in the Rapid Exchange System (RES);
- Data gathering on the European transshipment market should also include key ports in non-EU countries of Northern Africa and Turkey;
- It is recommended that T/S data is collected on a continuous basis to monitor the tensions between T/S and direct calls for the Baltic, the UK/Ireland and the Med, but also to assess the vulnerability of ports and port regions to changes in the transshipment market.

In light of the above it might be relevant to consider the 'transshipment incidence or T/S %' as a relevant and meaningful indicator in the category of 'market trends and market structure'.

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