THE EVOLUTION OF NORTH-EUROPEAN SHIPPING NETWORKS: FROM INTER-CONTINENTAL LINKS TO A GLOBAL SYSTEM, 1990-2000.

Antoine Frémont, Martin Soppé
CIRTAI Université du Havre 25, rue Philippe Lebon 76086 Le Havre Cedex France
e-mails: antoine.fremont@univ-lehavre.fr, martin.soppe@univ-lehavre.fr

Abstract

In a globalised economy, maritime transport is under two types of pressure. As a fully-fledged economic actor it follows the same process as other economic actors; the transport sector is becoming a highly competitive, increasingly consolidated, global system. Increasing integration of transport within the chain of production increases the pressure exerted by shippers to improve the competitiveness of the sector. In the context of the qualitative and quantitative change that affects demand, the attempt on the part of shipping lines to improve productivity and competitiveness results in a grouping of transport flows, the modification of networks and service strategies and increasing integration within the transport chain. Freight containerisation is one of the major advances in maritime transport and is completely compatible with the pursuit of productivity and concentration. The setting up of a global containerised maritime transport system has been gradual, involving a number of stages influenced by the strategies of shipping lines and the involvement of ports. As Europe is one of the three major regions in the global economy, we have examined the involvement of its ports in this system and the changes in the position of ports within shipping networks during the significant period between 1994 and 2002. This change has also been influenced by the profound reorganization that is occurring within European space. Our examination of the dynamic of containerised shipping networks and ports will be conducted at different levels: first we shall study changes in the position of Europe within the global system, then the changes in the links between the European seaboards and lastly focus on the ports in the North-Western European range.

Keywords: Transport geography; Containerisation; Globalisation; Europe
Topic Area: A2 Maritime Transport and Ports

1. What logic lies behind concentration in European Northern range ports?

1.1. Concentration and dispersion: contradictory strategies

Containerisation was introduced about 40 years ago and, according to views expressed in the 1970s and regularly repeated since, should have led to the concentration of traffic at a few ports, one or two at the most on each range. It is indeed the case that, logically, many factors which encourage concentration. Containerisation offers standardized transport and permits considerable economies of scale. The first of these to make itself felt was an increase in the size of vessels in order to reduce the unit cost of transport. In 2002, vessels with a capacity of more then 5000 TEUs accounted for 12% of global containerised capacity. In the case of the largest shipping line in the world, Maersk, this proportion rose to 24%.

To be able to provide weekly services and command significant market shares, shipping lines must mobilize considerable sea-going resources, which explains the tendency for mergers (for example, Maersk and Sea-Land in 1999), and alliances involving the sharing of sea-going resources. The twenty largest container shipping lines now handle more than 52% of global containerised transport compared with a little less than 35% in 1989. Maersk/Sea-Land on its own accounts for 9% of global capacity with a fleet of more than

600,000 TEUs. Three major alliances were formed at the end of the 1990s: the Grand Alliance with a capacity of almost 550,000 TEUs, the New World Alliance with almost 400,000 TEUs and the United Alliance with slightly more than 300,000 TEUs.

In each port range, only those ports which are able to massify flows will be used by shipping lines. These ports need not only to concentrate sea traffic but inland traffic too in order for the mobilized sea-going capacity to be profitable. A container ship is only justified in making a port call if at least 10% of its capacity is handled.

Concentration at ports is also explained by the development of the hub and spokes system since the end of the 1980s. Shipping lines have been influenced by the way air companies are organised and concentrate the port calls of their mother ships and feeder ships at pivot ports in order to increase the number of possible destinations for containers, at both global and regional levels, using the techniques of transhipment and interchange. On land, the massification of transport services by means of rail shuttles, block trains and inland distribution ports makes the hub a viable solution.

On paper therefore, everything is ready for traffic to be concentrated at a few ports. The possibility in the near future of container ships with capacities of between 10,000 and 12,000 TEUs, or type malaccamax vessels (18,000 TEUs **)** opens the way to new speculation.

The above concentration means that the actors in the transport chain are extremely dependent on the hub. Such a risk is not acceptable, in particular for shipping lines which mobilize considerable sea-going resources. Such companies are able to minimize the risk in two ways: by becoming directly involved in the cargo-handling terminals in order to secure port passage, or by refusing to be dependent on a few ports. The largest shipping lines have adopted the first approach. In 2001 they controlled 19% of global handled volume (Slack and Frémont, forthcoming). However, they are quite willing also to create competition at ports when there is none. The most striking example of this is provided by Maersk. In December 2000 this shipping line set up a presence in the Malaysian port of Tanjung Pelepas with the deliberate intention of breaking the monopoly held by Singapore, until then the unchallenged hub in South-East Asia. Evergreen, the sixth largest shipping company in the world, has also transferred its activities to Tanjung Pelepas. The resulting drain on its traffic prompted the Singapore-based freight-handling company PSA, which is nevertheless one of the world leaders in the business, to cut its prices.

The involvement of shipping lines in operations on land, by participating in port terminals, creating their own agencies instead of being represented by shipping agents or forwarding agents, setting up door-to-door services, creating direct links with major shippers and occasionally setting up their own logistical subsidiaries, increases the independence of shipping lines from ports. There are, in fact, several alternative ways of sending a container from its origin to its destination. Within the strategy of global shipping lines, ports are a parameter which can reduce the total cost of the land and sea transport service. They are elements among others in the network, and can be seen as pawns (Slack; 1993) which control neither their hinterland nor their foreland.

Lastly, using hubs runs counter to market interests. Transit through a hub increases the distance from the market and increases handling costs and transit time, all of which are difficult to sell to their clientele of shippers. Shipping lines are forced to bow to market realities even if it means sacrificing their own strategies.

1.2. The justification for a study of the European Northern range

A strategy of concentration and one of dispersion are both apparent in the case of the Northern range and it is therefore a particularly appropriate case for investigating these contradictory tendencies. Le Havre and Hamburg are separated by a straight line distance of only slightly over 1,000 kilometres, and this area contains approximately 13 container ports,

i.e. on average one port every 80 kilometres, a density which is unrivalled elsewhere in the world and which provides an excellent opportunity for observing competition between ports. This density of ports is explained by the size of the single European market, more than 300 million consumers with high purchasing power which in terms of GDP is the second largest economic unit in the world after the United States.

Competition between ports involves both the reception of ships and the provision of hinterland services. Competition at European level is between the Northern European and the Mediterranean seabords. The ports on both ranges can claim to reach the heart of the market, i.e. the Rhine Valley, and are also able to receive mother ships that operate on world routes. Within the Northern range, the issues are similar but competition is fiercer because the ports are closer together. No port has a captive hinterland. While their location means that Rotterdam and Antwerp are the two natural entry points to the North-South economic backbone of Europe, their role can be challenged by ports with slightly peripheral locations such as Le Havre, which can exploit its position as the first port of arrival and last port of departure in the North-European range. Vice-versa, Le Havre has no monopoly on services to Paris as the hinterlands of several French, Belgian and Dutch ports overlap on this market area.

However, the density of the range does not preclude the setting up of a hub and spokes system. In spite of some problems associated with road congestion and inadequate railways, the quality of inland services in Europe makes ports accessible from any inland point; each port tries to outdo the others in claiming in its advertising literature to be located at the “centre of the European hinterland”. Furthermore, some major or peripheral markets are accessible from the Northern range, in particular those of Scandinavian and Baltic countries and that of the Iberian peninsula. The British Isles, which is world’s the sixth largest economic power in terms of GDP and has a population of 60 million, is a market in itself which the shipping lines can either serve directly or by feedering from a Northern range port.

In contrast to the American Western range, for example, which only affords a few entry points to the United States and Canada (Los Angeles/Long Beach, San Francisco/Oakland, Tacoma/Seattle and Vancouver), the Northern European range provides shipping lines with a considerable variety of possible logistical solutions, in particular because the absence of a European port investment policy means that the ports, with backing from Central Governments or Local Authorities, are competing with each other to provide new terminals or installations.

1.3. A method: studying the supply of containerised transport

The only source of data on containerised traffic flows which is sufficiently detailed, reliable and complete are the port statistics concerning handled TEUs. The main reason for this is that shipping lines consider such data to be of strategic importance. In order to be able to conduct an exhaustive analysis of the global maritime transport network, we have had to use information from an annual statistical publication, the Containerisation International Yearbook. We have studied the organization of the containerised transport network at global and European level by examining the commercial supply provided by the 26 largest shipping lines in the world for 1994 and for 2002. These shipping lines account for approximately two-thirds of the capacity of the global containership fleet during the two periods in question (Table 1).

The available data provides information about the sequence of port calls for each service, the number and the capacity of ships assigned to it and the frequency of the service. They have been analysed and organized within a database on Weekly Containerised Transport Capacity (WCTC database). Information is also available on the operation of the service within an alliance and the real participation of each shipping company in jointly run services.

As the services operated by shipping lines are generally weekly, for the sake of uniformity and consistency all the capacities have been converted to weekly terms.

The WCTC database allows us to analyse the maritime network from three different standpoints: for each shipping line, for each port and each link between ports, ranges or maritime regions. Different groupings can be made within these three categories, depending on the issue that is being examined.

Table 1 The 26 largest shipping lines in 2002 and 1994

Rank 2002	Shipping line	Number of vessels	TEU	Rank 1994	Shipping line	Number of vessels	TEU
1	Maersk Sealand	264	694,940	1	Cosco	182	219,029
2	MSC	177	391,437	2	Maersk	70	164,009
3	PONL	147	384,893	3	Sealand	84	158,664
5	Evergreen	122	313,799	4	Evergreen	45	129,524
4	APL	82	260,626	5	NL	65	114,776
6	Coscon	131	247,197	6	NYK	53	112,516
7	Hanjin	53	201,558	7	DSR	39	103,813
8	K Line	59	169,442	8	MOL	74	96,783
9	NYK	67	166,964	9	Hanjin	35	85,466
10	CMA CGM	60	166,872	10	APL	45	81,985
	Sub-total	**1,162**	**2,997,728**		**Sub-total**	**692**	**1,266,565**
11	MOL	56	157,772	11	K-Line	43	77,849
12	OOCL	50	155,944	12	Yang Mming	27	72,020
13	CSCL	90	149,930	13	P&OCL	38	68,979
14	Hapag-Lloyd	34	134,009	14	MSC	59	66,787
15	Zim	56	124,037	15	H-L	23	66,442
16	HMM	32	123,093	16	Hyundai	25	58,276
17	Yang Ming	40	118,675	17	OOCL	22	53,365
18	Senator	33	107,888	18	CMA	19	44,093
19	Lloyd Triestino	24	84,747	19	UASC	42	36,584
20	PIL	57	75,692	20	Delmas	41	33,431
	Sub-total	**1,634**	**4,229,515**		**Sub-total**	**1,031**	**1,844,391**
21	Wan Hai	57	73,885	21	Uniglory	30	30,398
22	UASC	39	67,922	22	WanHai	26	25,470
23	Delmas	42	52,052	23	CGM	13	19,985
24	Safmarine	26	52,028	24	MISC	16	19,408
25	MISC	32	49,805	25	Safmarine	10	18,150
26	CSAV	25	49,122	26	PIL	33	16,773
	Total	**1,855**	**4,574,329**		**Total**	**1,159**	**1,974,575**

Source CI Yearbooks 2002 and 1994

2. Europe: one of the principal regions in the global containerised transport system

2.1. Europe's place in the organization of global traffic

Not less than 500 containerised transport services run by the 26 largest shipping lines in the world have been identified for 1994 and for 2002. More than 440 ports distributed over

seven maritime regions[1] (see Figure 2) are served. These regular shipping lines make up a transport system which although global is, nevertheless has a pronounced hierarchy (Frémont A., Soppé, forthcoming).

Europe is one of principal regions in the system: in 2002, it had 110 ports which were served by 195 services. As a traffic generator in the Northern hemisphere it participates in the dominant East-West trade links which form the main global route – the *circumterrestrial artery* - with the highest transport capacities and service frequencies (see Figure 3). These links are characterized by a large number of shipping lines and very fierce competition which leads both to an increase in the size of vessels and the formation of alliances between shipping lines.

Europe also has strong links with its Southern peripheral area (Africa) and to a lesser extent with South America. These links involve niche markets. Fewer shipping lines are active on these routes and competition is less severe. Service frequencies are lower and vessels are smaller.

The ports of the three principal economic regions[2] handle the majority of the WCTC provided by ports (i.e. 81% of the global port WCTC). In 2002 Europe on its own accounted for 23% of global WCTC, i.e. approximately half as much as the Far East (42%) but one and a half times more than North America (15%). Although Europe provides more WCTC than North America, which can be explained by denser service of European ports, the dominance of transpacific links between East Asia and North America is clearly apparent, while transatlantic traffic between Europe and North America is of secondary importance: there is a relative reduction in bipolar North Atlantic links to the advantage of a multipolar system with increased transpacific traffic.

[1] The world has been divided into seven important regions which are frequently used for the analysis of maritime traffic: Europe, North America, East Asia, South Asia, the Pacific, South America and Africa.

[2] The Far East, North America and Europe

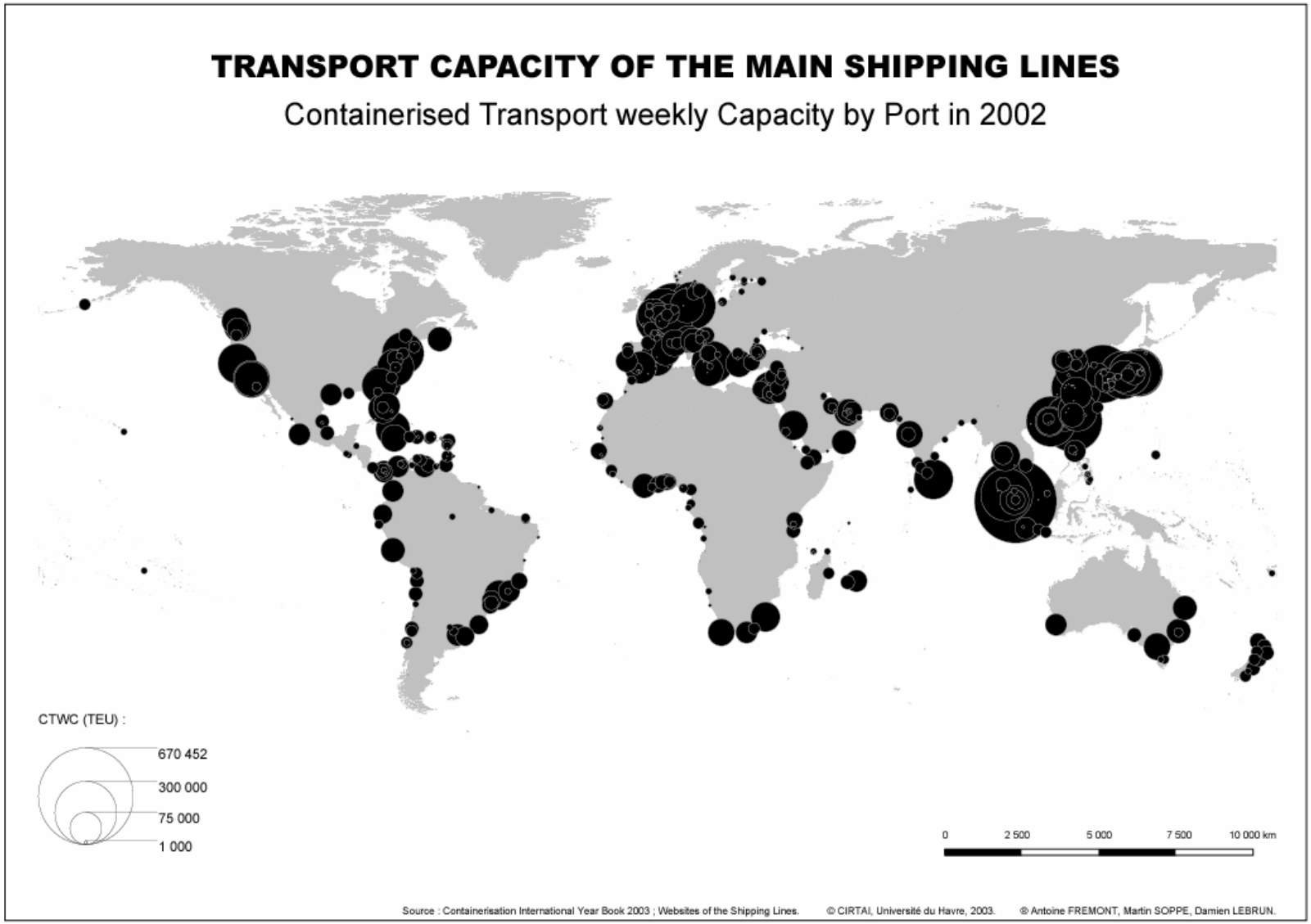


Figure 2 Transport Capacity of the main Shipping Lines

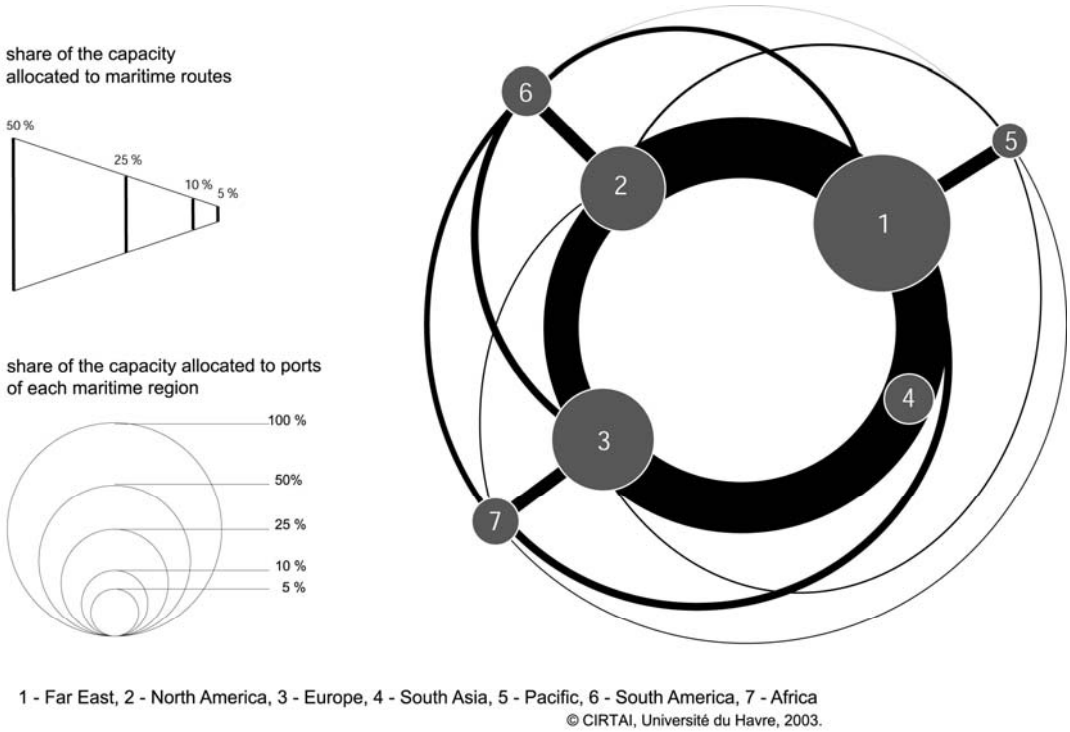
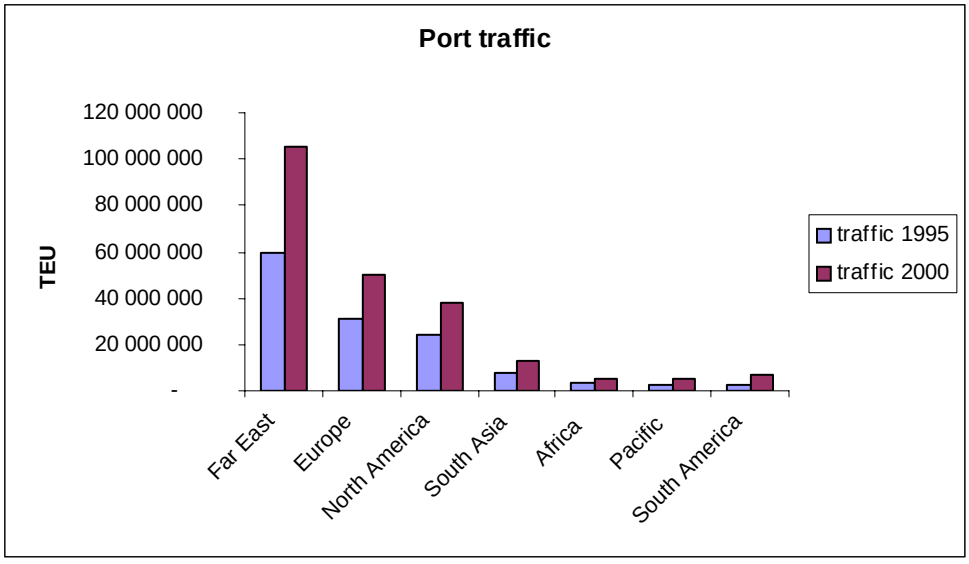


Figure 3 The general pattern of containerised maritime traffic

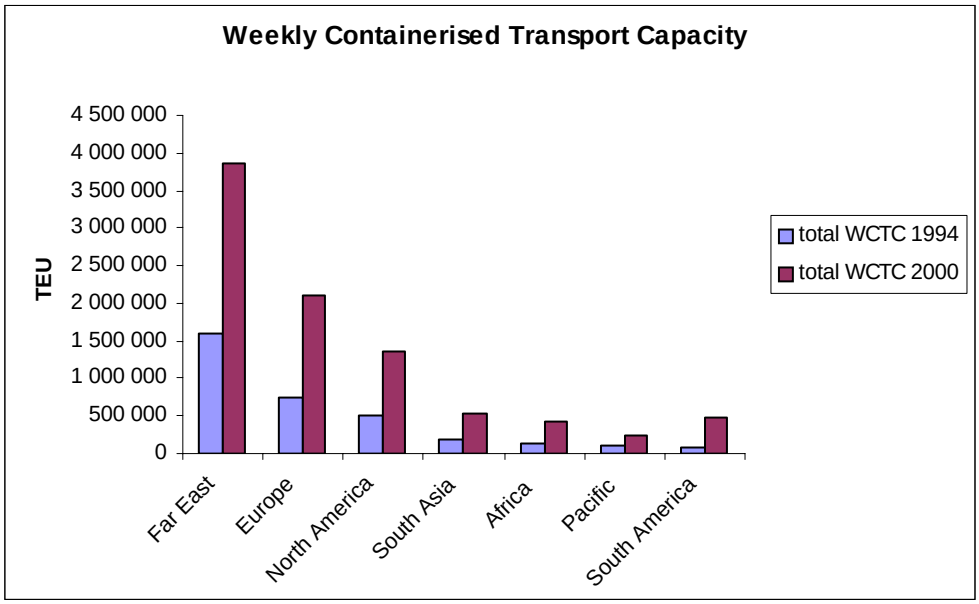
2.2. Contrasting development in the European region: an increase in transport supply and a decline in its relative importance in global traffic

In 2002 Europe is still one of the principal regions in the world for sea traffic. Both in terms of traffic and in terms of the transport capacity provided by shipping lines in the ports, it is in third place after the Far East and North America (figures 4 and 5).This situation did not fundamentally change during the observation period.



Source : WCTC Database/Le Havre, 2004

Figure 4 Traffic handled by ports



Source : WCTC Database/Le Havre, 2004

Figure 5 Transport capacity provides in the ports

Europe, however, differs from the other two principal regions in that it gained 1.2% of market share while the Far East lost 4.7% and North America remained more or less stable (-0.4%). Although their transport capacities increased, European ports, like North American ports, lost market share in terms of the number of containers handled.

Region	Change in % of WTCT	Change in % of port traffic market
Far East	**-4.7**	**1.50**
Europe	1.2	**-1.28**
North America	-0.4	**-1.29**
South Asia	0.2	-0.12
Africa	1.2	-0.34
Pacific	-0.1	0.31
South America	**2.6**	**1.22**

Source : WCTC Database/Le Havre, 2004

Figure 6 Evolution of the market shares - WCTC and port traffic

Europe is therefore changing in contrasting ways. Its share of global traffic is falling but its share of transport supply is increasing. This is the opposite of what we observe in East Asia where capacities are increasing the least while traffic is increasing the most.

This change is explained by the reorganization of shipping networks which is having a particularly strong effect on the European region. Between 1994 and 2002, Europe experienced one of the greatest increases in the number of containerised transport services. This increased from 179 to 260, i.e. an increase of 45%, while the increase at global level was 14% and the number of routes serving each region has increased on average by 32%.

The number of ports served also increased more in Europe than elsewhere. There is a general trend for the number of ports served by the largest shipping lines to increase (by

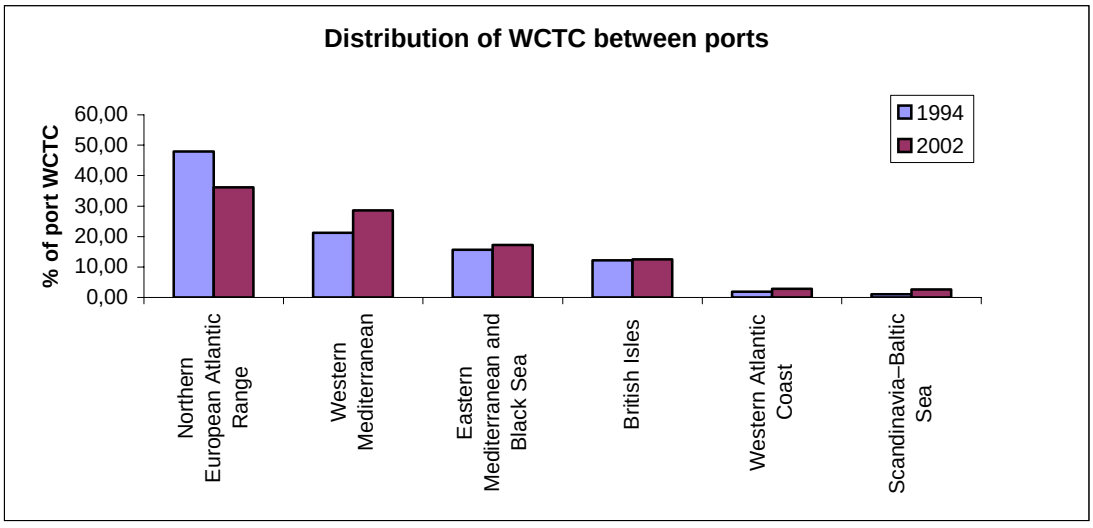
17%), but Europe is marked out by a greater increase (34%), while in the Far East the same number of ports, or slightly fewer, are served (a 2.3% fall).

The observation period therefore saw a significant change in the way the shipping lines gain access to Europe. Services in general (i.e. all those provided by the 26 largest shipping lines) have become more distributed and there seems to have been a degree of deconcentration, or at least an increase in the number and geographical spread of services.

We can suggest a number of explanations or hypotheses with regard to this change. European services have become denser: an increasing number of ports belong to the global carrier networks which, as a result of consolidation in the sector, are able to offer a greater number of services and destinations. Another factor is the specific geographical, economic and political nature of Europe: the decision of shipping lines to stop at several ports on the same port range may be due to the distribution of economic activity and the political and cultural inertia that affect the partitioning of European space. The opening up of the economies of Eastern Europe has also stimulated the growth of the shipping network: trade with the former members of the Eastern block is increasing and leading to the creation of new services in the Baltic, Mediterranean and Black Seas. The introduction of the single European market is gradually increasing competition between ports and between different inland transport feeder and distribution services. The shipping lines have a presence in several ports and make use of the competition between them to provide optimum services to port hinterlands while being as close as possible to the markets. This also allows them to avoid infrastructure saturation problems. The rationalization of shipping networks that is observed in the 1990s involved the setting up of hubs which optimise transport supply while reducing the capacities used: this would explain both the increase in port WCTCs and in the number of services making stops in Europe. A last hypothesis, which we shall discuss below, is that the geographical spread does not reflect genuine deconcentration. What is in fact occurring is that the apparent decentralization of traffic and densification of the network is hiding a new type of concentration which is directly linked to the competitive strategies of shipping lines. We have termed this *shipping line concentration*.

2.3. A decline in the North European range and dynamism in Southern Europe?

Within the overall trend of rising port WCTC supply in Europe (an increase of 185%, i.e.2,100,000 TEUs as opposed to 735 000 TEUs) the ports in the two ranges differ considerably.



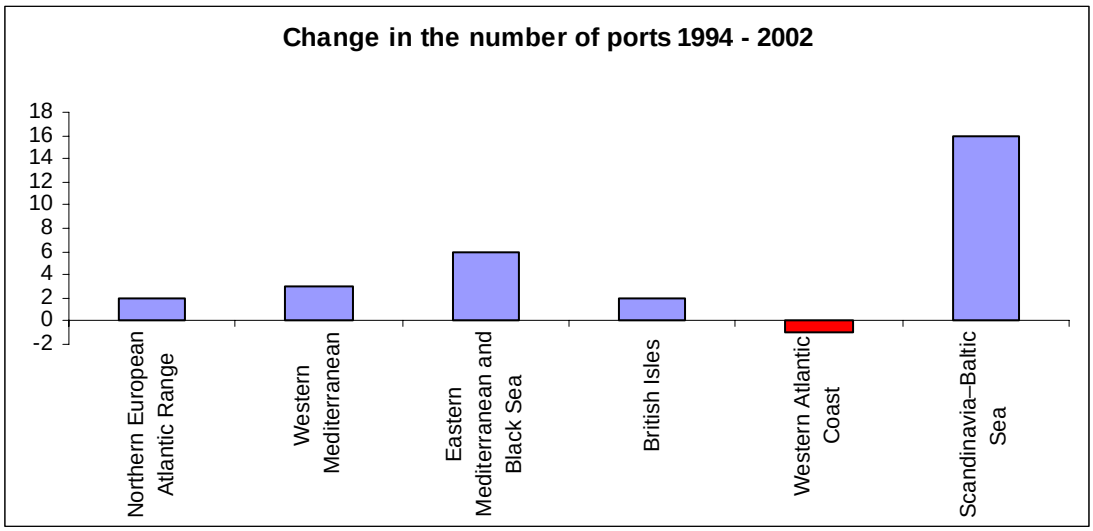
Source : WCTC Database/Le Havre, 2004

Figure 7 Distribution of WCTC between European ports in 1994 and 2002.

The most striking trend is a relative drop in the capacity available in the Northern range ports in comparison with the other European seaboards which indicates a geographical loosening up of supply. While this loosening up is general, it nevertheless favours the Mediterranean seaboards, in particular that to the West. In order to examine this change in more detail, we have aggregated the ports on the basis of two sub-regions: Northern Europe and Southern Europe[3].

During the period 1994-2002, we can observe a genuine process in which shipping traffic achieves a new balance to the advantage of Mediterranean ports. While in 1994 the ratio between port WCTCs in Northern Europe and Southern Europe was 62% / 38%, by 2002 the ratio was only 54% / 46%. This swing in supply was reflected by a similar relative shift in traffic, which was smaller but still significant: 65% / 35% in 1994 as opposed to 60% / 40% in 2002. The dynamism of the Mediterranean seaboards is even more striking from a global point of view: while Northern Europe lost 1.3% of global WCTC, Southern Europe gained 2.5%.

The two European sub-regions have been affected by the reorganization of shipping networks by the shipping lines, which we can describe as a simultaneous process of densification and repositioning. In eight years, the number of ports of call increased by 28, rising from 82 to 110, i.e. a significant increase of 34%. Apart from the Baltic Sea where new lines were created the marked increase in the number of ports took place on the Mediterranean seaboards.



Source : WCTC Database/Le Havre, 2004

Figure 8 Change in the number of ports on the different seaboards between 1994 and 2002

This densification of the shipping network serving Europe is accompanied by a repositioning of ports within the shipping networks. In all, 64 of the 110 ports that are currently served have been included within or excluded from containerised transport networks. Half the ports currently served by container shipping lines were already served in 1994. Apart from certain exceptions (Gioia Tauro), these changes have involved small ports. The repositioning of ports within shipping networks can be clearly seen on Table 9. Of the 25 largest ports on the basis of WCTC in 2002, the greatest changes in capacity during the period

[3] The European sub-regions
Northern Europe: Northern European Atlantic Range, Scandinavia–Baltic Sea, British Isles and Western Atlantic Coast.
Southern Europe: Western Mediterranean, Eastern Mediterranean and Black Sea

1994 –2002 have affected “medium-sized” ports, and 7 of the 10 ports that have grown the most are in the Mediterranean.

Table 9 Change in port capacity and traffic for the 25 largest European ports

Port	WCTC rank 1994	Change in WCTC 94-2002 in TEU	Increase in WCTC 94/2002 (%)	Change in port traffic 1995 - 2000 TEU
Gioia,Tauro	--	129,781	+ + +	2,652,701
Southampton	18	53,140	502.9	380,920
Haifa	27	22,454	395.9	344,580
Lisbon	25	19,935	328.3	149,908
Valencia	11	58,806	326.2	636,183
Leghorn	29	15,531	289.6	77,610
Zeebrugge	21	16,372	251.7	436,867
Genoa	17	30,157	249.3	885,390
Barcelona	14	40,305	240.7	698,246
Port,Said	9	46,092	222.7	263,773
Marsaxlokk	13	38,660	220.1	518,285
Piraeus	12	35,733	201.1	560,962
Antwerp	5	83,693	190.6	1,753,199
Trieste	28	10,067	186.2	56,121
La,Spezia	16	23,492	176.7	-55,521
Felixstowe	4	89,850	166.9	901,799
Naples	24	8,766	143.2	170,122
Thamesport	15	18,338	136.6	
Algeciras	7	41,286	136.2	854,408
Hamburg	3	80,518	132.2	1,358,066
Fos,(Marseilles)	8	26,879	120.3	-49,339
Bremerhaven	6	47,002	114.4	521,565
Rotterdam	1	103,765	100.2	1,488,423
Le,Havre	2	70,848	92.9	494,475
Tilbury	19	6,636	76.4	166,390

Source : WCTC Database/Le Havre, 2004

Without completely deserting the Northern range ports, which remain dominant in volume terms, the shipping lines have moved principally into medium-sized ports in the last decade. The most dynamic ports are generally in the Mediterranean. The relative move towards medium-sized ports is explained by a desire on the part of the shipping lines to have greater weight and be able to exert greater pressure on ports and on cargo-handling companies: there is a dual advantage to this - it enables them to limit the prices of port passage and also ensures the reliability of handling operations. Are these symptoms of the dawning of an age when shipping lines will dominate the other players in the transport chain, in particular the ports?

The transfer to secondary ports, which at first sight appears to represent deconcentration and geographical spread, is a consequence on one hand of the implementation of maritime hub and spokes networks and on the other hand of the attempt to find alternative services for the dense and enlarged European space. The Mediterranean ports appear to

respond to these two criteria particularly well. Their position on the major global route gives them a certain advantage as hubs both at global and European levels (Zohil J. and Prijon M., 1999**)** and their smaller size seems to interest shipping lines. The ports of Gioia Tauro, Algeciras, Marsaxlokk or Piraeus provide good examples of such pivot ports. Other ports, which are more focussed on serving their hinterland, combine the advantage of a position on the East-West artery with the ability to provide an alternative service for the European space, for example Genoa, Barcelona, Trieste and Marseille.

3. The strategies of shipping lines with regard to serving the Northern European range

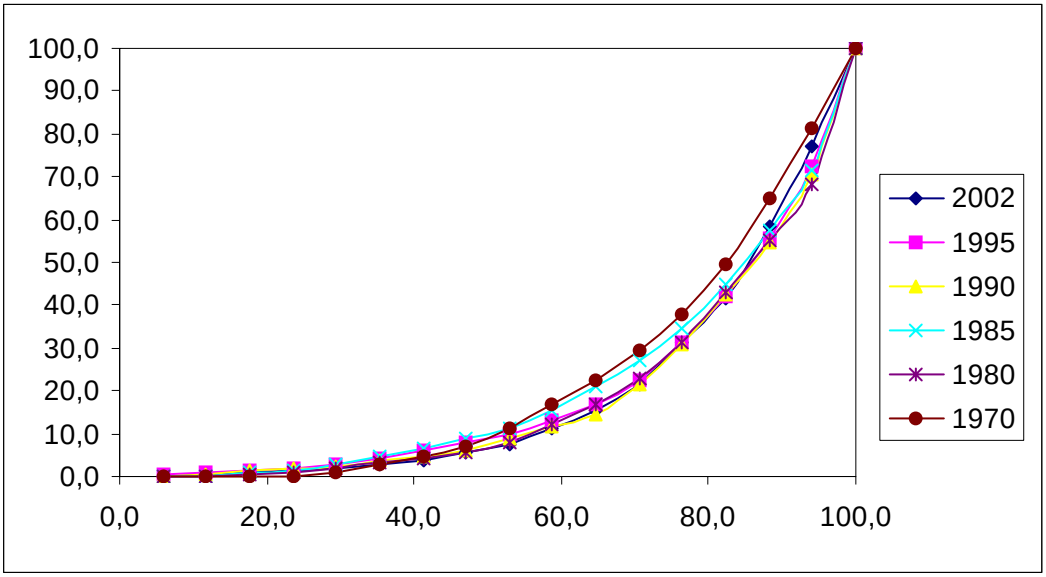
3.1. Concentration and the relative position of the ports in the Northern range

The first thing that stands out is the very high degree of stability. When containerization first began in the 1970s, the index of concentration (Gini coefficient) increased from 0.55 to 0.62, but during the 1990s it only varied at the margin and remained virtually the same. The superimposition of the Lorenz curves for different dates clearly shows the lack of substantial variation.

Table 10 Index of concentration (Gini coefficient) for the Northern range ports[4]

	2002	1995	1994	1990	1985	1980	1970
TEU	0.61	0.60		0.62	0.56	0.62	0.55
WCTC	0.48		0.52				

Source : WCTC Database/Le Havre, 2004



Graph 11 Lorenz curves for the Northern range ports

In the context of a large-scale increase in traffic and the capacity provided by shipping lines, this stability in concentration at ports does not exclude significant changes in terms of the relative proportion of traffic or WCTC passing through the different ports, even if these variations do not threaten the ranking of the largest ports (Rotterdam, Hamburg, Antwerp and Bremen/Bremerhaven), which has remained the same since the early 1980s.

It is possible to distinguish four major types of change, corresponding to four types of port. The first is Rotterdam, which at the mouth of the Meuse is ideally located for serving the

[4] Includes the ports of the Northern Range and the ports on the United Kingdom's Channel and North Sea seaboard.

Rhenish heartland of Europe via the Rhine. It has exceptional nautical conditions for receiving the largest container ships and was, in the 1970s, in the process of asserting its position as the dominant port in the Northern range with a market share of more than 30% in 1980, almost 20 percentage points ahead of Hamburg. But between 1980 and 1995, its market share fell steadily, and then more suddenly between 1995 and 2000. Only 4 percentage points now separate Rotterdam and Hamburg. This simple observation disproves the frequently repeated theory that all traffic will be concentrated on a single port in each range. On the contrary it probably expresses a refusal on the part of operators, both shipping lines and shippers to accept the possibility of dependence on a single port, however efficient it is.

Hamburg and Antwerp are continually gaining market share to the detriment of Rotterdam. They are nevertheless both located at some distance from the mouth of an estuary which means the Authorities need constantly to undertake new dredging operations in order to maintain their ability to receive the largest container ships of the moment. They draw advantage from their inland location and their closeness to the market which seems more decisive than maritime accessibility.

Four ports come after this (Bremen/Bremerhaven, Felixstowe, Le Havre and Southampton). Although smaller than the previous ones, they are nevertheless still important (the smallest of them, Southampton, handles more than 1 million TEUs). They are affected by more uncertain trends with alternating phases of relative growth and decline. Their nautical conditions are excellent, but these ports are extremely dependent on a hinterland which is limited to their national capital for which other major ports are also competing.

Lastly, small ports remain restricted to a secondary role; none of them has managed to move into the big league in the last 30 years.

Table 12 Change in the market share of ports in % of total traffic (TEU)

	2002	1995	1990	1985	1980	1970
Rotterdam	22.8	27.7	29.5	30.3	31.8	18.7
Hamburg	18.8	16.7	15.8	13.2	13.1	5.6
Antwerp	16.7	13.5	12.4	15.4	12.1	16.6
Bremen/Bremerhaven	10.5	8.8	9.6	11.3	11.7	15.0
Felixstowe	9.6	11.0	11.4	5.9	4.1	7.2
Le Havre	6.0	5.6	6.9	6.5	8.5	8.3
Southampton	4.5	3.9	2.8	2.4	6.0	1.8
Zeebrugge	3.4	3.1	2.8	2.2	2.6	5.4
Tilbury	2.0	2.0	2.9	4.4	4.5	12.0
Thamesport	1.8	1.6	0.1	0.0	0.0	0.0
Immingham	1.3	2.0	1.0	0.6	0.3	0.0
Hull	0.8	1.6	1.3	2.5	1.4	4.5
Dunkirk	0.6	0.4	0.6	0.8	1.1	0.9
Rouen	0.6	0.5	0.7	1.5	0.8	0.2
Goole	0.5	0.4	0.6	0.2	0.0	0.0
Amsterdam	0.2	0.5	0.6	0.9	0.9	2.2
Ipswich	0.1	0.8	1.1	1.7	1.1	1.8
	100.0	100.0	100.0	100.0	100.0	100.0

Source : WCTC Database/Le Havre, 2004

These trends are confirmed by an analysis of transport supply on the basis of WTCT although the changes are less accentuated than in the case of traffic.

Table 13 Change in the market share of ports in % of WCTC

Port	2002	1994
Rotterdam	21,0	24.2
Hamburg	14.6	14.3
Le Havre	14.4	17.8
Felixstowe	13.9	12.6
Antwerp	12.4	10.3
Bremerhaven (Bremen/Bremerhaven)	8.3	9.6
Southampton	6.9	2.5
Thamesport	2.9	3.1
Zeebrugge	2.1	1.5
Tilbury	1.4	2.0
Rouen	0.9	0.3
Dunkirk	0.8	1.0
Amsterdam	0.3	0.7
	100.0	100.0

Source : WCTC Database/Le Havre, 2004

3.2. Shipping lines and port concentration

If one considers all the shipping lines together, port concentration has remained almost at the same level, but it varies considerably if one looks at individual shipping lines, even though they all serve virtually the same number of ports and this number remained practically the same between 1994 and 2002. Two main categories of shipping line seem to emerge. European lines have on the whole increased the concentration of their port activities. This is particularly marked in the case of the Maersk-Sea Land, Safmarine group and the lines MSC and CMA whose activities over the period grew exponentially as a result of internal growth and/or the purchase of other lines (for example, the 1997 merger between CMA and CGM). The P&O Nedlloyd group is also following the same process of concentration but with a less marked change between the two study periods. The German company Hapag-Lloyd is the exception to this rule and is moving the opposite way towards deconcentration.

The second category consists of Asian lines. In 1994, their port concentration indices were often zero and they remained low in 2002. The only exception to this tendency was the Japanese company NYK whose concentration index was comparable with European lines.

This would tend to prove that European lines, which are close to their markets, rely on pivot ports in the Northern range and implement a hub and spokes type of strategy in spite of the narrowness of the range. In contrast, the Asian lines focus on direct links, firstly because they lack sufficient transport capacities and secondly because their strategy is to export national production towards centres of consumption.

Table 14. Number of ports served and port concentration for each shipping line in the Northern European range in 2002

	2002		1994	
	Ports served	**Gini**	**Ports served**	**Gini**
Maersk-Sea Land and Safmarine	9	0.53	8	0.38
Maersk-Sea Land			7	0.36
Maersk			7	0.28
Sea Land			5	0.33
Safmarine			6	0.12
MSC	8	0.51	6	0.01
P&ONedlloyd	9	0.44	10	0.41
P&OCL			9	0.33
Nedlloyd			9	0.40
NYK	7	0.45	7	0.16
CMA-CGM	11	0.40	10	0.44
CMA			5	0
CGM			9	0.43
Hanjin+DSR	6	0.36	7	0.24
Hanjin			4	0
DSR			7	0.21
K-Line	6	0.25	4	0.04
Hapag-Lloyd	8	0.24	11	0.39
Cosco	6	0.23	5	0
Evergreen+Llyod Triestino	7	0.23	5	0
APL	6	0.22		
All shipping lines	7.54	0.48	7.05	0.52

Source : WCTC Database/Le Havre, 2004

3.3. The pivot ports of European lines on the Northern European range

This hypothesis is confirmed by an examination of the relative importance of the ports in the range in comparison with the other ports served by the shipping lines. While Rotterdam systematically concentrates capacities, its share has almost always been falling; as a port it is unavoidable, but shipping lines nevertheless do not wish to be dependent on it. Only the Asian lines (NYK and Hanjin/DSR) have increased the relative importance of Rotterdam in their network as though, from the Asian perspective, the largest European port has to be used because there is no alternative.

In contrast, the European lines are attempting to find novel solutions. Maersk has completely modified its port network in less than 10 years by concentrating it on Bremerhaven (at the expense of Hamburg) and Felixstowe in addition to Rotterdam the relative importance of which has diminished considerably. MSC concentrates on Antwerp and Le Havre which has gradually been replacing Felixstowe in 2002. P&O Nedlloyd bases its port network on Hamburg and Southampton and like Maersk is tending to reduce the relative importance of Rotterdam. CMA seems as yet not to have made a firm decision.

The major shipping lines account for a very large share of the WCTC provided at their preferred ports. For example, Maersk on its own is responsible for 45% of the WCTC at Bremerhaven and MSC accounts for a quarter of the activity at Antwerp. On the other hand, those shipping lines which have not concentrated on a single port, like CMA or the Asian lines (such as NYK and Hanjin in this context)) do not play a dominant role.

This study provides us with a new perception of port concentration within the Northern range. The apparent stability is only superficial. The strategy of the world's three largest shipping lines is one of concentration involving a very small number of ports in addition to Rotterdam, which cannot be avoided but whose role within their networks they wish to restrict. There is a de facto distribution of their pivot ports as these ports perform the function of an exclusive hub: each shipping line concentrates on a different pivot port. This distribution explains the stability of port concentration when one considers all the shipping lines together. The lack of overlap at the hubs has consequences on the relative position of the shipping lines based in these ports and could, paradoxically, tend to generate monopolistic situations in a range which is in principle very open to competition because of the large number of ports.

The situation we have just described is a direct outcome of the strategies adopted by shipping lines in order to control the port link in the transport chain. These strategies depend on their resources (all of them are not in the same position as Maersk!), but control of the port is vital in order to maximize the sea-going performance of the container ships sailing on the operators' routes. Logically, the next stage could be to take control of port terminals, which will inevitably involve a direct conflict, probably destructive, with the transnational terminal operators which are widely present in the European ports.

Tables 15.a - 15.f Percentage of the WCTC of shipping lines passing through the Northern range ports in 2002 and 1994

15.a) Maersk-Sealand

	2002	1994			
	Maersk-Sealand	Together	Maersk	Sealand	Safmarine
Felixstowe	24.6	13.3	9.4	22.3	0
Rotterdam	24.0	34.6	32.3	43.8	14.3
Bremerhaven	22.0	10.7	10.5	9.9	14.3
Le Havre	12.9	15.9	16.7	15.4	14.3
Antwerp	7.7	0	0	0	0
Hamburg	3.2	12.7	15.6	8.5	14.3
Tilbury	3.0	3.4	0	0	28.6
Dunkirk	1.6	0	0	0	0
Rouen	1.0	0	0	0	0
Southampton	0	4.1	8.3	0	0
Zeebrugge	0	5.3	7.3	0	14.3
Total	100.0	100.0	100.0	100.0	100.0

Source : WCTC Database/Le Havre, 2004

15.b) MSC

	2002	1994
Antwerp	32.0	16.9
Felixstowe	29.7	16.9
Le Havre	19.1	15.7
Bremerhaven	9.0	16.9
Hamburg	5.4	16.9
Rotterdam	2.8	16.9
Dunkirk	1.0	0
Rouen	1.0	0
Total	100.0	100.0

Source : WCTC Database/Le Havre, 2004

15.c) P&ONedlloyd

	2002	1994		
	P&ONL	P&ONL	P&OCL	NL
Hamburg	23.2	12.8	12.3	13.3
Rotterdam	22.3	27.0	30.5	23.5
Southampton	15.2	2.5	5.1	0
Le Havre	11.2	17.9	14.0	21.7
Antwerp	11.0	3.8	4.0	3.5
Felixstowe	7.8	11.8	8.4	15.1
Bremerhaven	4.5	11.9	8.9	14.9
Tilbury	2.8	7.5	11.5	3.5
Zeebrugge	1.1	3.3	5.3	1.3
Thamesport	1.0	0	0	0
Amsterdam	0	1.6	0	3.2
Total	100.0	100.0	100.0	100.0

Source : WCTC Database/Le Havre, 2004

15.d) CMA-CGM

	2002	1994		
	CMA-CGM	Together	CMA	CGM
Le Havre	19.0	24.2	20.0	29.1
Hamburg	18.0	14.4	20.0	7.8
Rotterdam	17.6	13.3	20.0	5.3
Southampton	12.2	0	0	0
Zeebrugge	12.2	0	0	0
Antwerp	5.8	21.7	20.0	23.8
Rouen	4.2	0	0	0
Felixstowe	3.9	1.1	0	2.5
Dunkirk	3.7	7.3	0	16.0
Tilbury	1.8	2.4	0	5.3
Thamesport	1.7	10.8	20.0	0
Amsterdam	0	1.1	0	2.5
Bremerhaven	0	3.6	0	7.8
Total	100.0	100.0	100.0	100.0

Source : WCTC Database/Le Havre, 2004

15.e) NYK

	2002	1994
Rotterdam	37.1	23.2
Hamburg	19.3	10.7
Le Havre	19.3	10.7
Southampton	18.1	10.7
Antwerp	3.0	19.7
Tilbury	2.2	0
Felixstowe	1.1	0
Bremerhaven	0	12.5
Thamesport	0	12.5
Total	100.0	100.0

Source : WCTC Database/Le Havre, 2004

15.f) Hanjin - DSR

	2002	1994		
	Hanjin-DSR	Together	Hanjin	DSR
Rotterdam	31.8	20.1	25.0	18.0
Felixstowe	24.6	19.7	25.0	17.5
Hamburg	20.8	18.1	25.0	15.2
Le Havre	16.7	17.6	25.0	14.5
Bremerhaven	3.8	9.0	0	12.8
Antwerp	2.2	14.8	0	21.1
Tilbury	0	0.6	0	0.8
Total	100.0	100.0	100.0	100.0

Source : WCTC Database/Le Havre, 2004

Table 16. Percentage of available WCTC provided by European shipping lines, NYK and Hanjin/DST in the six largest ports of the Northern Range

Shipping line	Rotterdam	Hamburg	Antwerp	Felixstoxe	Le Havre	Bremerhaven
Maersk/Sea Land	**19.5**	3.7	10.5	**30.1**	15.3	**45.3**
P&ONedlloyd	14.5	**21.7**	12.1	7.6	10.6	7.4
MSC	1.3	3.6	**25.5**	**21.1**	13.1	10.7
CMA	6.6	9.7	3.7	2.2	10.4	0
NYK	5.8	4.4	0.8	0.3	4.4	0
Hanjin/DSR	10.7	10.0	1.3	12.4	8.2	3.2

Source : WCTC Database/Le Havre, 2004

4. Conclusion

Our study of the period 1994 –2002 demonstrates that the structure of the global maritime container transport system is not fixed and the changes it is undergoing are far from being complete. In this dynamic, services in Europe are changing radically, although it remains one of the dominant regions in the system. The modification is due to changes in the strategies of shipping lines and their networks, both at a global level and, in particular, due to the specific characteristics of the European space and the geo-economic and geopolitical changes that are occurring there. This radical change is affecting both the position of Europe in the global system and, internally, the organization of services on its seaboards and at it ports.

Although the frequently stated inevitability of the port concentration process seems open to question from a purely quantitative standpoint, the apparent geographical loosening up conceals concentration of another type. With a view to controlling the increasingly integrated transport chain and, more particularly, port passage, the shipping lines are concentrating their services at medium-sized ports and the alternative of inland transport. The ports on the southern seaboard have several advantages and seem to be the major beneficiaries of this shift.

References

Ashar, A., 1999. The Fourth Revolution, Containerisation International, December, 57-61.

Ashar, A., 2000 . 2020 Vision, Containerisation International, January, Pp 35-39.

Ashar, A., 2002 . Revolution Now, Containerisation International, January, Pp 56-59.

Bauchet, P., 1996. Les Transports De L'europe. La Trop Lente Intégration, Paris, Economica, 240p.

Cazzaniga Francesetti, D., Foschi, A. D., 2001. The Impact Of « Hub And Spokes » Port Networks On Transport Systems, Paper Presented At The Wctr.

Commission Des Communautes Europeennes, 1997. Com 97 . 678 Final, Livre Vert Relatif Aux Ports Et Aux Infrastructures Maritimes, Bruxelles, 51p.

Commission Des Communautes Europeennes, 2001. Com 2001 . 370, Livre Blanc. La Politique Européenne Des Transports A L'horizon 2010 : L'heure Des Choix, Bruxelles, 136p.

Cullinane, K., Khanna, M., 2000. Economies Of Scale In Large Containerships : Optimal Size And Geographical Implications, Journal Of Transport Geography, 8, 181-195.

Fleming, D. K., and Hayuth, Y., 1994 . Spatial Characteristics Of Transportation Hubs: Centrality And Intermediacy, Journal Of Transport Geography, 2, 3-18.

Fremont, A., Soppe, M., 2004. The Service Strategies Of Liner Shipping Companies, Belgéo, Forthcoming.

Fremont, A., 1998. La French Line Face À La Mondialisation De L'espace Maritime, Collection Géographie, Paris, Anthropos, 197 P.

Fremont, A., 1996. L'espace Maritime Et Marchand : Pour Une Problématique, L'espace Géographique, 3, 203-213.

Guy, E., 2003. Compétition Et Complémentarité Dans L'évolution Des Réseaux Maritimes De Transport De Conteneurs : Le Cas De La Façade Est De L'amérique Du Nord, Thèse De Doctorat, Université De Montréal, 245p.

Hayuth, Y., 1981. Containerization And The Load Center Concept, Economic Geography, 57(2), 160-176.

Heaver, T., Meersman, H., Moglia, F., Et Van De Voorde, E., 2000. Do Mergers And Alliances Influence European Shipping And Port Competition?, Maritime Policy And Management, 27(4),. 363-373.

Notteboom, T., 2001. Intégration Spatiale Et Fonctionnelle Des Systèmes De Ports A Conteneurs Et Des Hinterlands Européens, In Conférence Européenne Des Ministres Des Transports, La Desserte Terrestre Des Ports Maritimes, Paris, Ocde, 5-63.

Notteboom, T., Winkelmans, W., 1999. Spatial De .Concentration Of Container Flows: The Development Of Load Centre Ports And Inland Hubs In Europe, In Meersman H., Van De Voorde E. Et Winkelmans W. , World Transport Research, Selected Proceedings Of The 8th World Conference On Transport Research, Vol 1: Transport Modes And Systems, Pergamon, 57-71.

Slack, B., Comtois, C., Mccalla, R., 2002. Strategic Alliances In The Container Shipping Industry: A Global Perspective, Maritime Policy And Management, Vol. 29, N°.1, Pp. 65-76.

Slack, B., 1993. Pawns In The Game: Ports In A Global Transportation System, Growth And Change, 24, 579-588.

Slack, B., 1999. Satellite Terminals: A Local Solution To Hub Congestion, Journal Of Transport Geography, 7, 241-246.

Zohil, J., and Prijon, M., 1999. The Med Rule: The Interdependence Of Container Throughput And Transhipment Volumes In The Mediterranean Ports, Maritime Policy And Management, 26 (2)175-193.