A SECOND SCENARIO ON THE FUTURE OF THE HUB-AND-SPOKE SYSTEM IN LINER SHIPPING

H.E. Haralambides

Center for Maritime Economics and Logistics (MEL)
Erasmus University Rotterdam

Latin Ports & Shipping 2000 Conference & Exhibition, Miami FL., USA

ABSTRACT

The growth in liner shipping capacity, the degree of containerisation of general cargo trades and the average and maximum size of containerships have all been increasing at a remarkable rate during the past 20 years. Futurologists, naval architects but also a few economists earning a living by extrapolating past trends occasionally talk about mammoth containerships, as big as 18,000 TEU, calling at fewer and fewer hub ports, increasingly at dedicated facilities. This paper argues that although this is a possible scenario, it is not likely to happen. On the contrary, it is believed here that the maximum size of containerships is reaching its upper (economic) limit and the future will see an increase in the market share of smaller ships[1]*, directly calling at more ports that serve a limited hinterland; a development similar to what has happened in aviation after that market was liberalised.*

There are nowadays 6 important and very distinguishable trends that all, each reinforcing the other, point to this direction. These are: 1. worldwide port development; 2. regionalisation of trade; 3. infrastructure development in southern Europe; 4. road pricing in Europe; 5. the future of liner shipping alliances; and 6. the impact of information technology[2]*.*

---

[1] The term ‘smaller ships’ in this paper includes the full range from Post-Panamax downwards and it is used just as a ‘counterweight’ to future ‘goliathan’ plans and ideas.

[2] this last trend of information technology was recently brought to my attention by G. Thomas Corver, Planning and Strategy Manager of the ING-Barings Group, to whom I am thankful for a most stimulating afternoon chat when, while writing this paper, he just walked into my room!

INTRODUCTION

A cursory look at maritime statistics immediately shows that the rate of increase in liner shipping capacity outstrips by far the corresponding increases in world output and trade. Indeed, in the period 1991-2000, container shipping capacity has been increasing at a rate of 10.5%, *vis a vis* 2.5% of world GDP; 6.5% of international trade; and 2.1% of world merchant fleet by and large. To the uninitiated, this is an indication of overcapacity, often the culprit responsible for the industry's notorious unprofitability.

Indeed, overcapacity is an intrinsic characteristic of the industry, the combined result of regularity and frequency of service, and east-west trade imbalances. Notwithstanding this, however, the large divergence between demand and supply growth in liner shipping is also attributable to the considerable feedering operations, now the order of the day in the present organisational system known as hub-and-spoke. Indeed, from origin to final destination, goods may often have to be transhipped (on various modes) 5 or 6 times. Recent statistics show that approximately one quarter of containerised traffic in port relates to transhipment (Peters, 2000). Current research also shows that although sea-leg costs may have been going down in real terms as a result of economies of scale in liner shipping, door-to-door costs have been increasing. And this without taking into account the external costs of road transport as well as of the fact that the use of road capacity is cheap in so far as it does not as yet allow the recovery of infrastructure investment costs (this issue is further discussed below). It thus becomes increasingly clear that economies of scale in shipping are countered by increasing diseconomies in terms of door-to-door costs.

General cargo goods are increasingly carried in containers. The overall degree of containerisation, presently at about 60% (Peters, 2000), is expected to reach 70% by the year 2010 or indeed even higher. Total container traffic now amounts to 200 million TEU per year, 50% of which takes place within Asia (Drewry, 1999).

The maximum size of containerships that carry this trade has increased almost three times in the past 20 years, from 3000 TEU in 1980 to about 8000 TEU today (Hoffmann, 1998). The fleet's average size has consequently also increased from 990 TEU in 1980 to 1590 TEU in 1997.[3] Economies of scale have been important in reducing unit costs and although the shipbuilding costs curve has virtually flattened out (Brooks, 2000), there are still savings to be had. In 1970, Hapag-Lloyd was moving 6.8 million tonnes with 106 ships and 8,450 employees. Twenty five years later, the company was moving three times that amount with only 18 ships and 3,400 staff. A rough comparison between a 6,000 and a 4,000 TEU ship shows that the former saves 30% on crew, 20% on fuel, 15% on port and canal dues and 10% on insurance (Cheung Tam He *et al*, 2000). However, the relationships between ship size and return on investment (RoI), as well as between company size and profitability, are far from being conclusive (Hoffmann, 1998).

[3] For an excellent exposition of these developments see Gilman 2000.

1. WORLDWIDE PORT DEVELOPMENT

All over the world, ports are being spectacularly developed in tandem with their countries' general economic growth, development and trade requirements. In 1998, more than 20 billion dollars were earmarked around the world for port development projects (Drewry, 1999). Forty per cent of this, i.e. 8 billion dollars, were in Asia alone, and this is a rather conservative estimate. The Hirshman-Myrdall effect (see below) is little taken into account, as countries are not convinced that they should not develop their own ports just because they can be equally well feedered by neighbouring hubs.

Given the existence of the significant economies of scale involved in port development, once the need for port development is realised it is usually also understood that the development of container-handling facilities in excess of national requirements might have the positive spin-off effects of an *unbalanced growth* approach to development. According to this, basic infrastructural facilities (such as ports) are built up far ahead of existing demand, on the part of the industry, agriculture and commerce, in the hope that the latter activities will expand by the wake of the former (Resenstein-Rodan, 1943) (a/o. see for example north American railways, particularly those of Canada).

Thus, the more ports are developed, the more attractive and economical it becomes for carriers to call there directly with smaller ships/cargo-loads, instead of feedering from a neighbouring hub, particularly if this development is accompanied by structural changes that enhance the operational efficiency and productivity of ports. Finally, countries have moved heaven and earth to develop and modernise their ports -amidst environmental, population, land-use and budgetary constraints- and many of them would thus feel very reluctant to even consider new ideas to further expand port infrastructure and superstructure in order to accommodate larger ships whose benefits (to the consumer and society at large) have yet to be shown.

2. REGIONALISATION OF TRADE

The trend towards smaller ships and direct calls/diversion will also be facilitated by the growth of intra-regional trade in Asia. As mentioned earlier, fifty per cent of more that 200 million TEU moves a year take place within this region. This means smaller distances overall, and smaller distances in their turn mean smaller optimum size of ships. The consequent development of Asian ports and fleets to serve this trade, and the increased profitability of these trades, will perhaps make it more economical for Asian operators to deploy an increasing number of such ships to Europe-Far East, instead of building dedicated large containerships to serve Europe, as is currently the case under the hub-end-spoke system. In addition, relative uniformity in ship size gives operators increased flexibility in alliance operations that aim to provide global coverage. This trend will become increasingly apparent especially if peripheral ports around Europe are developed and modernised, together with the rest of infrastructure, as discussed below.

3. INFRASTRUCTURE DEVELOPMENT IN SOUTHERN EUROPE

The high degree of efficiency and productivity of what has come to be known as the Hamburg-Le Havre range of ports, coupled with the existence, expansion and consolidation of sophisticated inland transport networks, the completion of the internal market, and a road transport pricing policy that favours long-distance haulage, have allowed these ports to capture in full the benefits of the new logistical developments in transport. Thus, approximately 50% of Europe's external trade is channelled through these ports. This has been one of the reasons that, until recently, had blunted the South's motivation to develop its own ports, being in a sense adequately served by the North. This rather passive approach to development, known in the literature of economic development as the Hirshman-Myrdall effect, combined with lack of funds, restrictive labour practices, high prices and low productivity had resulted in a situation where Mediterranean ports were by-passed in the Europe-Far East trades, with goods destined for the South being transhipped in the North and then carried over land. South European ports were (and many of them still are) thus lagging behind, despite the comparatively higher growth of their respective economies and the consequent port and transport requirements.

This example of inequitable regional development in Europe has not passed unnoticed in the Union's Cohesion Policy. The latter, together with the Treaty of the European Union, require the EU to promote the interconnection and interoperability of national networks and access to them, taking into account the need to link island, landlocked and peripheral regions of the Union with its more central areas. The aim is to enable citizens of the Union, economic operators and regional and local communities to derive full benefit from the internal market.

However, interconnection, interoperability of transport networks in general cannot be achieved if ports are not included in the equation as the crucial links of a closed (i.e. total) European transport system. Considering European ports as a whole and as the international interface of the European logistical network is consistent with the approach taken by the Commission in its *white book* on the Future Development of the Common Transport Policy. In fact, while taking note of existing inefficiencies and discordances, the *white book* provides for a global approach to the problem. It aims at a more balanced modal development of transport, allowing users a greater freedom of choice; at a more balanced distribution among regions of benefits resulting from infrastructural development; at improving the efficiency of companies operating in this sector; at increased safety and attention to the problems of environmental protection. All this, while taking social problems related to the sector's employment levels into account.

Today, south European ports are still important instruments of regional development, and crucial links that connect the periphery with the centre, both with regard to cargo *and* passengers. They thus contribute to the economic and social cohesion of Europe and many of them are developing as southern gateways to the continent for the increasing far-eastern traffic. Ports in Italy, Spain and Greece have gone to great lengths towards development and restructuring, increased efficiency and competitive pricing. As a result, they have been able to strike lucrative deals with major carriers and an ever increasing part of European trade enters now the continent from the

South. That, incidentally, was one of the main findings of the EU ATENCO project[4] and explains, for example, the interest that Bremen and Hamburg have recently taken in Contship, and consequently in the port of Goia Tauro.

South European ports are expected to expand and modernise at even higher rates in the future. An additional incentive for that is the rapid growth of north Africa, the Middle East and the Black Sea, and the Union's intention to create a customs union and eventually a free trade area with the non-member Mediterranean countries (European Commission, 1995; Haralambides, 1998). All in all, a population equal in size to that of the EU, with 80% of it leaving at a distance of less than 100 Km from the coast. Again, the more ports are developed and modernised, the more economical a direct call by a (smaller) mother-ship becomes.

4. ROAD PRICING IN EUROPE

The heavy demand on road use in Europe, compounded by the underpriced, fixed-cost-based, supply of road infrastructure, and the increasing unwillingness of many governments to invest in new road capacity (0.8% of Community GDP in 1995, compared to 1.5% twenty years ago) create a number of significant problems, particularly with regard to congestion, safety and environment. Some often quoted illustrative figures could further highlight this point. Thus:

- The death toll in road transport amounts to 55,000 people per year (1.5 million injured);
- Every day, 4,000 km of Community motorway are totally congested;
- Yearly congestion costs amount to 120 billion ECU, or 2% of Community GDP;
- The external costs of accidents, air (excluding global warming) and noise pollution have escalated to 130 billion ECU/year;
- In total, transport externalities represent roughly 4% of Community GDP.

Externalities such as these, however, are rarely internalised in the pricing of road infrastructure, the more so when the latter has lost most of its "public interest" character and is increasingly becoming a private consumption good. Thus, the anticipated emphasis towards a "variable cost" approach in the pricing of road use (user pays principle) by many European governments (European Commission, 1996) is expected to make competition among ports and transport systems fairer and more efficient. To quote the EU: '*… as a general rule, all transport users pay the full cost, <u>internal</u> and external, of the transport services they consume, even if these costs are in some cases paid by society to assist those in need…*'.

Such a pricing policy, if ever implemented, will make long-haul road transport considerably more expensive. This is bound to limit the hinterland of hub ports and, correspondingly, boost not only alternative modes, but also extend the hinterland of south European ports that could equally well target Asian cargoes destined for France, southern Germany, Switzerland, Austria, the countries facing the Black Sea and a considerable part of Central and Eastern Europe. As discussed above, the competitive position of South-European ports and short-sea-shipping in this region will further

[4] 'Analysis of the Cost Structure of the TEN-ports (ATENCO'. PL 98-3011 (confidential).

improve along with progress in the integration of non-member Mediterranean countries and the eventual formation of a Customs Union and a Free Trade Area with them.

Incidentally, the development of Trans-European Transport Networks (TENs) coupled with a different road pricing policy will also have an effect on the *price equalisation* policies of most maritime conferences; policies that, however well justified under the present circumstances, affect both port competition and encourage long-haul road transport.

Liner shipping companies incur substantial fixed costs due to their need to provide regular and frequent services to their customers. As a result, they require increased port reliability and quick turnaround times, sometimes achieved through the use of their own dedicated terminals. Furthermore, the inherent overcapacity in liner shipping, again as a result of the need for regular and frequent services, oblige liner companies to try and extend their catchment areas far beyond the immediate hinterland of their port(s) of call. This need explains their price equalisation policy according to which short-haul cargoes cross-subsidise long-haul ones. Long-haul cargo may, thus, pay less than its full direct costs of transportation, the difference accounted for by either the relatively higher price of short distance haul, and/or lower sea-leg tariffs. Arrangements such as these encourage haulage over long distances and, from a EU Common Transport Policy (CTP) point of view, cannot be unquestionably acceptable, especially when shorter distances and other modes are available and under-utilised.

Having said that, however, this policy of liner shipping companies is not necessarily the result of the particular market structure of liner shipping. Even with higher competition prevailing, a liner company/conference would still have the incentive to cross-subsidise long-hauls as long as the marginal costs incurred are less than the costs of having to sail with less than optimal load factors. The latter costs have of course to do with the economies of scale of large vessels that are, however, only realised if high capacity utilisation is achieved.

5. THE FUTURE OF LINER SHIPPING ALLIANCES

Up to now, developments in ports (hub-and-spoke) have been dictated by developments in shipping rather than the other way around. As already said, developments in liner shipping in particular have been necessitated by the drive to cut unit costs through increases in the size of ships. The capital-intensity of modern containerships, however, requires very fast turnaround times and thus appropriate investments in ports. At the same time, shippers require a certain frequency of service that befits their *just-in-time* and *flexible-production* technologies. The combination of “large ship size” and “adequate frequency of service” can easily lead to low load factors and under-utilisation of capacity, for operators intending to “go it alone” without a secure cargo basis. One could argue that the industry has fallen into some sort of vicious circle where the need to cut costs leads to the construction of larger ships creating overcapacity that depresses rates thus leading to a stronger need to cut costs and so on and so forth.

Global shipping alliances have thus emerged in order to exploit ‘economies of scope’ among otherwise competing operators, through strategies such as the dovetailing of individual service networks; vessel sharing; slot-chartering; joint ownership and/or utilisation of equipment and terminals and similar endeavours on better harmonisation of operations (Cariou and Haralambides, 1999; Haralambides and Veenstra, 2000). All these have as their ultimate objective to increase capacity utilisation of very large containerships.

However, liner shipping alliances have proven to be unstable coalitions and this fact alone does not entice individual carriers to undertake the required long term commitments; something that defeats the very same *rationale* of alliances. Mergers and acquisitions are thus becoming more appealing to carriers and industry observers note that it won’t be long before we see liner trade carried by a handful of mega-carriers. Such consolidation, in an industry that is already highly concentrated, will take place, if at all, under the increasing scrutiny of the regulator, at both ends of the Atlantic, who, with the final consumer in mind, is likely to encourage more competition rather than further consolidation. If the liner shipping market thus becomes more open and competitive in the future, ship sizes are bound to decrease together with an increase in the number of ports of call. Low prices would then be achieved through higher competition rather than big ship sizes.

In such a scenario, shipping companies will be forced to provide the services their customers want, rather than the ones they find it convenient to offer. Reduction in ship size and more direct calls could follow the example of the air-transport industry. The most common jet flying across the Atlantic is not the 420-seat 747 jumbo but the 200 plus-seat Boeing 767. Eight out of 10 transatlantic planes are twin-engined craft such as the 767, its bigger brother the 777, or the various airbuses. This taste for smaller international jets reflects the fact that travellers now like to shun big international hubs such as London and New York and fly directly to their destinations. This is changing the international market into a web of direct intercontinental flights rather than one big air-bridge between London and New York.

6. CONCLUDING NOTES ON INFORMATION TECHNOLOGY

The impact of information technology on transport, as well as on all aspects of our lives, has yet to be fathomed. One thing however is for certain. Information makes markets more efficient, reducing the need for middlemen, may they be brokers, forwarders, consolidators or NVOCCs (Pettersen-Strandenes, 2000). The supply chain thus becomes shorter and the future may see more direct international transactions between buyer and seller, for smaller quantities, expediently delivered. Unavoidably this will have to be done by smaller ships and direct port calls, through a system of ocean transportation that I have often called ‘the transition from land- to sea-based logistics’.

BIBLIOGRAPHY

Brooks, M.R. (2000) Sea change in liner shipping: regulation and managerial decision-making in a global industry. Oxford, Elsevier Science Ltd.

Cariou, P. and H.E. Haralambides (1999) 'Capacity pools in liner shipping; an allocation model for the east-west trades'. International Association of Maritime Economists, Halifax, Canada, 13-14 September 1999.

Cheung Tam He, C., H.E. Haralambides and S.D. Tsolakis (2000) 'The Global Outlook of Liner Shipping and Port Networks in the Information Society of the 21st Century'. The 16th International Port Logistics Conference, 6-8 February 2000, Alexandria, Egypt.

Drewry Shipping Consultants (1999) 'Container market outlook: high risk and high stakes - where is the payback?' London, Drewry Shipping Consultants Ltd.

European Commission (1995) 'Strengthening the Mediterranean policy of the European Union: Establishing a Euro-Mediterranean partnership'. Communication from the Commission to the Council and the European Parliament [COM(94) 427 final].

European Commission (1996) 'Towards fair and efficient pricing in transport'. [COM(95) 691 final].

European Commission (1997) 'Green paper on seaports and maritime infrastructure'. [COM(97) 678 final].

Evangelista, P. and A. Morvillo (2000) 'Cooperative strategies in international and Italian liner shipping'. *International Journal of Maritime Economics (IJME)*, Vol. II, No. 1, 1-16.

Gilman, S. (1999) 'The size economies and network efficiency of large containerships'. *International Journal of Maritime Economics (IJME)*, Vol. I, No. 1, 39-59.

Haralambides, H.E. (1998) 'Future trends in international transport and their impact on the Mediterranean region'. Second International Transport Conference on "Development of Transport Connections between Western Europe, the Mediterranean and the Black Sea". Sochi, Russia, April 2-3, 1998 (Published also in *Shipping International Monthly Review*, Vol. 177, No 332, May 1998).

Haralambides, H.E. (1999) 'The state of the play in international shipping, ports and multimodal transport at the dawn of the 21st century. *The Economist* Conferences, Athens Intercontinental Hotel, 18-19 November 1999.

Haralambides, H.E. and A.W. Veenstra (1997) 'Current trends in containership size development'. in: *De Sterkten en Zwakten van de Vlaamse Havens en van het Vlaamse Havenbeleid.* Ministry of the Flemish Community, Vlanders Social-Economic Commission, Flemish Port Commission.

Haralambides, H.E. and A.W. Veenstra (2000) 'Modelling performance in liner shipping. In: K.J. Button and D.A. Hensher (eds.): *Handbook of Transport Modelling*. Pergamon-Elsevier Science (forthcoming).

Hoffmann, J. (1998) 'Concentration in liner shipping: its causes and impacts for ports and shipping services in developing regions'. Santiago, ECLAC.

Peters, H.J.F. (2000) 'Developments in global seatrade and shipping markets, their effects on the port industry, and private sector involvement'. Special Interest Group on Maritime Transport and Ports (SIG2), World Conference on Transport Research Society (WCTRS) workshop, Genoa, June 2000.

Pettersen Strandenes, S. (2000) ‘The shipbroking function and market efficiency’. *International Journal of Maritime Economics (IJME)*, Vol. II, No. 1, 17-26.
Rosenstein-Rodan, P. (1943) ‘Problems of industrialisation of east and south-east Europe. *Economic Journal* (June-September 1943).
Ryoo, D.K. and H.A. Thanopoulou (1999) ‘Liner alliances in the globalization era: a strategic tool for Asian container carriers’. *Marit. Pol. Mgmt*, Vol. 26, No. 4, 349-367.