

**DETERMINANTS OF PRICE AND PRICE STABILITY IN LINER SHIPPING**

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## INTRODUCTION

This paper originates from the author's involvement, as head of a team of consultants, in the European Commission's review of Regulation 4056/86: The regulation that, in the main, provides liner shipping conferences with limited exemption from EU antitrust laws.

A central issue in this process, reflected in most submissions of interested parties to the Commission (particularly those of the European Liner Affairs Association (ELAA) and the European Shippers Council (ESC)) was the importance of *price stability*, -and the ensuing long term supply stability- as one of the reasons for providing antitrust immunity to liner shipping conferences.

Opinions of shippers and carriers are diametrically opposite on this issue: Shippers claim that price stability is an irrelevant concern and what really matters is *service reliability* which is nowadays achieved through (confidential) service contracts. Carriers, on the other hand, argue that (relative) price stability, as well as the ensuing long term supply stability, are *indispensable* for reliable services, and conference price-setting is a low cost mechanism to self-regulate a network industry such as liner shipping, which is vulnerable to destructive competition.

The present paper thus revolves around pricing and price stability, concluding with a summary of the econometric analysis carried out by Erasmus for the European Commission.<sup>1</sup> Price stability, however, is a subject difficult to disentangle and treat in isolation from the operational and strategic issues facing the liner shipping industry. These are rather unique and unless properly understood, especially by competition lawyers and policy makers, price stability cannot be put in the right perspective. This might entail dangers and policy pitfalls to the detriment of the industry and, more importantly, to the detriment of international trade in containerized cargoes.

As a result, the present paper devotes considerable length on the discussion of the most pertinent economic fundamentals of the liner shipping industry, from an *industrial economics* viewpoint. In so doing, the paper borrows liberally from Stephen Martin's outstanding exposition (Martin, 1994, 2002). Although a preliminary version of something much more substantial under preparation, it is hoped that the paper -and the extensive bibliography provided at the end<sup>2</sup>- will provide 'perspective' in the hazy policy discussions on conferences that are presently taking place in Europe.

## LINER SHIPPING AND CONFERENCES: TWO DEFINITIONS

### Liner Shipping

C. Ernest Fayle, in an effort to distinguish tramp from liner services, describes a *liner service* as one implying '...a fleet of ships, under common ownership or management, which provides a *fixed service*, at *regular intervals*, between named ports, and offer themselves as *common carriers* of any goods or passengers requiring shipment between

those ports and ready for transit by their sailing dates. A *fixed itinerary*, inclusion in a regular service, and the *obligation to accept cargo* from all comers and to sail, *whether filled or not*, on the date fixed by a published schedule...'. In contrast, he defines a tramp ship, a 'seeker' or a 'general trader' as one '...which can be hired as a whole, by the voyage or the month, to load such cargo and to carry it between such ports as the charterer may require...' (Fayle, 1933).

### **Conferences**

In the *UNCTAD Code of Conduct for Liner Conferences*, the term conference or liner conference is defined as '...a group of two or more vessel operating carriers which provides international liner services for the carriage of cargo on a particular route or routes within specified geographical limits and which has an agreement or arrangement, whatever its nature, within the framework of which they *operate under uniform or common freight rates* and any other agreed conditions with respect to the provision of liner services'. (UNCTAD, 1970).

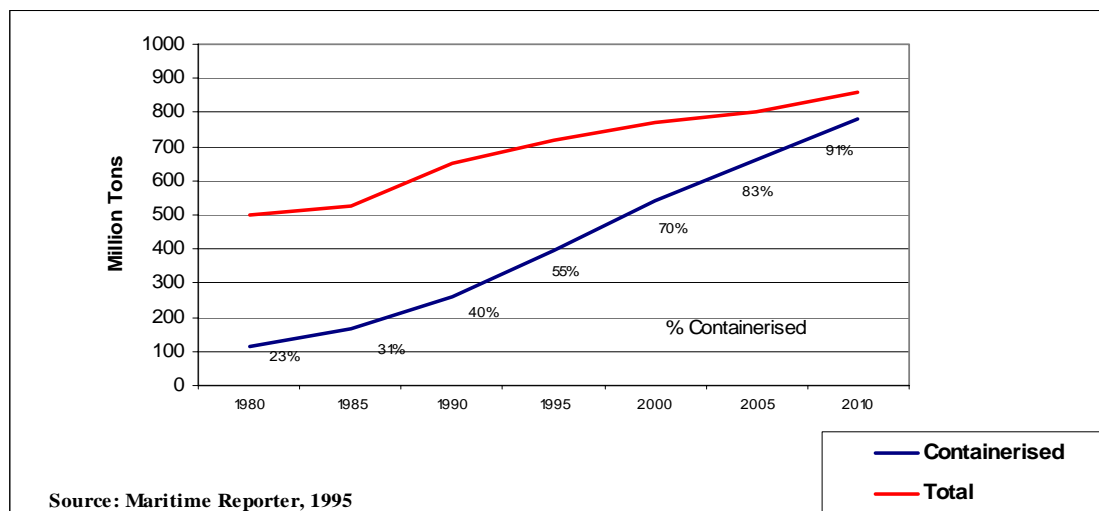
For more than 100 years, liner shipping conferences have been resembled to price-setting cartels. In his celebrated book, Daniel Marx Jr. defines shipping conferences, or rings, as '... agreements organised by shipping lines to *restrict or eliminate competition*, to regulate and rationalise sailing schedules and ports of call, and occasionally to arrange for the pooling of cargo, freight monies or net earnings. They generally control prices, i.e. freight rates and passenger fares. The nature of their organisation varies considerably, depending on the market structure of the trade route. Some have been conferences quite literally -informal oral conferences- but many have employed written agreements establishing a permanent body with a chairman or secretary, and containing carefully described rights and obligations of the conference membership...'. Daniel Marx Jr, 'International Shipping Cartels'.

### **LINER SHIPPING: THE PAST**

Cargo carried by liner shipping has come to be known as *general cargo*. Up to the beginning of the 1960s, such cargo was transported, in various forms of packaging (pallets, boxes, barrels, crates), by relatively small vessels, known as general cargo ships. These were twin-deckers and multi-deckers, i.e. ships with holds (cargo compartments) in a shelf-like arrangement where goods were stowed in small pre-packaged consignments (parcels) according to destination. That was a very *labour intensive* process and, often, ships were known to spend most of their productive time in port, waiting to load or discharge. And although seafaring was great fun in these days(!) *congestion* was a chronic problem in many ports, raising the cost of transport and hindering the development of trade. Equally importantly, such delays in ports made trade movements erratic and unpredictable, obliging manufacturers, wholesalers and retailers to keep large stocks. As a consequence, warehousing and *carrying costs* were adding up to the cost of transport, making final goods more expensive and, again, hindering the development of international trade (Haralambides and Veenstra, 2000).

## LINER SHIPPING: CONTAINERISATION

This situation started to change in the 1960s with the introduction of *containerisation* in the trade between the United States and Europe, and subsequently in the rest of the world. Containerisation is often described as a revolution in transport. General cargo goods are now increasingly carried in steel boxes (containers) of standardized dimensions (most common is the 8x8x20 feet unit known as TEU –Twenty (feet) Equivalent Unit-, although containers of double this size (40 feet) are quite common particularly in North America). *Container penetration* in general cargo goods thus saw a marked increase: from something like 20% in the 1960s, to more than 70% presently (Figure 1). At the same time, the general cargo ship started to see itself out (Figure 2), replaced by specialized cellular containerships of ever increasing dimensions (Figure 3), achieving spectacular gains in productivity and, as a result, low transport costs. At the time of writing, containerships in excess of 8000 TEU of carrying capacity are being built, while designs of 10, 12 or even 18,000 TEU ships are already on the drawing boards of naval architects.



**Figure 1:** Container Penetration in General Cargo Goods

Mammoth containerships such as these can cost anything in excess of 50 million US dollars and it could take up to nine of them to run a weekly service between Europe and the Far East. The capital intensity of these ships –the equivalent of a jumbo jet in aviation– obliges them to limit their ports of call at each end to a minimum of ‘hub’ ports or *load centres* such as Singapore, Hong Kong and Rotterdam, from where huge surges of containers are further forwarded (feedered) with smaller vessels to regional and local ports. A complex *hub-and-spoke* network(s) has thus developed whose fine-tuning and optimisation bears directly on the consumer’s pocket.

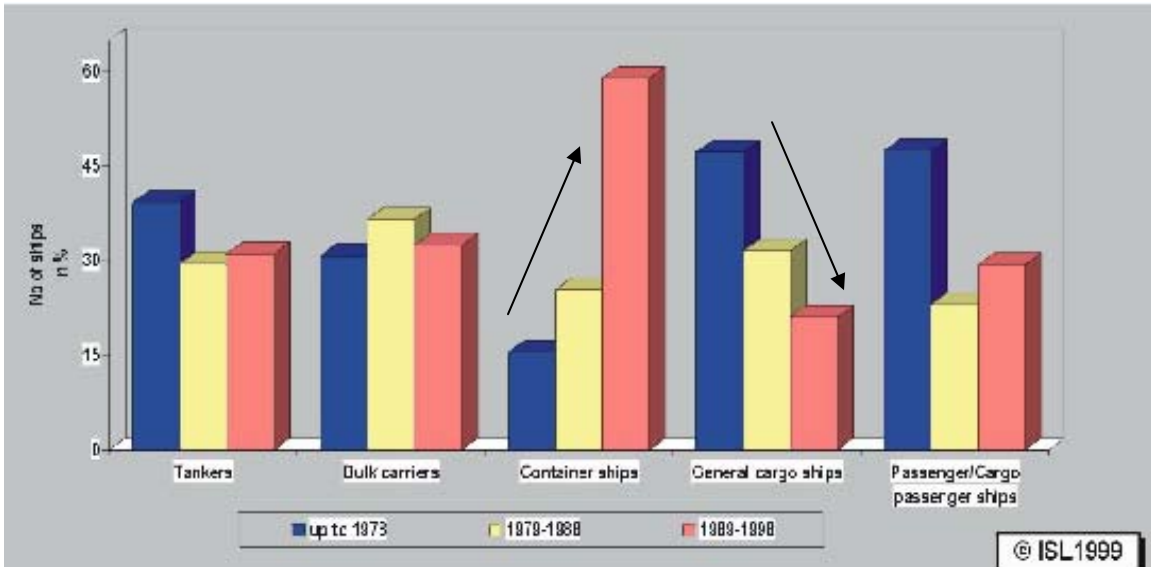


Figure 2: The Demise of the General Cargo Ship

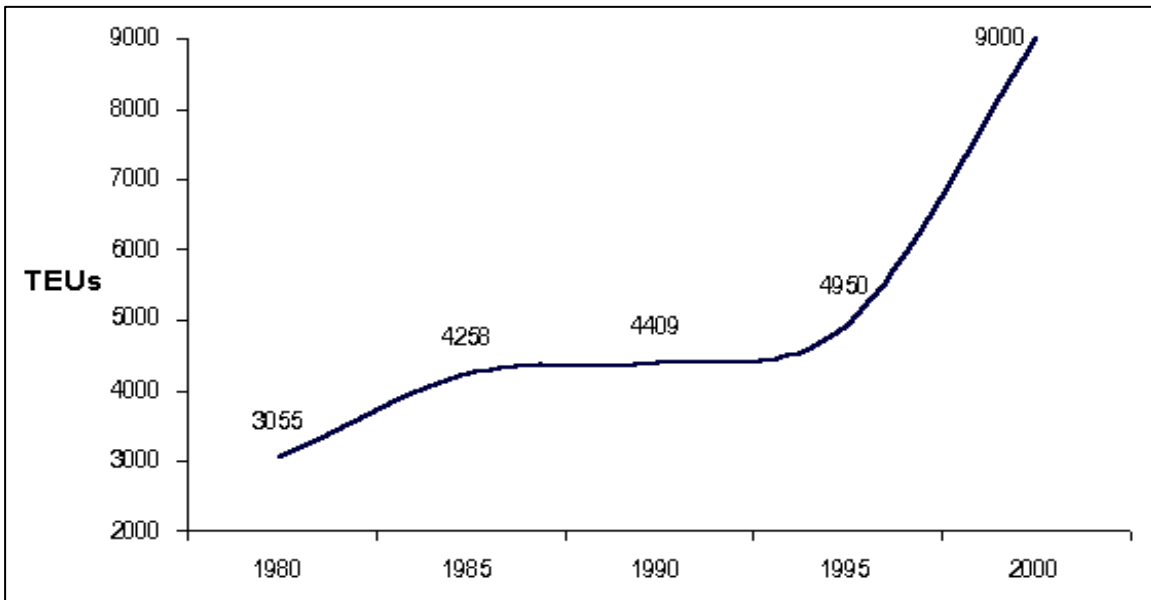


Figure 3: Developments in Containership Sizes (source: Hoffmann, 1999)

## CONTAINERISATION AND PORT EFFICIENCY

Around the world, the port industry has invested a lot in order to cope with the technological requirements of containerisation. Modern container terminals –and suitable cargo-handling equipment- have been built and new, more efficient, organisational forms (including privatisation) have been adopted in an effort to speed up port operations. Operational practices have been streamlined, the element of uncertainty in cargo flows largely removed, forward planning has been facilitated, port labour regularised and customs procedures simplified. These developments took place under the firm understanding of governments and local authorities that ports, now, constitute the most important link (node) in the overall door-to-door transport chain and thus inefficiencies (bottlenecks) in the port sector can easily whither away all benefits derived from economies of scale in liner shipping.

Containerisation has thus brought about a remarkable increase in port productivity (Table 1) and this is considered to be the single most important reason for the increase of containership sizes. Equally importantly, labour productivity and the commensurate increases in the remuneration of port workers, coupled with the accuracy and predictability of port operations, allowed the *regularisation* of port work, from its *casual* and disreputable status of earlier times, in many ports.

**Table 1:** Port Labour Productivity in the US West Coast

<b>YEAR</b>	<b>Work Hours (million)</b>	<b>Tons Cargo (million)</b>
1960	29	29
1990	15	175

Source: Longshoremen Union

Another important effect of containerisation and door-to-door transport was the by-passing of the ‘waterfront’. Containers are now packed (stuffed) and unpacked (stripped) away from the waterfront, either at the premises of the exporter (consignor) and/or the importer (consignee), or at Inland Container Depots (ICD), known also as ‘dry-ports’.

In addition to relieving pressure on expensive and usually congested port land, the by-passing of the waterfront in the stuffing and stripping of containers (thus having them ready in port to be handled by automated equipment) increased immensely the predictability and reliability of cargo movements. This has in its turn enabled manufacturers and traders to reduce high inventory costs through the adoption of flexible Just-in-Time and Make-to-Order production technologies. *Inter alia*, such technologies have helped manufacturers to cope with the vagaries and unpredictability of the business cycle and plan business development in a more cost effective way.

## FUNDAMENTAL TRAITS, PRECONCEPTIONS AND A VIEW ON REGULATION

The most pertinent characteristic from the above definition of liner shipping is the provision of a fixed regular service (itinerary) and thus the obligation of the ship to sail whether filled or not. This makes the greatest part of a ship's operating costs fixed (i.e. invariable to the number of containers it carries), the only variable costs being *Terminal Handling Charges* (THC). Particularly in view of the industry's inherent excess capacity, due to east-west trade imbalances, liner shipping is a declining cost industry and, in such a case, *marginal cost pricing* could easily lead to *destructive competition*. As such, liner shipping wouldn't be far from the textbook definition of a *natural monopoly*.<sup>3</sup>

Imagine the admittedly simplified case where, shortly before the ship sets sail, an unexpected customer arrives at the port with one container to ship. If the vessel has unfilled capacity, which is often the case in liner shipping, its operator would be tempted to take on the extra container even at a price as low as merely the extra (marginal) cargo-handling costs involved in taking the container onboard. This could have a cascading effect and, were it to become common practice, competition among carriers would push prices down to the level of short-run marginal costs. Consequently, the liner service would not be sustainable in the long-run, as operators would not be able to cover full costs (most importantly capital costs such as depreciation allowances for the eventual replacement of the ship). Cases like these are quite well known in the industry, one being the export of waste paper from US West Coast to Asia, known to ship for less than two hundred dollars per box.

Conferences have thus been allowed to fix prices at long-run average or marginal cost, in order to ensure *minimum efficient size* (MES) and an uninterrupted supply of service to the benefit of trade. The leniency of the Regulator, in most industrialised nations, has been based exactly on this: In high fixed costs industries, or rather industries facing *increasing returns to scale*, marginal costs are always below average total costs and thus cut-throat competition based on marginal costs will lead to deficits and to a service unsustainable in the long run to the detriment of the consumer (shipper) who first and foremost requires *regular* and *frequent* services as a result of modern just-in-time logistical transport arrangements. In regulated natural monopolies, the regulator has two options: either to subsidise the deficits of the monopolist –something that even if allowed would lead to inefficiency and complacency- or to allow him to set prices at average cost. In the (international) liner shipping industry, and in the absence of a *national* regulator, this has been achieved by allowing conferences to self-regulate.

Recently, however, shippers have strongly contested conference price-fixing, claiming that *restrictive business practices* such as these not allowed in any other industry. In doing so, shippers fail to see that conference price-fixing is a low cost solution to allow an international industry self-regulate, when national regulation (applicable to other industries) is obviously not applicable, given the international character of shipping.

The word *regulation* here has to be put in a wider perspective however. In other capital intensive industries selling final goods (*vis a vis* the intermediate and non-storable transport service), there is substantial *demand management* (e.g. advertising) as well as time-honoured relationships and rapport (explicit or tacit) between government, industry and labour. Good examples of this are known to all who have read Galbraith's seminal book "The New Industrial State". The Dutch 'polder' (consensus) model, the Japanese *Keiretsu* structure and the Korean *Chebol* are all manifestations of the importance of such links, often taking the form of consensus practices; hidden or open subsidies; R& D subsidies; trade policies and politics; and a miscellany of actions government and industry undertake to ensure that their products will be sold and long term investments will pay off.

Imagine whether Boeing or Airbus would ever be able to undertake years of expensive R&D for the development of a new aircraft type, if they weren't somewhat confident that their government(s) would do their utmost to eventually sell it. Imagine how competitive and sustainable US industries would have been, were it not for the free use of technology originating from a heavily subsidized defence industry.

If only for its international character, all this does not exist in shipping, and the only reassurance towards a feeling of confidence is carriers' ability to self-regulate by fixing rates. In the absence of conferences, the alternative would be mergers and thus bigger companies. A few of them would dominate trades, vested with significant market power, in the absence of regulatory control. Conference price-fixing is therefore a low cost arrangement towards self-regulation. Effective regulatory control would continue to be necessary, to avoid possible abuses. The 'onus of proof' of any possible market power should however be with regulatory authorities who, frankly, cannot expect others to do their work for them. If the onus of proof is placed on carriers, taxpayers may rightfully ask what is the purpose of having (and paying for) competition authorities.

The real questions however are: are conferences able to abuse their price-setting privilege, discriminate, manage capacity, and charge prices well above costs? In other words, do conferences have market power? How steep is a conference's demand curve? Is liner shipping a concentrated industry? Does concentration necessarily lead to market power? Is liner shipping a contestable market? We will deal with these questions in turn.

## **MARKET POWER**

From a competition policy viewpoint however, the relevant question is whether prices wouldn't have been even lower without conferences or, in other words, if price-fixing conferences have a certain degree of market power. Today, this question would be extremely difficult to answer and this can explain the weak econometric results of the *Erasmus Report* discussed below. Presently, liner rates, particularly on US trades, represent less than 20% of total traffic. The relevant questions would thus be: what do agreed liner tariffs purport to achieve? Are they just *benchmarks* and *voluntary guidelines*

for prices in confidential service contracts, as claimed by carriers? Even if they are, how effective could they be in enforcing some sort of price discipline in service contracts particularly when the sole objective of *confidentiality* is to preclude explicit or tacit collusion? If conference price-fixing were to be disbanded, wouldn't this lead to greater efforts for more effective tacit collusion? And, finally, shouldn't a possible disbanding of conferences lead to the simultaneous abolition of the *confidentiality* clause in service contracts? (honestly, to try to enhance competition by restricting information is a contradiction in terms!). Until some sort of *price index* exists, representing both liner tariffs *and* prices in service contracts, the question whether market power exists in liner shipping could not be answered, conferences notwithstanding. As a matter of fact, the *Erasmus Report* showed (see below), even tentatively, that conferences nowadays have little power, if any, to increase prices. In some cases, they may even reduce them!

Market power refers to a producer's ability to charge and maintain prices above marginal costs and this is often measured by the Lerner's Degree of Monopoly (Lerner, 1934), given by the inverse of price elasticity of demand at equilibrium:

$$\begin{aligned}
 MR &= MC \\
 R &= f \cdot Q \\
 f &= g(Q) \\
 MR &= \frac{\partial R}{\partial Q} = f + Q \frac{\partial f}{\partial Q} = f \left( 1 + \frac{Q}{f} \frac{\partial f}{\partial Q} \right) \\
 MR &= f \left( 1 - \frac{1}{e} \right) = MC \\
 \text{or} \\
 \frac{f - MC}{f} &= \frac{1}{e}
 \end{aligned}$$

Where:

MR = Marginal Revenue; MC = Marginal Cost; R = Total Revenue;  $f$  = price; Q = Output;  $e$  = price elasticity of demand.

The last expression, giving the proportional excess of price over marginal cost, is known as Lerner's Degree of Monopoly. It should be remembered that, in imperfect markets, the cause of welfare loss is the restriction of output which raises the price above marginal cost. It is thus natural to measure the degree of market power by the extent to which the seller can hold the price above marginal cost.

Even for a monopolist however, there is a limit to control over price: If the quantity demanded is very sensitive to price, the price elasticity of demand will be large. The right-hand side of the equation will be small, and the profit-maximising price will be

close to marginal cost. In such a case, the profit maximising firm will restrict output only slightly, if at all, below the competitive level.

On the other hand, if the price elasticity of demand is small, the firm has more leeway to raise the price: when the quantity demanded does not decline much as the price rises, the profit maximising firm will be able to raise the price above marginal cost without suffering substantial losses in business.

The importance of ‘elasticity estimates’ for the pricing strategies of liner companies is discussed below in the context of price discrimination. Despite this, studies on price-cost margins in shipping do not exist, apart from a rather unsuccessful attempt by staff of the World Bank (Fink *et al*, 2000). As always, the reason for this is data unavailability: cost per TEU/mile data are highly sensitive and confidential and the same goes for the prices in confidential service contracts that now cover more than 80% of total liner business.

## PRICE DISCRIMINATION

Market power can also be established by a seller’s ability to exercise *price discrimination*, i.e. charge different buyers a different price according to their willingness or ability to pay (in other words, according to their price elasticity of demand). In shipping, this practice has often been referred to as the ‘charging what the traffic can bear’ principle. In (non-storable) services, such discrimination is neither uncommon nor unique to shipping, given that arbitrage is not possible and buyers are geographically separated. In tangible goods too however, efforts towards product (and thus price) differentiation are so intense that, often, consumer sentiment ranges from utter frustration to sheer anger (if one wants proof of this he could only try to find the same personal computer in two different shops, in his neighbourhood or beyond!).

Whenever price discrimination is possible, a seller’s ability to charge different prices according to buyers’ willingness to pay can increase profits far beyond those of a uniform price. Assume that the conference can discriminate between two different cargoes ( $Q$ ) or shippers:

$$\begin{aligned}\pi &= R_1(Q_1) + R_2(Q_2) - C(Q_1 + Q_2) \\ \frac{\partial \pi}{\partial Q_1} &= R'_1(Q_1) - C'(Q_1 + Q_2) = 0 \\ \frac{\partial \pi}{\partial Q_2} &= R'_2(Q_2) - C'(Q_1 + Q_2) = 0 \\ R'_1(Q_1) &= R'_2(Q_2) = C'(Q_1 + Q_2)\end{aligned}$$

Profit ( $\pi$ ) maximisation in such a case would require the two marginal revenues (i.e. price minus the cost of the ‘sales effort’ to get the extra container) to be equal to each other and to the marginal cost of transporting the extra container. If this can happen, then:

$$f_1\left(1 - \frac{1}{e_1}\right) = f_2\left(1 - \frac{1}{e_2}\right)$$

$$\frac{f_1}{f_2} = \frac{1 - \frac{1}{e_2}}{1 - \frac{1}{e_1}}$$

and the conference would maximise profit by charging a higher price to the shipper with the lower price elasticity of demand. In the limit, in cases of perfect price discrimination, the seller would extract the whole of consumer surplus for himself, simultaneously maximising profit.

In the past, in periods of strong, closed, conferences and break-bulk general cargo transport, and when the industry was not (self) regulated (!), price discrimination was taking place on the basis of the value of transported goods (charging what the traffic can bear); among shippers; ports; and through price equalisation strategies (favouring long distances over shorter ones in an effort to expand hinterland catchment areas).

With the introduction of the container and *freight all kinds* (FAK), as well as the introduction of individual and confidential service contracts, most of this type of price discrimination has disappeared. It has instead been substituted by a genuine effort of carriers –through, admittedly, substantial sales efforts- to offer a differentiated service and thus compete on quality.

But although price discrimination has indeed been taking place in the past (or even today, in the terms and prices of confidential service contracts), this may have been happening for a completely different (and benevolent) reason: Price discrimination has been able to attract low value cargoes (often from developing countries) that wouldn't move otherwise, in order to fill the ship. This promotes rather than prejudices trade and social welfare: A larger volume of trade is carried and this allows the construction and employment of the largest ships possible. Ensuing economies of scale and lower transport costs promote trade even further.

Furthermore, it has often been argued, price discrimination introduces, paradoxically, an element of competition in the sense that it attracts *hit-and-run operators* who, with minimal infrastructure and other overheads, 'skim' the market, targeting high-value goods only, by rigorously undercutting established prices. Thus, price discrimination makes the liner shipping market much more *contestable* (see below).

## COMPETITION ON QUALITY OF SERVICE

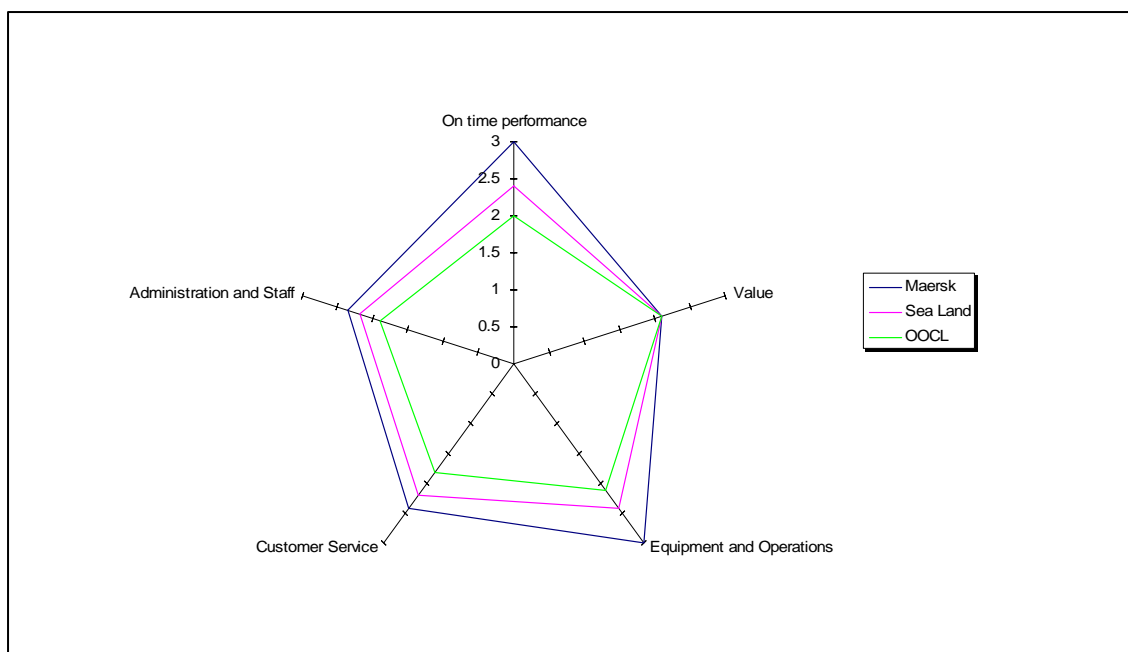
The limitation of price competition obliges carriers to compete on *quality of service*; and this is precisely what shippers have been requesting. Devanney *et al* (1975) argue that restrictive business practices in liner shipping (conferences) do not allow carriers to extract economic rent, given their strong competition on quality. When price is fixed,

differentiation on quality is the only way a carrier can increase his own revenue at the cost of others. In earlier times, particularly when competition between sailing and steamships existed, *speed* was the main lever of carriers to differentiate service: some were simply able to offer quicker services or, in case of difficult circumstances such as congestion in ports and bad weather, were better in maintaining sailing schedules.

Nowadays, ‘quality variables’ are considered to be the provision of information and EDI systems; logistical services; better coordination and integration with inland transport companies; ownership of terminals and equipment; frequency of service; geographical coverage and efficient response to the particular requirements of customers.

The modern term used for such practices is *market segmentation*. It is usually justified by arguments such as ‘different shippers have different needs’, ‘quality service requires attention and customisation to customer needs’, ‘uniform service and price leads to waste in the same way a ‘buffet dinner’ does’, and so on.

But although the above ‘quality variables’ are undoubtedly important service attributes, especially in today’s world of ‘logistics’, the *extent* to which shippers require such services still remains to be seen. Carriers try hard to sell a differentiated service<sup>4</sup>, often to very suspicious shippers requiring cost break downs and ‘no frill sea-leg only’ transport costs. And no one would blame them for this: industrial economists have often considered ‘competition on quality’; or the ‘cost of monopolisation’; or the ‘eating up of supernormal profit’, as socially wasteful. In addition, product and price differentiation blunt consumer insight, relaxing at the same time one of the fundamental conditions of competitive markets, i.e. *perfect information*. Whether ‘carrier logistics’ and ‘integrated transport solutions’ are thus *demand-pulled* or *supply-pushed* remains yet to be researched.



**Figure 4:** Competition on Quality (shippers’ rankings of liner companies). Source: unknown.

## VERTICAL INTEGRATION

Related to *competition on quality* is the issue of vertical integration in liner shipping. Currently, carriers are investing heavily not so much in ships (that can now be easily chartered in from institutional investors) but in ‘logistical’ investments such as EDI systems, warehouses and distribution centres, container terminals, and land and air transport companies. Their *stated* objective is to be in better control of their operations and thus able to offer a better, tailor-made, service to their customers. This is undoubtedly true but at the same time such investments make the liner market less contestable, particularly if one were to argue that ‘protected’ income –due to price-fixing– is invested in related markets where intense competition prevails. Freight forwarders, NVOCCs and third party logistics providers are often very vociferous against carrier strategies to offer an integrated service. Rightly, this might, in a sense, be seen as unfair competition, and it was exactly for this reason that the European Commission has not allowed multimodal tariffing to be covered by the conference block exemption of Regulation 4056/86.

## INDUSTRY CONCENTRATION

In the textbook definition of *perfect competition*, if such thing ever existed, there is a very large number of sellers, each one too small to influence price through his own decisions. They are thus all price-takers, competing on price only, and they either adjust their costs to the externally determined price or leave the market in bankruptcy. As the number of sellers is reduced (i.e. as industry concentration increases), competition is usually seen to diminish substantially. Personal rivalry however –fought with corporate weapons other than price– can paradoxically increase. Reduction of competition is usually explained by the fact that, together with concentration, the *barriers to entry* for aspiring newcomers also increase, in terms of capital and other large scale production requirements.

The potential impact of industry concentration on competition brings out one important policy difference between Europe and the United States. In Europe, equal emphasis is placed on market shares (concentration), as well as on *abuse* of market power. The latter may lead to loss of social welfare and transfer of income from consumers to producers and these are aspects less easily accepted in Europe than in the USA. There, concentration *per se* is not a major issue. Concentration is often considered the result of normal business processes, or the most efficient way of organising production. It is rather the effect of concentration on market power (and its abuse) that ought to be prevented.

In addition to various *concentration ratios* used by governments and regulatory authorities, a commonly used method for calculating industry concentration is the Herfindahl Index:

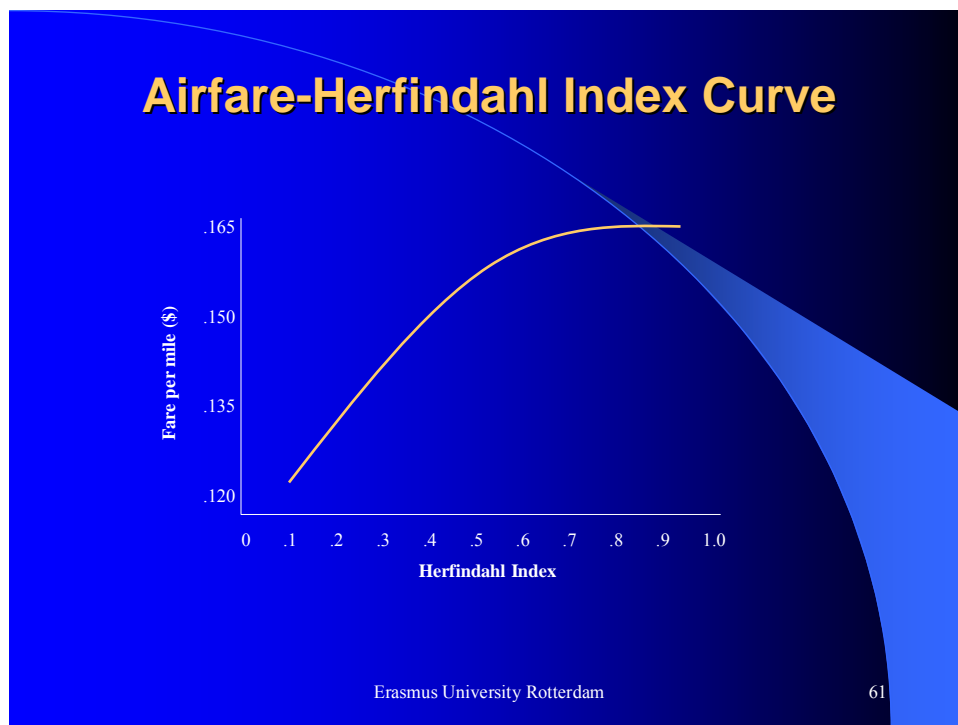
$$H = \sum_{i=1}^N s_i^2 = s_1^2 + s_2^2 + \dots + s_N^2$$
$$0 \leq H \leq 1$$

Where:  $S_i$  = the market share of the  $i^{\text{th}}$  firm in the industry;  $N$  = number of firms.

The index consists of the sum of squared market shares of all firms in the industry and ranges between 0 (perfect competition) and 1 (monopoly).

But does concentration lead to market power? Baumol's theory of *contestable markets* answers "not necessarily, for as long as markets are contestable"; i.e. *entry* and *exit* is relatively easy and costless (see below).

Studies on the relationship between industry concentration and market power do not exist in shipping but examples can be borrowed, *mutatis mutandis*, from other industries, such as aviation.



**Figure 5:** Concentration and Market Power in the Airline Industry  
(Source: David R. Graham, Daniel P. Kaplan and David S. Sibley, 1983)

Figure 5 graphs the relationship between fare per mile and industry concentration in the airline industry. If the airline industry was contestable, the fare-concentration relationship would be horizontal. Whether the number of actual competitors was large or small, the force of potential competition would hold price down to average cost. However, fares are rising with market concentration until the Herfindahl Index is around 0.7, equivalent to 1.4 equally sized firms.

Kim and Singal (1993) utilised product price data to examine the market power effects and wealth transfers from consumers related to mergers in the airline industry. This study involved an investigation of the extent to which airline mergers have affected airfares. The results indicate that airline mergers during the 1985-88 sample period led to higher prices, creating wealth transfers from consumers. In particular, the merging firms were found to have increased airfares by an average of 19.44% relative to other routes unaffected by merger, whereas rival firms responded by raising their prices by an average of 12.17%. The price increases were positively correlated with changes in concentration and did not appear to be the result of an improvement in quality, or of an industry wide contraction of air services to rectify a supply-demand imbalance. The price changes were also positively related to the distance of routes, suggesting that airlines exploit greater market power on longer routes for which substitution by other modes of transport is less likely.

Although significant, concentration levels in liner shipping do not give cause for concern even if one were to group companies together, as one, in conferences. Figure 6 presents the market shares of the top 20 liner shipping companies.



**Figure 6:** Concentration in Liner Shipping  
(Source: Containerisation International)

Concentration measures depend on the *definition of the relevant market*. Apparently, the wider the market definition, and the larger and more dissimilar the number of firms in it, the lower the industry concentration. As can be seen in Figure 6, if one includes 'others', i.e. smaller companies, regional lines, feeders, etc., the market share of Maersk Sealand is less than 10%. If 'others' are excluded from the 'market definition', the market share of

Maersk Sealand almost doubles, while that of the four largest companies reaches 41.5%. The Herfindahl index (without 'others') is 0.07639, corresponding to a concentration of 13 equally sized firms.

## CONTESTABILITY

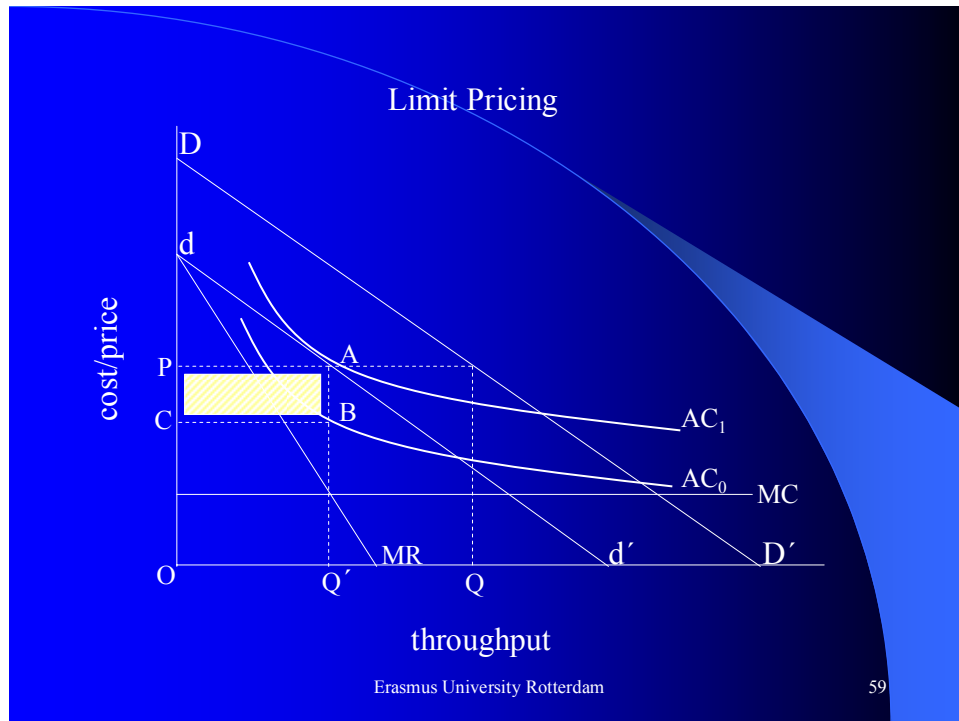
The premise of contestable markets sees numbers in themselves irrelevant as indicators of competition. The main contention of the Theory of Contestability is that, irrespective of market structure and capital concentration, the real issue is how accessible (contestable) the market is to new competition. If entry (and eventually exit) to the market by new competitors is easy, the market is said to be contestable and often only the *threat* of entry (potential entry) is enough to restrain incumbents (existing producers) from abusing their market power. The fact that the possibility of entry exists, introduces an element of competition, and although there may actually be only one active operator in the market, the market is in fact competitive, with prices not far from social opportunity costs.

One of the most crucial elements in determining easiness of entry and exit is the existence of *sunk costs*. In policy discussions, sunk costs are often confused with *fixed costs*. However, the latter are simply costs that do not vary with output, such as depreciation, while sunk costs are those costs that cannot be recovered once the firm decides to leave the market; advertising and 'sales effort' costs are good examples here. It is thus possible for fixed costs not to be sunk (one can always charter out a containership if he decides to leave that market) and a lot of variable costs (such as advertising and brand name) to be sunk. The lower the sunk costs, the easier it is to exit, and thus to be induced to enter the market in the first place. In other words, the more contestable the market is.

The existence of low sunk costs means that, in principle, even a transient profit shouldn't be ignored by an aspiring entrant. If an entrant perceives that he may eventually leave the industry without great difficulty and in doing so he can recoup any costs incurred as a result of his initial entry, he will consider himself to be in a riskless, 'no-lose' situation; even punitive price responses by the incumbent will not worry him. Consequently, his entry decision will be constrained by no forces other than profit, no matter how small. In such a case, if a positive economic rent exists in the industry, new entry will be induced until the economic rent has been eliminated. In the limiting case, where entry is absolutely free and exit is absolutely costless, the market is said to be perfectly contestable.

As a result, despite industry concentration, even a monopolist in a contestable market is much more vulnerable than what would have otherwise been thought: Due to low barriers to entry, he is highly susceptible to *hit-and-run* entry and *market niching* by new entrants. The aviation industry nowadays abounds with low budget operators, such as EasyJet, targeting the most lucrative segments of the network, leaving the majors to cover their high network costs, with the well known financial results (and bankruptcy) of many of them.

Under such circumstances, the only way a monopolist can maintain his position in the market is to make entry unprofitable by setting prices equal to average cost, thus realising only normal profit. Such a pricing strategy is known as *limit pricing* (Figure 7). Yet such behaviour, is normally only expected in competitive markets! This is the full explanation lying behind Baumol's statement that an absence of entry in a highly concentrated industry may be a sign of virtue, not vice.



**Figure 7:** Limit Pricing

Carriers often argue that liner shipping is a contestable market. The existence of high fixed costs -or high proportion of fixed to total costs- is not necessarily a barrier to entry as long as these costs are not sunk, i.e. irrecoverable. Ships, it is argued, are mobile, they can switch between markets, sold or chartered-out. Nowadays, the existence of second-hand markets, as well as a containership charter market that, incidentally, has at times represented more than 50% of the physical containership fleet, add strength to such arguments.

Shippers on the other hand argue that, although, admittedly, the acquisition of the ships themselves may not pose problems of entry or exit, network costs as well as economies of scope and economies of rationalisation often do. Modern liner shipping operations involve extensive global networks of often exclusive agents, dedicated terminals, investments in EDI and logistics systems, strategic alliances among carriers and intermodal haulage arrangements; in other words, considerable vertical and horizontal integration (economies of scope). Such costs, and not the ships themselves, are to a great extent sunk and entry deterring. (at this point reference should be made to the increasing

trend of dedicated terminals and the way this increases sunk costs making liner shipping less contestable). One should not also neglect the importance of a long-established brand name -often associated with increased quality, safety and low risks-; time-honoured carrier-shipper relations; habit; friendship; convenience; and nationality (let alone nationalism) as factors making customer switching to a new entrant difficult.

As always, the truth is again somewhere in the middle. Entry to liner markets nowadays does not refer to new companies appearing, but rather to existing ones expanding their networks with new services; something much easier now in a world of *alliances*. And this is relatively easy as it only incurs incremental -albeit joint- costs. In this view, liner shipping is highly contestable.

## **LINER SHIPPING PRICING AND RATE STABILITY**

### **Earlier Econometric Studies**

Price determination in liner shipping and the issue of market power have been addressed by a number of econometric studies, using panel data, with varying degrees of success. Three main variables have been used in most of them: the 'unit value of transported goods' -admittedly and indicator of market power and carriers' ability to 'charge what the traffic can bear'-; the 'stowage factor', i.e. the good's volume to weight ratio (a cost indicator suggesting a competitive market); and the 'total trade volume on the route', indicating the potential for outside competition.

Several authors have presented results on such pricing models, where tariffs were regressed on the above variables. Examples are Deakin & Seward (1973); Bryan (1974); Heaver (1973a); Shneerson (1976); Jansson & Shneerson (1987); Talley & Pope (1985); and Brooks & Button (1994). The models in the first five of these works are rather similar in terms of the variables they employ. Their results are also fairly comparable and indicate that both the 'unit value' and the 'stowage factor' are important explanatory variables for liner tariffs.

The basic idea with these two explanatory variables is that if the 'unit value' variable proves to be significant, carriers are able to discriminate on price and there is thus a considerable degree of market power. If, however, the 'stowage factor' is shown to be the most important variable, this implies that carriers compete on costs and considerable competition thus prevails in the market.

### **Price Determinants and Rate Stability: the Present Approach**

The introduction of the container and *freight all kinds* (FAK) virtually eliminated carriers' ability to charge 'what the traffic can bear', or differentiate prices according to the stowage characteristics of the (break bulk) goods. Earlier econometric studies on pricing have therefore only historical value today.

The approach taken in the *Erasmus Report* was to estimate liner tariffs and their stability according to demand-supply interactions and industry concentration. A number of premises can thus be tested by this approach:

- Does trade imbalance (and excess capacity) urge carriers to cheat and undercut conference rates?
- Does a tighter market lead to higher prices or to carrier discipline on agreed rates?
- Does concentration lead to higher prices (i.e. market power) or to better discipline and more stable prices?
- Does deregulation lead to rate instability?
- Do conferences have an impact on the level and stability of rates?

*Rate stability* is defined as the ratio of the percentage deviation of the change in liner tariffs to the change in the US deflator. *Rates* for all six major routes (transpacific; transatlantic; Europe-Far East) are obtained from Containerisation International. The demand-supply balance in the four US routes is calculated from data in the PIERS database; MDS Transmodal data are used for Europe-Far East. Conference membership is established from various sources including the Journal of Commerce archives. Concentration is calculated by the Herfindahl index (The full model; construction of variables; regression techniques used; estimation results; and other information can be found in the annex of the *Erasmus Report* ([http://europa.eu.int/comm/competition/antitrust/legislation/entente3\\_en.html#review4056](http://europa.eu.int/comm/competition/antitrust/legislation/entente3_en.html#review4056)))

The first results, which are considered preliminary, are rather weak in terms of explanatory power and statistical significance. A number of reasons exist for this. First and foremost, (average) prices used here are nominal liner tariffs not including the corresponding prices in service contracts which are confidential and thus unavailable. Service contracts on US routes nowadays represent more than 80% of total liner business. Second, the impact of concentration ought to be measured on price-cost margins and not on prices alone; however, cost per ton-mile data do not exist either, and estimating them would be a substantial research on its own. Finally, the impact of *alliances* on concentration should also have been taken into account. Although alliances are not price-setting arrangements, many of their practices –in terms of investment planning, itineraries and joint utilization of resources- bear both upon costs and prices in the end. All the above constitute significant areas for future research.

Despite these shortcomings and a need for more research, a number of interesting results can be discussed:

### **Price Developments**

Overall, the striking feature of the liner tariff series used in the *Erasmus Report* (quarterly averages 1993-2002) is that, in real terms, they have been in general decline (Table 2) despite increases in the volume of world trade.

**Table 2: Average Quarterly Change in Liner Tariffs (1993-2002)**

<b>Trade Lane</b>	<b>Average Quarterly Change (in real terms)</b>
EB TP	-0.8%
WB TP	-1.8%
EB TA	-1.7%
WB TA	-0.5%
EB Asia- Europe	-1.5%
WB Asia-Europe	-1.1%

The most significant decline is found in the two U.S. export lanes, the Westbound (WB) Transpacific (TP) and the Eastbound (EB) Transatlantic (TA). Real freight rates in the Eastbound Europe – Asia trade fell on average by 1.5% per quarter and the performance on the Westbound leg was only marginally better.

This overall decline in rates has been the result of technological developments (larger vessels and economies of scale) and competition among carriers. Apparently, market power, if it still exists nowadays, has not been able to maintain prices, let alone increase them. This is a definite benefit to consumers, as required by the conditions for the conference block exemption of Regulation 4056/86.

### **Rate Stability**

Of the six trade lanes, the Westbound Transatlantic appears to be the most stable. This trade has an historic reputation for rate stability, demand and supply. Conference membership in this trade peaked in 1995-96 then began a gradual decline ending 2002 with just seven carriers holding a 46% share of volume from a high of 81% in the third quarter of 1992. The Eastbound Transpacific trade comes second in terms of stability. This trade is one of the fastest growing markets and has historically had high levels of capacity utilization but also relatively high incidences of entry. The Westbound Transpacific is relatively unstable as is the Eastbound Asia-Europe trade. These markets form the U.S. and European export routes to Asia and have relatively low levels of capacity utilization relative to the inbound legs of the voyages.

## Prices, Stability and Concentration

Standard industrial organization theory suggests that, *ceteris paribus*, higher industry concentration would lead to higher prices, as the limited number of suppliers could easier control the market.

In liner shipping, throughout the period under investigation, industry concentration (as measured by conference participation) has been steadily declining. The most precipitous decline was this of the Pacific, following the passage of OSRA, where conferences were disbanded and replaced by *discussion agreements* with no binding rate making authority. In the Europe-Asia trade too, however, there has been a marked decline in industry concentration (Figure 8).

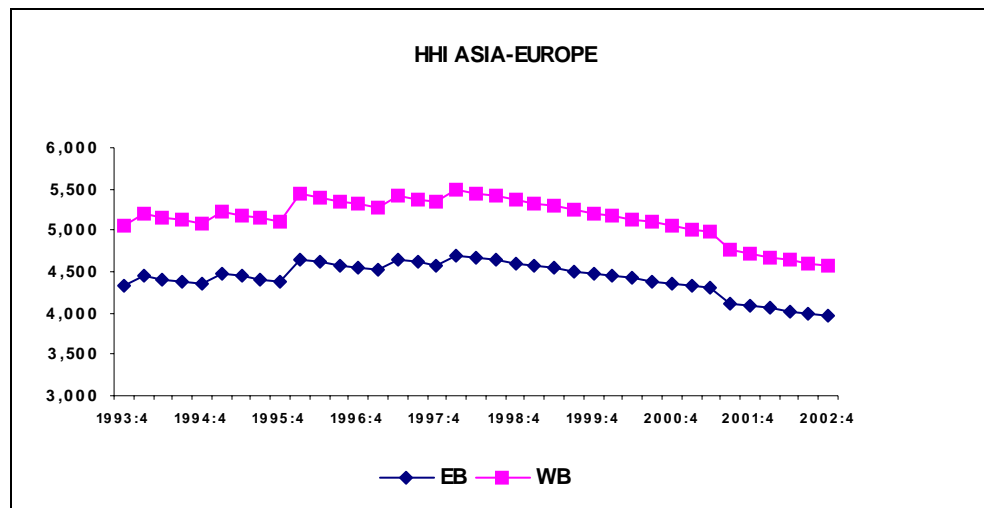


Figure 8: Concentration in Europe-Asia Trades

The statistical relationship between liner rates and industry concentration is apparent in all three major routes: Both rates and concentration have been consistently declining throughout the period (see *Erasmus Report*). The same could not be said however for the relationship between *rate stability* and concentration. Here, the relationship is less obvious or uniform across routes, but a simple inspection of the graphs (Figure 9) wouldn't pose great difficulty in preliminarily establishing that reduction in concentration has led to greater rate instability. This was to be expected especially if one compares liner rates with those of the completely unregulated bulk shipping. Conference price-fixing could thus be seen as an *indispensable* mechanism to achieve rate stability. Whether rate stability is, or ought to be, desirable to shippers is a completely different question. So far, they have been saying that rate stability is good for purposes of production and inventory planning; recently they appear to be refuting this, opting for market forces and complete deregulation.

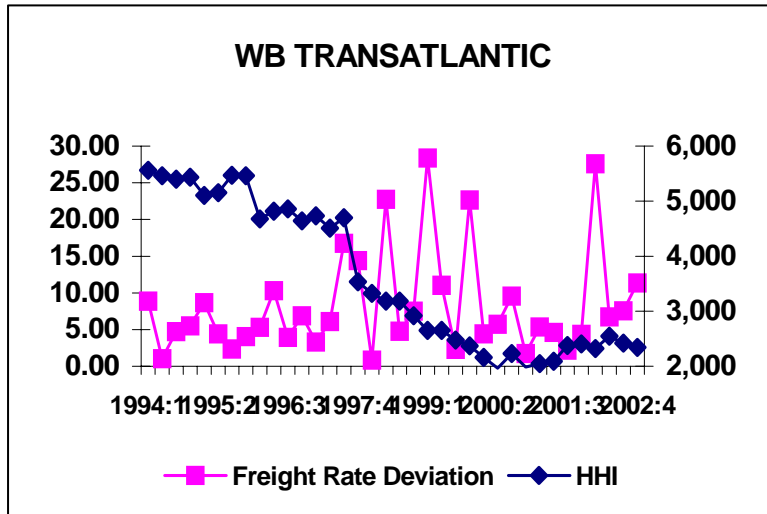


Figure 9: Concentration and Rate Stability

**Prices, Stability and Excess Capacity**

The trade of both Europe and America with Asia is heavily imbalanced (Figure 10). Both trading blocks import much more from Asia than they export to it. The 1997-1999 Asian crisis, part of the period under investigation, accentuated this trade imbalance even further: weak Asian currencies boosted exports from the region, but the simultaneous reduction in the purchasing power of Asian citizens depressed imports as well.

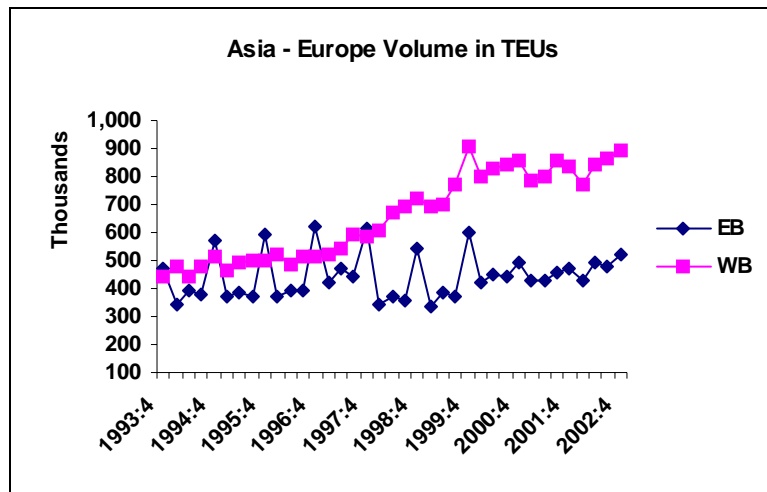


Figure 10: Europe-Asia Trade Imbalance

Such a trade imbalance, combined with carriers' premonition towards larger vessels (in order to, allegedly, enjoy economies of scale), leads to substantial excess capacity of tonnage.

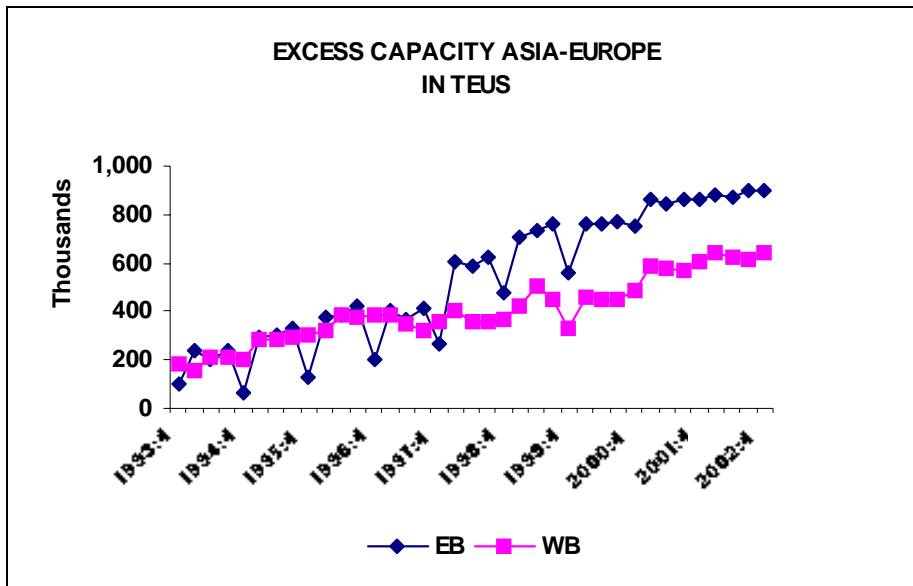
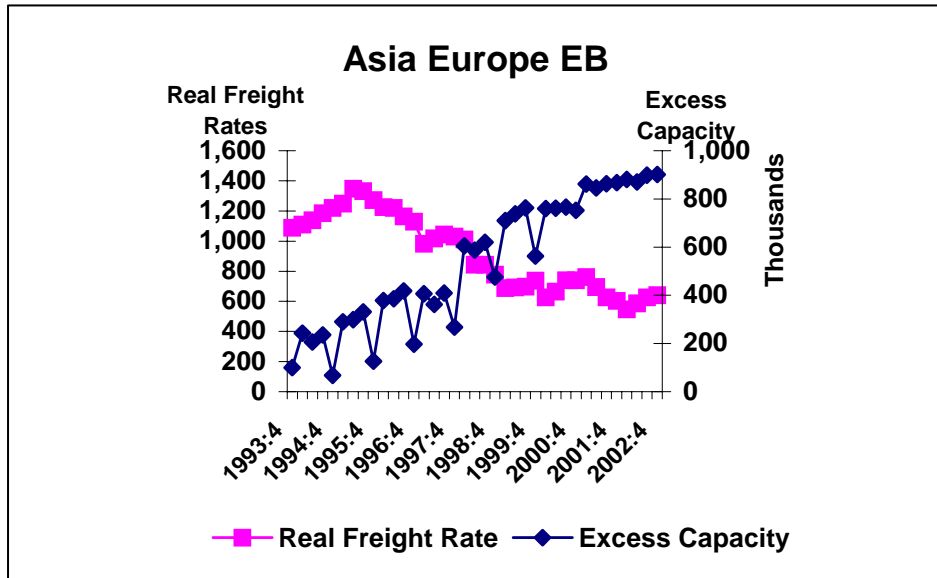


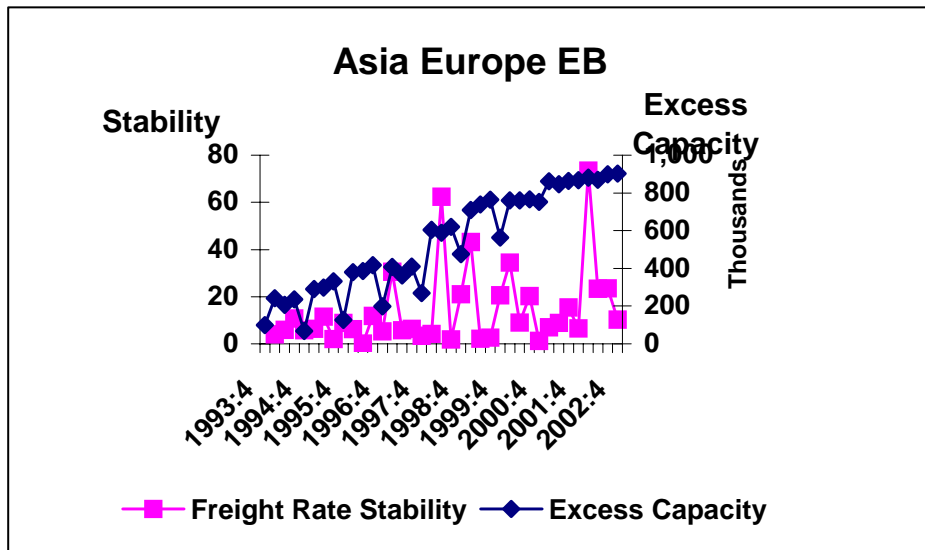
Figure 11: Excess Capacity Europe-Asia

Trade imbalances are often cited as a significant cost to carriers. The carrier may have to deploy larger vessels on the busy leg, to accommodate demand, but, on the light leg, these vessels will sail with substantially under-utilised capacity, which raises the unit costs of that voyage. Carriers operating full ships on one leg, but facing dwindling cargo volumes on the other, are likely to reduce rates on the light leg but attempt to cover those revenue losses by raising rates on the busy one. The incentive of conference members to deviate from agreed upon prices will be especially compelling in such circumstances and, as a result, rate instability may well ensue as pricing discipline breaks down. Both these effects of excess capacity on rates and their stability can be observed in the following two figures 12 and 13.

So far, excess capacity has been managed reasonably well through a combination of pricing discipline and coordination within alliances. It shouldn't be forgotten however that the logistical needs of modern shippers require high frequency of service *and* low transport costs, which are in the main achieved through the economies of scale of larger vessels. However, in terms of excess capacity, the combination of high frequency *and* large vessels could mix an explosive cocktail for carriers that would like to go it alone. Up to now, they have been able to provide both frequency and size through the combined effect of pricing discipline and alliance coordination. In the absence of any of the two, the only alternative would be further consolidation. The effects of this on prices and trade is yet to be fathomed.



**Figure 12:** Excess Capacity and Rate Stability: Europe-Asia Eastbound



**Figure 13:** Excess Capacity and Rate Stability: Europe-Asia Westbound

## CONCLUSIONS

The combined effect of both industry concentration *and* excess capacity<sup>5</sup> on prices and price stability is far from being conclusive in the present paper, and further research is required along the lines suggested above. Basic data requirements for this would be a *liner tariff index*, accounting for prices in service contracts, and *unit cost* data of liner operations. Currently, more than 80% of liner business is done through (confidential) service contracts and, frankly, any industry analysis based on published liner tariffs only would resemble the proverbial *straining out of the gnat and swallowing the camel!*

With utmost caution, two main conclusions could be risked from this paper: Conferences nowadays do not appear to have any perceptible power to maintain (let alone increase) prices; in some cases, their existence has even reduced them. Lower industry concentration, in the absence of conferences, leads to price instability. This is of course to be expected and it has been the main reason why conference price-setting has been exempted from competition law.

Excess capacity, an intrinsic characteristic of the liner shipping industry, has a destabilising effect on rate stability. In addition to trade imbalances, excess capacity is accentuated by the construction of ever larger vessels, aiming to achieve economies of scale and low transport costs. Up to know, carriers have been able to manage excess capacity through the combined effect of pricing discipline and alliance coordination. In the absence of any of the two, the only alternative would be further consolidation. The effects of this on prices and trade is yet to be fathomed.

Measures of concentration in liner shipping should also take into account *global shipping alliances* (forthcoming in another paper). Although alliances are not price-setting arrangements, many of their practices –in terms of investment planning, itineraries and joint utilization of resources- bear both upon costs and prices in the end.

And a final word on the *confidentiality* of service contracts: In OSRA 99, the confidentiality provision was a ‘low political cost’ compromise in lieu of disbanding conferences altogether. Any discussion on the future of conferences should thus deal simultaneously with the confidentiality issue. Indeed, to attempt to enhance competition by concealing (price) information is a contradiction in terms.

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<sup>1</sup>In addition to the author, members of the team that produced the what has come to be known as the *Erasmus Report* were Mike Fusillo, Albert Veenstra, Bill Sjoström and Ullrich Hautau. The econometric analysis on rates and rate stability is part of the *Erasmus Report* which is now a public document that can be downloaded from the Commission’s website [http://europa.eu.int/comm/competition/antitrust/legislation/entente3\\_en.html#review4056](http://europa.eu.int/comm/competition/antitrust/legislation/entente3_en.html#review4056).

<sup>2</sup> Compilation, in its greatest part, is owed (with many thanks) to Mike Fusillo.

<sup>3</sup> Minimum Efficient Size (MES), high fixed costs and low marginal costs, may make it more profitable for a single firm to provide the industry, rather than many of them in competition.

<sup>4</sup> I know of a carrier who is sending X number of SMSs per day to his customers, informing them of the whereabouts of their containers!

<sup>5</sup> Apart from seasonality adjustments, other explanatory variables used in the *Erasmus Report* were mainly dummies accounting for the effects of September 11 and the passage of OSRA 99.