

## EFFICIENCY AND COMPETITION IN LINER SHIPPING\*

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### I. Introduction

Shipping conferences have been a controversial subject from the very time they were established. They have been under a constant attack by economists but they have survived the various public investigations into their affairs. Conferences have been allegedly blessed by rate stability and rationalization of services. These have granted them their anti-trust immunity. The latest probe into their affairs - the 1984 USA Shipping Act - put more cement into their anti-trust immunity, but at the same time it erodes the conference system in its old style, by introducing more competitive elements and thus presenting the conference system with new roles and challenges.

Our point of departure is that the present system of shipping conferences is deficient, and alternative ways of organizing the market are recommended. Our criticism of the present system is:

- (a) The power of the shipping conferences to fix rates is a source of waste by inducing excessive service competition.
- (b) Lack of costs consciousness and a structure of freight rates that deviates from marginal costs is a source of inefficiency, affecting adversely rationalization of services and the optimal modal split.
- (c) The discriminatory structure of rates is socially unjust. Liner companies practice rate discrimination. They charge different rates to different commodities, and they charge different rates to shippers of the same commodity.

The seemingly absurd consequences of these practices are:

- too high freight rates are paid by the shippers;
- too low profits are earned by the shipping companies;
- a waste of real resources invested in shipping, viewed from a point of view of world efficiency.

### II. The Price-fixing Power of Conferences - the Transformation of Cartel Profits into Social Losses

Shipping conferences fix freight rates, which are published in tariff books, and which abide (in the USA prior to the 1984 Act) all member lines. The adherence to the agreed rates has worked reasonably well in the last 100 years and if necessary conferences have recruited specialized bodies to enforce their internal law and prevent cheating. Particularly in the USA trade, where conferences are open, self policing devices have evolved. In these conferences a mandate to police conference members is given to a neutral body, which is either formed by the conference or else the conference buys these services from an outside concern, normally called 'policing body'. Cheating can be assumed to be practiced in some trades, but not to an extent that undermines the stability of conferences.

The main form of competition that is available to individual lines is then service competition. The substitution of service competition for price

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competition, transforms all potential profits into costs of inputs in the fight for a greater share of each individual line. The mechanism by which this is obtained can be described as follows. In the first place the high level of fixed rates will induce individual lines to compete by putting in more ships on the route, in order to increase their share in the trade. Given a level of freight rates well above the level of marginal costs, it is profitable (from a private point of view) for an individual line to increase its sailings. The trouble is that every shipping line tries the same, with the end result of high costs and low profits for everybody. The exertion of the price-fixing power of liner conferences, tends to raise the level of costs to practically any level of freight rates that is initially established. In the second stage, given the low load factors and the absence of supernormal profits, two things happen: first, individual lines are now willing to carry relatively low-rated minor bulk cargo to fill up space, and secondly, each individual shipping line will try to overbid its competitors for high-rated cargo in respect of various qualities of service, with the result of too high quality of service, and a further increase of costs.

The adjustment of the level of costs to revenue is done by successive reductions in the load factor. In equilibrium it is expected that load factors will be low, and will be negatively correlated to the average freight rate on the route. On trade routes where the average freight rate is high, the load factor will have to fall more to bring into equality costs and revenue. The welfare loss, as a result, will be greater.

This mechanism was studied by us (Jansson & Shneerson (19)) for 5 trade routes between the Mediterranean and the rest of the world for the year 1972. Load factors were calculated on the basis of a sample taken on the 11th day of each month in 1972. The recorded load factors were in the range of 40 to 79 percent. These load factors were found to be negatively correlated with the average freight rate on these routes. The lowest load factor, of 40%, was obtained in the creamy trade with the USA. More recent data, pertaining to all the USA container trade in 1979, reveals an even gloomier picture. After allowance for 50% broken stowage, the range of load factors is between 22 and 75 percent. 14 (out of 17) trade routes fell in the range of 22%-58%, and the remaining 3 in the range of 64%-75%. (Jansson & Shneerson (19), ch. 12).

Evidence regarding excessive service competition was systematically pointed out first by Devanney III, et al (9). In a study of the USA-South American Pacific Coast Trade, it was found that "as compared to an efficient system, the present system utilizes 2½ times too many ships, which average about a factor of 2 too small and 40% too fast" (Devanney III et al., p. 69).

The current fierce container competition, particularly on the Pacific trade, and the introduction of the Very Large Container Carriers (VLCC), the very largest of these of 4,400 TEU's may be another manifestation of this principle. It will certainly have the effect of lowering the load factor and reducing profitability over these trades.

The resemblance to the air-lines prior to deregulation calls for a comparison Douglas and Miller (10) showed that the regulatory regime, in which prices were set, but air-carriers were free to determine frequency of flights, had resulted in excessive service competition (see also Bailey(2)). Efficient air-lines were defined by them of 60 to 70 percent, while actual load factors under the regulatory regime in May 1973, showed load factors that were in the range of 40 to 50 percent. Yet, apparently, load factors that exceeded many US container trade load factors.

The inefficiency created by the futile fight to increase the share of each individual line can be shown with the aid of figure 1.

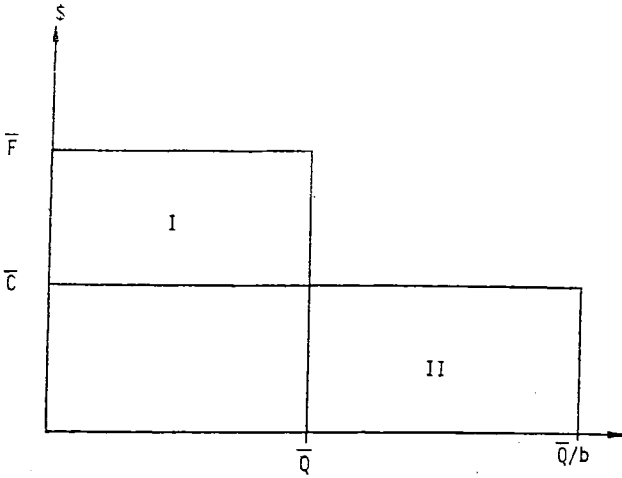


Fig. 1a The Total Capacity Cost ( $\bar{C} \cdot \bar{Q}/b$ ) as Determined by the Total Net Revenue ( $\bar{F}\bar{Q}$ )

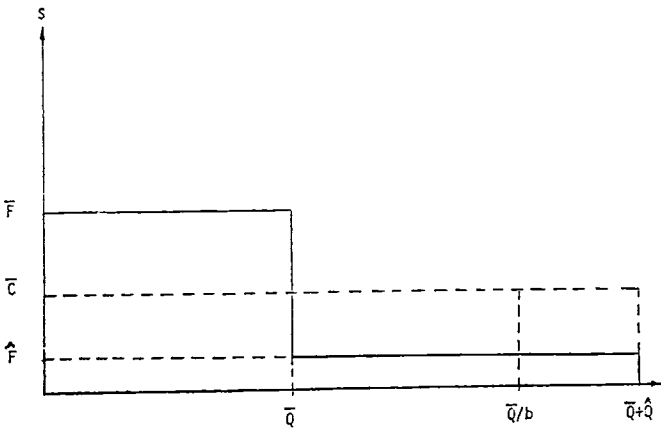


Fig. 1b The Total Capacity Cost  $\bar{C}(\bar{Q} + \hat{Q})$  as Determined by the Total Net Revenue ( $\bar{F}\bar{Q} + \hat{F}\hat{Q}$ ) Incorporating the Possibility to Lift Filling Cargo

A given total trade volume,  $\bar{Q}$ , is assumed to face all conference members' operating on the route. This quantity is carried by members at an average net freight rate,  $\bar{F}$  (net of handling charges), which exceeds the marginal capacity costs,  $\bar{C}$ . Equilibrium will eventually be reached when all shipping lines earn normal profits. This occurs when the total net freight revenue equals the total capacity costs, or alternatively, when area I equals area II. Total carrying capacity on the route is a product of the number of sailings,  $N$  and the ship size,  $S$ , which is equal to the ratio of  $\bar{Q}$  to the load factor  $b$ . Area II represents the costs of excess capacity. In fact, it may even be an underestimation of this cost. To the extent that the high level of freight rates affords high costs operators to stay in the trade, costs may further go down if the more efficient firms will outbid the less efficient ones - in the absence of the high freight rates umbrella. Expansion into the tramp market will not reduce these losses. The average tramp rate will typically be below  $\bar{C}$ , but will have some positive contribution to revenue. Assuming that all sailings are now filled with tramp cargo,  $\hat{Q}$ , the total net revenue is the area under the thick line. In equilibrium areas I and II must be the same, and as in figure 1a. This condition determines the value of  $\hat{Q}$ . The final outcome is that the magnitude of the social loss has stayed the same.

### III. Deviations of Freight Rates from Marginal Costs - the Consequences on Efficiency

It is well established by now that the structure of liner shipping freight rates is grossly out of line with the corresponding marginal cost structure. The explanation comes both from practicing price discrimination - charging high value commodities higher freight rates, and due to the failure to take into account the existence of a capacity limit. A large volume low-rated cargo is not paying its way, and a small volume high value cargo cross-subsidizes it. Large scale cross-subsidization was first shown by Jansson (17), and later discussed by Laing (20), Evans (12), Australian Department of Transport (1) and Zerby and Conlon (26). Evidence of freight rate discrimination, which when put together with the typical low profits made in liner shipping also implies cross-subsidization, has much longer history. Beginning with the first systematic (and unfortunately not very successful) attempt by Chinitz (7), and followed by Heaver (16), Economic Commission for Latin America (11), Bennathan and Walters (3), UNCTAD (24), Waters (25), Shneerson (23) and Bryan (4), to quote just part of the effort devoted to clarify this issue.

Freight rate discrimination and cross-subsidization are naturally viewed by the shipping industry as indispensable to their profitable operations. But also among shipping economists there is a large support to the desirability of these practices. The arguments in favour fall into two headings: First, the elimination of cross-subsidization will drive away low paying cargo from the liner business. The losses to the remaining high value cargo of reduced frequency will outweigh any possible gains of the proposed change. Second, except for the direct handling costs, all shipping costs are anyway common costs to all cargo carried, and cannot, except arbitrarily, be allocated to individual commodities.

The first argument is in essence a claim for the existence of "economies of scale", when both producers and users are put together. If substantial economies of scale exist, price discrimination (or synonymously, cross-subsidization) may increase output to the optimal level, viewed from both producers and users point of view. This may not be the optimal way of achieving this, but even prior to this, the argument hinges on the existence of large scale economies of scale. On the firm level, the little evidence

we have does not lend it any support (Ferguson 1961). It was found there that above 4 or 5 ships on deep-sea routes, further cost reductions are doubtful. Unfortunately, there has been no comprehensive study of this issue since 1961. Our close-door neighbours - the aviation economists - in preparation of the grounds for deregulation, have devoted a great deal of effort to establish the non-existence of firm size economies, with quite remarkable success. No evidence of economies of scale to firm size beyond a certain scale was found, but rather constant returns to scale: Caves (5), Gordon (14), Douglas and Miller (10), Roy (22) and a comprehensive summary by Chiram (8). Caves et. al (6) did not find evidence of economies of scale, but some economies of density.

Of no less relevance to the issue is the question of economies of scale on the industry level. When trade on a route increases, when we consider both users and producers costs, and when all shipping lines are lumped together, do we expect to find "system" or "social" economies of scale? Even if costs of every shipping company is characterized by constant returns to scale, users costs may go down as a result of a rise in the frequency of service. This costs reduction is attributed to the collective services of all shipping lines on the route, and not to a particular line. A liner shipping costs model which includes both producers and users, showed that some system scale economies exist, but of small magnitude. The elasticity of system (=producers plus users) average costs with respect to the volume of trade, took values between 0 on short-sea routes to -1/12 on deep-sea trade routes.

The common cost issue - largely debated outside shipping, particularly in regulated industries - is, by and large, a non-issue. The subject can not receive here the full treatment it deserves, but we can just state the main argument for what we term the "common cost fallacy". The point is that as long as the capacity of the ship is not limitless, each commodity carried aboard ship incurs an opportunity costs. Marginal costs of shipping each commodity can unambiguously be defined. It would equal the handling costs plus the shadow price of scarce capacity. Such a calculation may not be trivial, but is certainly not too complicated to be implemented in practice.

We can not find, then, good defense for cross-subsidization and freight rate discrimination. These practices, on the other hand, have lead to (a) wasteful competition for lucrative cargo, (b) lack of costs consciousness and therefore lack of incentives to save costs, and (c) inoptimal modal split of the international seaborne trade.

The elimination of cross-subsidization means that rates of high value goods will go down, and of low value goods will rise. These changes are expected to have little effect on the total volume of world trade. First, if freight rates in all conference tariffs are changed, the aggregate impact on demand is not expected to be great. The aggregate demand for shipping, when possibilities of substitution between lines and between different sources of supply are eliminated, is expected to be very low. Second, the effect on trade depends on the relative size of the elasticity of shipping high and low value goods. While the share of shipping costs in the final value of goods is greater for low value goods, tending to make this shipping elasticity greater the elasticity of demand for the final product is typically lower for low value goods, tending to make the shipping elasticity for these goods lower. The final outcome will be determined by the relative magnitudes of these two.

The effect on the modal split of international cargo transport is expected to be quite significant. The freight rate decrease of currently high-rated cargo will probably win back some cargo from air-transport. The freight rate increases of currently low-rated cargo will likely divert cargo to the tramps. Will this new modal-split be more or less efficient? On dense trade routes, where frequency of service has little effect on costs and where approx-

imately constant returns to scale exist, currently low rated liner cargo clearly does not cover the marginal costs. The taking over of such cargo by tramps is desirable from a welfare economic point of view. In thin trade routes, the level of freight rates based on fully distributed costs may slightly exceed the marginal costs.

But this, as we argued, is not significant enough to change the desirability of this alternative modal - split of liner shipping specializing in the carriage of high value goods and tramp shipping being confined to the carriage of low value goods.

#### IV. The abolishment of the price fixing power of conferences and a cost based rate structure

The combination of a fixed level of freight rates which abide conference members and a structure of rates which is out of line with the structure of costs are the main sources of inefficiency of the conference system. The main method of eliminating these sources of inefficiencies is by abolishing conferences as price cartels, and exposing the industry to competition. Competition among lines will lower the rates on high value commodities, and will tend to equalize the net marginal revenue of all commodities. Different lines serving the same trade are very close substitutes. From the point of view of an individual line the freight rate elasticity will be pretty much the same, i.e., very elastic for all commodities. This in turn means that the deviations of rates from the handling costs (or the contribution towards covering capacity costs) will be pretty much the same.

The opening of liner services to competition leaves two unsettled issues. First, will rate stability come to an end?, and second, will the role of coordination of services be left to the free market?

Liner freight rates are certainly more stable than the more competitive bulk market, but the rate stability of individual lines is much smaller than the front of stable rates presented by the conference tariff. This was demonstrated by constructing a liner freight rate index for the route FRG (Hamburg/Bremen Ports) to Israel, which is controlled by the conference CONISCON. Two indices of the general level of rates over the route, for the period 1975-85, were constructed. One for the whole conference, and a second one for a particular shipping line operating within the conference. The CONISCON conference is a closed conference consisting of just 3 shipping lines, and operating on a basis of revenue pool. At the same time it faces strong competition from 3 independent firms that offer more than 50% of the total shipping capacity on the route. Figure 2 shows the freight rate index for the CONISCON conference as a whole, and a freight rate index for an individual line. It appears that little of the promised rate stability is delivered by the index of the actual freight rates charged by individual lines. This index shows much greater fluctuations than the published tariff of the conference. It appears that the conference tariff fills the role of a recommended freight rates ceiling. Actual rates of individual lines fluctuating (with the conference permission) mostly in response to outside competition. It seems, then, that there is less rate stability to loose than is commonly believed. Whatever rate stability exists, it should not be lost when price competition is openly introduced. Stable freight rates are a superior quality of service. For those lines that wish to continue to offer this quality of service, the prevailing period of notice of freight rate changes should continue to be applied. Freight rates in these cases should be based on the expected costs. Actual costs will show greater fluctuations, and lines that wish to base their rates on the actual costs

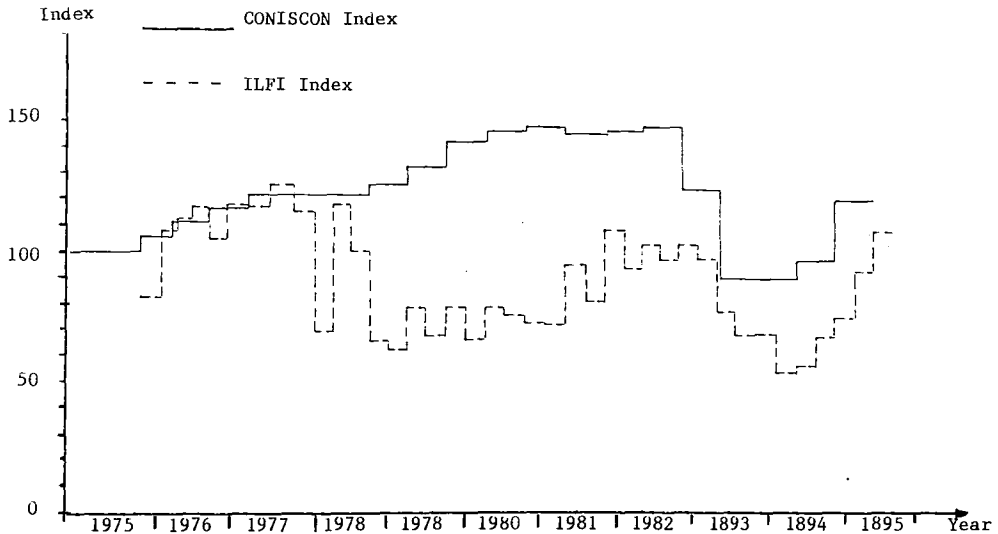


Fig. 2 A comparison of an individual line freight index to the conference freight index, 1975-1985.

may do so, but the general level of these rates should be lower to compensate for the lower quality (or greater risk) of the services they provide.

The issue of coordination of services present more problems. The quality of liner services as reflected by the frequency of service is a collective quality of all shipping lines operating on a route. This speaks for the need to coordinate services to guarantee overall economic efficiency (though the short experience of the post deregulation era in air transport indicates that the quality of service has not deteriorated there, but rather improved. See Bailey (2)). Shipping conferences may have to take a new role of a representative body that has its major task in the coordination of services of individual shipping lines. The conference, taking into account both producers and users costs, will determine the optimal size of the ship, the itinerary and schedules of individual lines. These are viewed differently from the point of view of an individual line and the whole market, and an optimum would unlikely be reached without the coordination of these services.

It should be stressed again that a prerequisite for the success of a new competitive system is the abolishment of the discriminatory structure of freight rates. We have argued that under competition there will be no incentive to charge different commodities different rates. But the current wide disparities in freight rates that have evolved over a period of a century, may require some helping hand in this process of changing direction towards a cost-based structure. This can take the form of guidelines issued by independent regulatory body. Space does not permit detailed discussion of the principles and format of this new tariff. (A detailed discussion of this issue appears in Jansson & Shneerson (19), ch. 11).

In summary it can be said that the new tariff is expected to be an improvement in the following respects:

- differences in the cargo handling productivity in different ports, now very little accounted for, will be reflected in the freight rate structure;
- Seasonal differences in demand and corresponding shipping capacity shadow prices, currently nonexistence, will be reflected in the rate structure;
- The differences in demand intensity on the "fat" and "lean" legs of the route will be accounted for;
- For break bulk cargo, package type and package size will be reflected in the tariff.
- The tariff will be simplified, will be made logically consistent and will be available to all users of international shipping.

#### V. National and International (De)Regulation of Liner Shipping

The liner shipping industry is a multinational business. There are few trade routes in the world that are served by ships of just one nation. Rules and regulations imposed by one nation will affect others, and if these rules are conflicting, a rather confusing situation may emerge.

There have recently been two opposing forces attempting to (de)regulate liner shipping. There have been national initiatives aiming at liberalization of the liner trade, and absurdly enough, there have been international initiatives attempting to protect and promote national interest, and effectively deliberalize the liner shipping trade.

The British enquiry into shipping (the Rochdale Report of 1970 (21)) has gone some way (perhaps not far enough) towards liberalization of liner shipping. While the need for coordination of services was acknowledged as necessary for economic efficiency by the committee, it recommended free entry into conferences, and openness of tariffs that "should be published and available to anybody on request at reasonable cost" (Rochdale Report p. 135). Presumably for practical reasons the committee did not explicitly recommend the abolishment of the power of conferences to fix rates. The Rochdale report came up with the interesting idea that other nations should adopt the model recommended in the report. Eventually the Committee of European National Shipowners Association (including Japanese shipowners) drew up what they called a code of liner conference practice (the CENSA code of 1972), which, however, in relation to the Rochdale proposal was, in the words of Richard Goss (15) a watered-down version in that it basically endorsed the status quo and failed to adopt any of the reforms recommended by the Rochdale Committee. The Rochdale Report came at a time when other forces were gaining momentum. The UNCTAD code of conduct of liner shipping and the market sharing formula have been on the international agenda. This code reflected the aspiration of some developing countries to promote their own national interests at the expense of international efficiency of resource allocation. It was therefore a move towards deliberalization of the liner shipping industry. While the liner trade volume affected by the market-share guidelines of the UNCTAD code is not expected to exceed 7%, it has been feared that the policy of protectionism will have disproportionately adverse effect on the industry.



The USA Shipping Act, 1984, is as yet the best example to follow in forming a policy towards liner shipping. The act endorsed the immunity of conferences from the anti-trust law, but at the same time (a) it specified procedure to follow to prevent discriminatory practices, and (b) it legalized competition among conference members by granting each line the right to modify its freight rates. The legislator, realizing the futility of preventing freight rate agreements, encouraged competition by legalizing the right to compete in freight rates.

The liner shipping industry is sailing through a period of crisis. This is an end of an era of technological changes (the container evolution), an era of excess shipping capacity generated by too optimistic outlook which resulted in a decline of freight rates (which is required to restore equilibrium again). On the major trade routes of the world, the competition by the independents has eroded the conference dominance, and in some cases the role of a 'conference' and an 'outsider' has been reversed. National and international legislation have added uncertainty. A protectionistic policy initiated by UNCTAD, attempting to employ the existing conference system to promote national interests, against a deregulation of freight rate policy initiated by the U.S. government.

Liner conferences will have a role to play in the future business of this industry, but it should be a different role. A role of coordinating organization in an era of competitiveness. The U.S. example, it is hoped, will be followed by other nations. Hopefully, it will assist the industry to restore equilibrium and maintain a more efficient industry.

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