

Liner Shipping Economics¹

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Introduction

Shipping is a service industry that by general acknowledgement provides the lifeline of international trade. Suffice it to say that, due to the morphology of our planet, 90% of international trade takes place by sea. Technological developments in ship design and construction, and the ensuing economies of scale of larger ships, have also promoted trade –particularly that of developing nations- by making economical the transportation of goods over long distances. This has expanded markets for raw materials and final products and has facilitated the industrialisation of many countries around the world.

Often, the shipping industry is categorised in two major sectors (markets): the bulk shipping sector (engaged mainly in the transportation of raw materials such as oil, coal, iron ore and grains), and the liner shipping sector (engaged in the transportation of final and semi-final products such as computers, textiles and a miscellany of manufacturing output).

From an economic and industry structure point of view, the two sectors are as different as they could be: bulk shipping uses very large carriers, such as tankers and bulk-carriers, to transport goods in bulk on a contract basis. The service requires minimal infrastructure and in this respect it resembles a taxi service whereby the contractual relation between passenger and driver (cargo owner and shipowner) expires upon the completion of the trip. The industry is highly competitive with prices (freight rates) fluctuating wildly even in the course of a single week.

Modelling in bulk shipping is therefore focused on the estimation of demand and supply functions and freight rate forecasting. For a good literature review see Beenstock & Vergottis (1993), Stopford (1997), Norman (1979) and Wergeland (1981).

On the contrary, liner shipping is geared to the provision of regular services between specified ports according to time-tables and prices advertised well in advance (Jansson and Shneerson 1987, 16). The service is in principle open to all with some cargo to carry and in this sense it resembles a public transport service, like that of a bus or a tram. The provision of such a service –often offering global coverage- requires extensive infrastructure in terms of ships, agencies and equipment. For

¹A similar albeit shorter version of this paper can also be found as: Haralambides, H.E. and Veenstra, A.W. (2000) 'Modelling Performance in Liner Shipping'. In: K.J. Button and D.A. Hensher (eds.): *Handbook of Transport Modelling*. Pergamon-Elsevier Science.

instance, the provision of a weekly service between Europe and the Far East requires investments in excess of one billion US dollars. Understandably, investments of this magnitude may, on the one hand, lead to undesirable capital concentration and, on the other, pose considerable barriers to entry for newcomers. These aspects of the industry have constituted important research areas as discussed below.

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. Congestion was thus 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.

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 6x6x20 feet unit known as TEU –Twenty (feet) Equivalent Unit-, although containers of double this size (40 feet) are quite common in North America). The most important thing however is that now containers are 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'.

Expensive port labour is thus by-passed, pressure on port space relieved, and ship time in port minimised. These developments increased ship and port productivity immensely and allowed ships to become even bigger achieving economies of scale and low prices. Nowadays, containers are increasingly carried by specialised 'cellular' containerships many of which are able to carry more than 6,000 TEUs, while designs for 8, 12 or even 18,000 TEU ships are already on the drawing boards of naval architects.

At the time of writing, such mammoth ships could cost anything in excess of 50 million US dollars and it could take up to 9 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.

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 cargohandling 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.

By-passing the waterfront in the stuffing and stripping of containers, and thus having them ready in port to be handled by automated equipment, increased immensely the predictability and reliability of cargo movements, enabling 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.

Optimisation of Liner Shipping Operations

Under the assumption of a certain market share (demand), the constraints of regularity and frequency, and the incessant drive to cut costs (mainly through the deployment of larger ships), liner shipping companies must optimise their operations providing solutions to a number of important questions such as: how many ships on a route? should I serve a specific demand with few larger ships or with more smaller ones? what are the logistical requirements of the customer in this respect? what speed? at which ports to call? how should I deploy the ships and the containers? how do I manage the fleet of empty containers? Should I buy or lease containers? Where should I buy fuel from?

Operations Research (OR) –mainly linear and integer programming algorithms- has been extensively used to give answers to such questions. For a review see Cariou and Haralambides (2000) and Ronen (1983 and 1993).

Ronen (1993) notes that, since the 1980s, the problems addressed in the literature have become more realistic, involving ‘actual’ optimal solutions rather than approximations (in operations research the latter are called ‘heuristic’ solutions and are rather common due to the mathematical complexity of real-world problems). He attributes this to advances in mathematical programming, facilitated by the existence of inexpensive computing power.

Deployment of vessels has to do with the problem of allocating ships to routes within the service network of a liner operator. Examples of problems on size, mix and deployment of vessels can be found in Lane *et al* (1987) (fleet size and mix) and Jaramillo & Perakis (1991) (deployment). Lane *et al* try to determine the most cost

effective size and mix of fleet on one fixed route. They apply their model to the Australia-North America West Coast route. Jaramillo & Perakis construct a model that assigns a fixed fleet of ships to a given set of routes, taking into account detailed information on operating costs, cruising speeds and frequency of departure. They present an example of 14 ships and 7 routes.

Rana and Vickson (1988) present a model for the determination of fleet size and routing of vessels. Their problem starts from an operator who contemplates adding an extra ship to his fleet. Rana & Vickson are able to determine the route this additional ship should ply, and they also solve problems that include schedules up to 10 or 20 ports. This makes their model suitable for practical purposes, although they constrain their model to include only one type of container.

Jansson & Shneerson (1985) derive a transport cost function that also includes user costs (mainly inventory costs). In this way, they are able to determine the optimum ship size. Their analysis however does not address the issue of routes.

Scheduling problems concern the assignment of departure and arrival times of ships operating on a route. Rana & Vickson (1991) present a model that addresses such problems in liner shipping. They point out that scheduling is a fairly common problem in transport but, nevertheless, liner shipping has certain intrinsic features that make the design of scheduling models particularly difficult.

These complexities are, among others, the existence of combined pick-up and delivery activities, the fact that all ships in a fleet can have different routes, and the peculiarity that routes, being a string of ports, are always followed in a fixed sequence. The Rana & Vickson model extends the results of their 1988 work in the sense that it is now able to address problems involving more than one ship. In essence, this makes their model a routing one. The scheduling issue is addressed by determining the sequence in which the different ships call at ports in the service network. They report an example that includes 3 ships and 5 ports, although they mention the possibility to apply the model to networks of 10 to 20 ports. The computational efforts, however, increase very rapidly with the number of ships. This seems to constrain the practical application of the model in liner shipping, where 8 to 12 ships are commonly used on a route. Nevertheless, Rana & Vickson believe that their procedure is the surest way forward to more realistic models that can cope with more ships, and they see applications in aviation, bus and railway networks.

One of the largest cost elements in liner shipping has to do with the management of the fleet of containers. The flow of containers across the world does not coincide with the routing of containerships, because containers do not spend all their time onboard ships. They need to be picked up and delivered at inland locations, maintained, repaired or may not be needed for some time. This makes the management and optimal relocation of empty containers a separate control problem in liner shipping. The main liner company objective in this regard is to ensure that, at every location, enough empty containers are available so that all transport requests from customers

can be satisfied. This problem becomes an actual and immediate one whenever, on a certain route, more cargo moves in one direction compared to the other. Such a route is known as an 'unbalanced route', or a route with 'cargo imbalance'. This is the case, for instance, of the Europe-Far East route, one of the three main liner routes where most of the full containers travel westbound.

All liner companies have management systems in place to optimise the relocation of containers, but as a result of commercial considerations little is known on the associated models. As an exception, Gao (1994) presents a two-stage container repositioning model that determines first the size of the container fleet, and subsequently the allocation of containers in the liner service network.

Market Structure modelling

Perhaps one of the most important characteristic of the liner shipping industry is its high fixed costs. In order to keep its pre-advertised time-schedule, a ship must leave port regardless if it is full or not. Its costs thus become fixed, i.e. independent of the amount of cargo carried. Next, imagine the admittedly simplified case where, minutes 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. If this were to become common practice among operators, competition among them would push prices down to the level of short-run marginal costs and 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).

It has thus been thought that price competition should be limited and a mechanism found to allow operators charge long-run average total costs to the benefit of a sustainable, regular, frequent and reliable service, according to the requirements of demand (i.e. the customers themselves). This mechanism was found in the face of 'conferences', which are cartel-like route-based coalitions of carriers, having price-setting as their main objective.

In the UNCTAD Code of Conduct for Liner Conferences (UNCTAD, 1975), 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'.

Marx (1953) in his celebrated book defines shipping conferences, or rings, -among the earliest cartels in international trade- 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...’

The limitation of price competition enabled conference members to compete on ‘quality of service’. A good insight into the role of the ‘quality’ variable in liner shipping can be found in Devanney *et al* (1975). These authors observe that conferences, while often being considered as monopolists, do not actually earn the corresponding monopoly profits. They explain this by pointing at the strong competition among conference members on the quality of service. When price is fixed, differentiation on quality is the only way a conference member can increase his own revenue at the cost of other members. Devanney *et al.* suggest that the main variable in this respect is speed: some conference members are simply able to offer quicker services or, in case of difficult circumstances such as congestion in ports and bad weather, are better able to maintain 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.

It must be said that conferences pre-existed such pricing worries and in reality there were conceived as mechanisms to protect trade, often combined with ‘gunpoint diplomacy’, between the metropolis and its colonies. In modern times, they have been allowed to exist, so far exempted from anti-trust legislation, on the basis of ‘sustainability of service’ arguments like the above. Such regulatory ‘leniency’ however has not come without the sometimes severe criticisms and outcry of many shippers (cargo owners) who have seen price-setting; price discrimination; port, cargo and market share allocations; secrecy of conference agreements and similar restrictive business practices exercised by conferences as not promoting trade to the detriment of the consumer.

For example, conferences have been known to exercise price discrimination –the outstanding trait of monopoly pricing- according to the principle of ‘charging what the traffic can bear’. In brief what this means is that the carrier has the ability to assess the price elasticity of a certain cargo (or shipper) and charge each according to its (his) ability to pay. In economic terminology, price discrimination enables the carrier to extract much of ‘consumer surplus’ for himself. Such practices, however, are becoming less and less common as a result of containerisation and the consequent charging of uniform rates per container. Obviously, containerisation makes it increasingly difficult to justify price discrimination on the basis of the alleged need for different treatment of goods according to their particular characteristics (such as volume, stowage, cargo-handling, etc.).

Price discrimination in liner shipping has been viewed both negatively and positively. First, regardless whether price discrimination is effectively exercised or not, only the potential ability of carriers to do so demonstrates a certain degree of monopoly power justifiably detested by consumers and regulators alike. However, price discrimination has also been seen positively in the sense that it has promoted trade by making possible the exportation of low value, price-sensitive commodities, many originating from developing countries. 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 conference prices. As a result, conferences have traditionally tried to exclude independent outsiders through a number of devices such as fighting ships (price wars), deferred rebates, loyalty agreements and so on.

Notwithstanding the above, the issue of monopoly power and the ensuing pricing strategies of conferences have remained important research areas of market modelling in liner shipping. Whether price discrimination –that has undoubtedly been exercised by conferences- aims at profit maximisation or merely at allowing low-value cargoes to be transported (in order to increase ship capacity utilisation and/or expand geographical coverage to peripheral or otherwise 'uninteresting' regions such as Africa and Latin America) still remains to be shown. Research results have not been conclusive given the inherent difficulties in measuring price elasticities of a miscellany of goods loaded at a great number of ports around the world (Sjostrom, 1992).

The issue of monopoly power has been approached through other avenues as well. A number of econometric models, using cross-section data, have been estimated with varying degrees of success. They all attempt to 'explain' prices (tariffs) through such explanatory variables such as the 'unit value of the transported goods' (an indicator of price discrimination); 'stowage factor' (an alleged cost indicator expressed by the volume/weight characteristics of the good); 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 mentioned 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, conferences are able to discriminate on price and there is thus a considerable degree of monopoly power. If, however, the stowage factor is shown to be the most important variable, this implies that conferences compete on costs and considerable competition thus prevails in the market.

The inclusion of the 'trade volume' variable has given rise to the examination of a most interesting phenomenon that has come to be known as the 'inbound-outbound freight rate controversy' (Heaver, 1973b). A number of authors had observed that routes inbound usually carried different rates from routes outbound a certain area. This was first noticed in the transatlantic route, but it appeared to exist on other routes as well. Bennathan & Walters (1969), Heaver (1973b), Devanney *et al.* (1975) and Byington and Olin (1983) have made contributions in this area. They found that reasons lie in the commodity structure of the inbound and outbound routes and cargo imbalances, as well as in differences in the level of competition on both legs of the route. In this respect, more competition means lower rates.

In the case of the United States and the transatlantic route, Bennathan and Walters (1969) observed a cargo imbalance favouring the outbound leg. As a result, the authors argued, tramps (i.e. unscheduled independent ships) were sailing from the US full with bulk cargo, leaving all outbound liner cargo to the conferences. Competition from tramps was thus minimal and as a consequence tariffs on the outbound leg were higher than the inbound one (Europe-US) where more competition prevailed. This situation could be explained reasonably well by variables such as trade volume and number of conference and non-conference operators on the route.

In the sixties, but particularly in the nineteen seventies, containerisation virtually eliminated competition from tramps. Obviously, large company size and infrastructural requirements could not be met by the often single-ship tramping companies whose advantage was merely 'flexibility'. Interest in the inbound-outbound issue was thus lost together with the importance of the 'stowage factor' as an explanatory variable of liner tariffs.

The latter development was illustrated in the work of Talley & Pope (1985) who obtained data similar to those of Deakin & Seward, Heaver, Bryan, and Jansson & Shneerson, but on a containerised route. They found that the stowage factor, previously an important explanatory variable, disappeared from the equation and, at the same time, the coefficient of 'unit value' was much smaller than in previous results. Due to the uniform way of treating cargo in a container, these results are not difficult to understand. Brooks & Button (1994) confirm these results and suggest alternative variables that should nowadays be considered: customer type, direction of trade and type of service.

New Theoretical Perspectives on Liner Shipping

Unlike monopoly theory, a useful concept in explaining the structure of liner shipping markets is that of 'destructive competition' (see, for instance, Davies, 1990). This process -whereby competition will eventually lead to the destruction of the liner service itself- provides the basis for some new perspectives on the market structure of liner shipping. These perspectives can also lead to new quantitative research of a

nature completely different than the one discussed above. This section briefly introduces two of these perspectives, namely the theory of contestable markets and the theory of the core, and discusses the quantitative analysis that finds its basis in these theories.

The theory of contestability

The theory of contestable markets owes its origin to Baumol *et al.* (1982). A perfectly contestable market is characterised by two properties:

- There are no barriers to entry in the market (such as necessary investments);
- Operators already in the market will not react with their prices to the entry of newcomers.

One could say that a contestable market can be entered and exited at will by anyone, while the operators in the market have no way of discouraging this. The fact that this possibility exists introduces an element of competition, even though there may actually be only one active operator in the market. Therefore, while at first sight this operator could be viewed as a monopolist, the market is in fact competitive.

Davies (1986), Zerby (1988), Franck & Bunel (1991) and Shashikumar (1995) argue that liner shipping markets can accurately be described as being contestable. Opposed to this claim are Pearson (1987) and Jankowski (1989a).

The main issue in the application of the theory of contestability in liner shipping is 'entry', especially potential entry. The type of entry that is relevant in this context is not the introduction of new companies in liner shipping, but the introduction of ships on a given route. These ships may be new ones, but could also be existing ones previously active in another route; and it is this possibility of shifting ships between routes that makes contestability theory so appealing for liner shipping.

Davies (1986) is the only author who offers an actual empirical analysis to substantiate the validity of contestability theory in liner shipping. He presents counts of actual entry and exit of ships on a number of liner routes and on the basis of those counts he concludes that entry and exit indeed occur a lot. This work is heavily criticised by Pearson (1987) and Jankowski (1989a), who argue that it is not the 'actual' entry that is relevant, but the threat of entry, and that substantial entry and exit could also point at destructive competition, which is an indication of short run marginal cost pricing rather than contestability.

The theory of contestability does not seem to offer as many possibilities for successful modelling of liner shipping as the monopoly view does, even though it offers a more satisfactory description of liner shipping markets. In his critique on contestability, Jankowski (1989b, 314) argues that '(..) market contestability does not explain why institutions (such as conferences) have emerged in liner shipping and not in other

modes, something that limits the usefulness of the theory for policy analysis'. Pirrong (1992) and Sjoström (1989) feel that such an explanation can be provided by the Theory of the Core.

The Theory of the Core

A less disputed, but perhaps a more esoteric approach to liner shipping market structure is the Theory of the Core. Here, in short, the trading mechanism is not based on price but on exchange arrangements between agents (such as carriers and shippers) in a particular market economy. The trading process is called a 'market game'. The combined possessions (such as vessel fleet and amount of cargo) of agents in a market game is called an 'allocation'. If such an allocation is feasible and it cannot be improved by a coalition of agents, then the allocation is said to lie in the 'core' of this market economy. One of the contemporary proponents of the theory is Telser (1978, 1987).

The theory of the core has been applied to liner shipping to show that this could be an example of an industry where the core is actually 'empty'. This means that stable liner systems cannot exist for long. Pirrong states that 'a core-based model effectively explains the incidence of collusion and competition in ocean shipping markets' (1992, 129).

Sjoström too argues that liner shipping might possibly be characterised by an empty core, which could be taken to mean that conferences exist to 'solve the problem of an empty core' (op. cit. 1162; see also Pirrong 1992, 89, 90). Jankowski (1989b, 315) argues similarly that conferences exist to change the structure of the market games in such a way that the outcome is more beneficial to both shippers and carriers.

The conditions for an 'empty core' are: inefficient entry, demand divisibility and marginal cost indivisibility. Sjoström and Pirrong argue that these conditions are met in liner shipping. Both authors provide empirical evidence for their assertion.

By relaxing the conditions of an empty core, Sjoström constructs a test to obtain situations where it is uncertain whether an empty core might arise or not. If the core is empty, Sjoström assumes that a cooperation agreement will emerge. In this way, he derives a number of testable implications (op. cit., 1164ff):

1. Agreements are more likely the more homogenous firms are;
2. Agreements are more likely in markets with lower price elasticity of demand;
3. Agreements are more likely if firms' capacity is large relative to market demand;
4. Agreements are more likely if the industry is in recession;
5. Agreements are more likely in industries with more variable demand or costs;
6. Agreements are less likely if there exist legal restrictions to entry.

Sjostrom compares these core theory implications with the ones arising from monopoly theory. He finds that in the case of implications 4, 5 and 6, the two theories lead to opposite conclusions. Furthermore, on the basis of a cross-section sample of 24 conference routes, he is able to estimate only implications 2, 3, 5 and 6. Implications 1 and 4 are not testable, as the author does not have an operational definition of company 'homogeneity', and his data (cross-section) is for one time period only. The estimation results show support for the theory of the core, since this theory produces the correct predictions of the signs of the estimated coefficients.

Pirrong emphasises the importance of costs, relative to demand, as a possible source of an empty core. His investigation thus focuses on the nature of demand and the structure of (marginal) costs. First, Pirrong asserts that demand in liner shipping is finely divisible (i.e. shippers desire the transport of small consignments) and highly variable (1992, 105, 106). He calculates ratios of parcel size to the size of a ship and finds these to be small (.2 to 5 per cent). Furthermore, coefficients of variation of monthly shipments are considerable: demand varies by 10 to 20% of average shipping volume.

With regard to costs, Pirrong estimates cost functions on the basis of data for 266 voyages from North Atlantic US and Mexican ports to Europe. He distinguishes in capital costs, voyage costs and cargo handling costs and presents evidence that voyage costs represent 35-43% of total costs. Since these costs are largely unavoidable, cost indivisibilities exist in liner shipping. Therefore, the author argues, the combination of a highly divisible demand with cost indivisibilities support the view that, even in a larger market, liner shipping may be confronted with an empty core problem (ibid., 115).

Concluding remarks

In addition to an effort to provide a general overview of liner shipping, this chapter has focused on two types of models that have mainly occupied the attention of researchers in recent years. The first concerns models aiming at the optimisation of liner shipping operations. The volume of publications here is rather limited, the reason being the confidentiality that often shrouds highly commercial information such as fleet deployment and container repositioning strategies. Still, the available literature offers a comprehensive coverage of the various optimisation problems that can be found in liner shipping.

The second, and more important, type of models in liner shipping concern market structure. The pertinent questions here –entailing significant policy implications- are the degree of capital concentration, carrier coalitions such as conferences and alliances, monopoly power and related pricing strategies. The amount and extent of work carried out in the last few decades leaves a lot to be desired. This is particularly true in the area of economic modelling of market structures and tariff setting processes. With the imminent demise of the conference system -and the monopoly theory approach- general price theory in liner shipping has come to a virtual standstill. In addition, the theory of contestable markets does not offer clear modelling opportunities, while Core Theory provides useful albeit difficult to interpret insights.

Modelling efforts have also been seriously hampered by the unavailability of time-series data of reasonable length and consistency. Most of the works cited in this chapter have employed cross-section data. Time-series modelling could, however, offer interesting insights into the market structure of liner shipping –something that cross-section modelling cannot reveal- and could also allow the construction of forecasting models. A time-series data set would at least have to contain data on fleet, tariffs, secondhand ship prices and volumes of container flows. Of these, limited information exists on the fleet of containerships and on liner tariffs. The latter are mostly published tariffs, having little or nothing to do with the ‘actual’ prices paid for the transportation of containers nowadays. Building suitable and comprehensive data sets on liner shipping markets is one of the most important research tasks in the coming years.

A final word is due on the recent phenomenon of ‘global shipping alliances’. These are also coalitions of carriers but, contrarily to the route-based character and price-setting objectives of conferences, alliances are not involved in price-setting and one of their main objectives is to offer shippers global geographical coverage through cooperation, harmonisation and dovetailing of their members’ operations.

Regularity and frequency of service, the two imperatives of liner shipping, combined with today’s need for very large containerships, can easily lead to low capacity utilisation for operators that would decide to go it alone. 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.

With a few notable exceptions (Evangelista, P. and A. Morvillo, 2000), research on the institution of shipping alliances is still in its infancy and questions on their stability, market power, degree of integration and similar concerns that permeated the discussion on conferences in the past have yet to be addressed.

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