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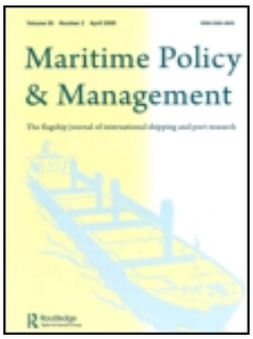

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Some notes on structure and stability in liner shipping

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Almost six years have elapsed since the passage of the Ocean Shipping Reform Act (OSRA), legislation that has led to significant changes in the structure of the US liner shipping industry. The European Union (EU) is poised to follow suit with the impending elimination of rule 4056/86, the block exemption from EU competition rules for liner shipping companies operating on European trades routes. The EU reform, however, is likely to go further than OSRA by prohibiting both conferences and discussion agreements on European trade routes. The outcome of such a policy is uncertain and the current review of it is several years old already. This paper is intended to provide some insight into the potential impact of regulatory reform in Europe, using the US experience as a benchmark. Specifically, the impact of OSRA with respect to industry structure, including its profitability, efficiency and what may be in store for the future is examined.

1. Introduction

A well functioning liner shipping system enables countries to fully extract the rents associated with international trade by providing shippers of high-value, manufactured and agricultural goods with streamlined access to a ready supply of ocean transport services. Moreover, in order to facilitate the planning of production for export, shippers increasingly require service guarantees months in advance. Although external conditions such as weather, geopolitical developments, port, railway and road congestion and market conditions related to the costs of labour, capital, fuel and infrastructure have sporadically interrupted service, the liner shipping industry has a good track record of filling these needs for shippers. Indeed, one may wonder what the state of international merchandise trade would be without regularly scheduled container shipping services.

Up until the passage of the Ocean Shipping Reform Act (OSRA) in 1998, US government liner shipping policy sought to encourage the conference system as the optimal means for achieving stability of prices and surety of tonnage supply [1]. But the US liner shipping industry has undergone significant changes during the past several years, most, if not all, of it precipitated by OSRA, which became law in May of 1999, but for which carriers had been preparing for at least two years prior. OSRA rendered conferences virtually obsolete by encouraging carriers and shippers to engage in long-term confidential contracts. This made enforcement of the conference rate virtually impossible, and effectively sealed the demise of the system. Of the major conferences operating in US trade lanes, only the Trans-Atlantic Conference Agreement (TACA) has survived, although in a significantly weakened state.

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OSRA has had unquestionably far-reaching effects on the organization of liner shipping markets. First, it sparked a series of mergers and acquisitions which are likely to accelerate going forward. The Maersk–P&O Nedlloyd and Hapag Lloyd–CP Ships combinations are just two of the most recent and largest. Second, and perhaps more importantly, OSRA persuaded large carriers to abandon conferences in favour co-operating through global alliances that now dominate US and global trade routes [2].

There is a growing interest on the various effects of OSRA because the European Union (EU) is currently considering a similar but more restrictive policy. This paper is intended to offer some insights into how OSRA might have changed the structure of and stability of US liner shipping markets. Section 2 describes the current and past structure of liner shipping markets, and section 3 begins an assessment of its impact on the stability of supply. Some concluding remarks are offered in section 4.

2. Industry structure

Industry structure refers to market concentration, the size and size distribution of firms, entry and exit conditions, product differentiation and the extent of vertical integration. This section touches on each of these topics with an emphasis on the differences in market structure between the pre- and post-OSRA periods.

2.1. *Concentration*

The causes of concentration in liner shipping are many but stem primarily from the objective of capturing economies of scale [3]. Relatively low freight rates and low rates of return on capital have forced individual carriers to concentrate on reducing fixed unit costs. For the most part, this objective has been pursued through deploying increasingly large and more efficient vessels and in developing hub and spoke logistics systems to circumvent infrastructure restrictions. On the surface, this is an effective strategy as long as demand is sufficient to fill the ships on the fixed sailing schedules. But demand is highly uncertain and displays highly seasonal patterns that nearly guarantee chronic and destabilizing industry-wide excess capacity. This peculiarity of the industry raises the odds that individual firms will need to co-operate to minimize unit costs in the case of alliances or maintain stable revenues as in the case of conferences. In either case, co-operation among individual firms may reduce the accuracy of a traditional market structure analysis where each firm is treated as a single entity. Nevertheless, the salient features of the post-1984 US liner conference system offer support for a disaggregated analysis under certain assumed conditions [4]

First, as in the case of any cartel-like arrangement, it may be assumed that conferences are composed of members with heterogeneous cost functions. This implies that high-cost members prefer a higher freight rate than low-cost members and the agreed upon freight rate will reflect the costs of the least efficient member. But this outcome provides low-cost members with a strong incentive to deviate from the agreed upon price during periods of slow demand and excess capacity. The incentive rises further when detection and enforcement are weak. The latter is an apt description of the post-1984 reforms liner conference system. Since that time, conference members have had the right to take ‘independent action’ on rates without fear of retribution from the conference [5]. This significantly raised the potential level of intra-conference competition. Second, the 1984 legislation

mandated the end of 'closed conferences' such that conferences could no longer exclude any carrier that expressed a wish to join. This raised the size of the conference in terms of the number of firms and thus the level of potential intra-conference competition. Third, anecdotal evidence suggests that the published conference rate was almost never strictly adhered to by individual members nor was it ever strictly enforced. The 'fill the ships' mentality of liner shipping sales managers would always override any conference obligations. Finally, the presence of rate-discounting independent lines, some of them major carriers, raised the odds that conference members would cut prices to protect their market share regardless of the agreed upon freight rate. Each of these factors indicates that conference member pricing was and is more competitive than would be expected from a cartel-like arrangement and lends credence to the notion that a disaggregated measure of industry concentration adequately represents its structure.

After OSRA, the dissolution of the conferences was followed by the creation and enlargement of discussion agreements and increased reliance on vessel sharing agreements. These arrangements also threaten to derail a disaggregated concentration analysis. Discussion agreements are not registered as conferences under US law and are thus not permitted to fix prices or capacity. However, members are permitted to meet regularly to discuss the general levels of supply, demand and the direction of freight rates. Whether this leads to illicit price fixing is an open question and, because of the paucity of adequate pricing data, not easy to answer.

Global alliances, formed in part as a response to industry excess capacity, may also detract from the accuracy of concentration measurement. In spite of regulations that preclude collective price setting among these groups, their facility in sharing capacity, terminals and equipment, joint-scheduling, slot-chartering and marketing functions tend to make them appear to behave as a single entity. Nevertheless, the alliances are not permitted under US law to fix prices among themselves, and it is up to analysts to trust that this is actually not occurring.

Assuming that discussion agreements and alliances offer no more cohesiveness of pricing behaviour than conference agreements implies that there is sufficient intra-agreement competition to justify a disaggregated accounting of concentration. The results of such an analysis for several US liner import markets are depicted in table 1. It should be cautioned that, in some markets, government protection of national fleets may have a large role in the determination of market structure [6].

The statistics display two clear trends. First, the industry is less concentrated today than pre-OSRA, in some cases significantly so. In light of the extent of merger activity in the industry during the late-1990s and in particular, the Maersk–Sealand combination in 2000, this comes as a surprise and is a strong indication of the lack of barriers to mobility. Second, the largest and fastest growing markets tend to be the least concentrated. The east–west trades are less concentrated than the smaller north–south trades. This could come about, presumably, because larger, faster growing markets allow sufficient room for several carriers and thus entry is more common [7].

In part, concentration is lower in the post-OSRA period because equipment or vessel sharing agreements among carriers have reduced barriers to mobility. Vessel sharing agreements were a rising phenomenon, even before the advent of global alliances. In table 2, the average number of carriers carrying cargo aboard one vessel in each of 12 US import trade lanes is shown for the years 1991, 1996 and 2004. Figure 1 shows that the rate of growth of these arrangements was positive but

Table 1. Concentration in selected US import trades.

	Herfindahl index[1]			
Trade route (imports)	1988	1998	2000	2004
Northeast Asia–USWC	1415	1453	1265	1099
Northeast Asia–USEC	1691	1637	1648	1206
Southeast Asia–USWC	2275	1855	1960	1695
North Europe–USEC	1489	1245	1364	1202
Mediterranean–USEC	1367	1320	1474	1582
Middle East–USEC	5755	3266	3455	4006
India/sub-Continent–USWC	11678	6143	4454	3462
Oceania–USEC	5565	6108	7331	4918
Oceania–USWC	3652	4177	4483	4834
East coast South America–USEC	3747	1420	1458	2045
East coast South America–USGC	3632	3075	2308	2714
West coast South America–USWC	4250	3878	3536	3402
West coast South America–USEC	2499	2551	2212	1835
Caribbean–SEC	2401	2358	2975	3346
Central America–USWC	3165	4710	10452	4482
Central America–USEC	4135	2910	3157	2889
Central America–USGC	5884	4712	3499	3660

Source: data derived from PIERS *On Board Review*, various issues. [1]The Herfindahl Index is calculated as the squared sum of firm market shares.

Table 2. Average number of carriers per vessel US import markets 1991–2004.

Market	1991 average	1996 average	2004 average	Annual growth rate
Northeast Asia	1.8	2.2	3.3	5.0%
Southeast Asia	1.4	1.6	2.2	3.3%
North Europe	1.9	2.6	3.3	4.3%
The Mediterranean	1.5	2.4	2.5	4.0%
Central America	1.1	1.3	1.9	4.7%
Caribbean	1.0	1.2	1.6	3.6%
West coast South America	1.4	1.4	1.7	1.6%
East coast South America	1.1	1.6	2.6	6.6%
Mid-east	1.0	1.9	1.2	1.7%
India Subcontinent	1.0	1.8	2.4	6.9%
Africa	1.3	1.8	1.5	1.0%
Australia–New Zealand	1.4	1.3	3.7	7.8%
Total	1.6	2.2	3.1	5.4%

Source: data derived from PIERS *On Board Review*, various issues.

gradual in the lead up to and just after OSRA, but accelerated significantly in 2000. Vessel sharing, which evolved into the larger global alliances prevalent today are a means of entry without the requirement of deploying physical assets. It permits carriers the ability to 'test the waters' prior to making large capital commitments and thus helps to reduce the risks associated with full-scale entry. The only significant costs incurred are in the reciprocity. In the US, the Federal Maritime Commission (FMC) looked favourably on vessel-sharing agreements as a means of rationalizing capacity outside the conference system. Furthermore, vessel sharing facilitates entry, which imposes pricing restraint on incumbent carriers. In other words, it increases

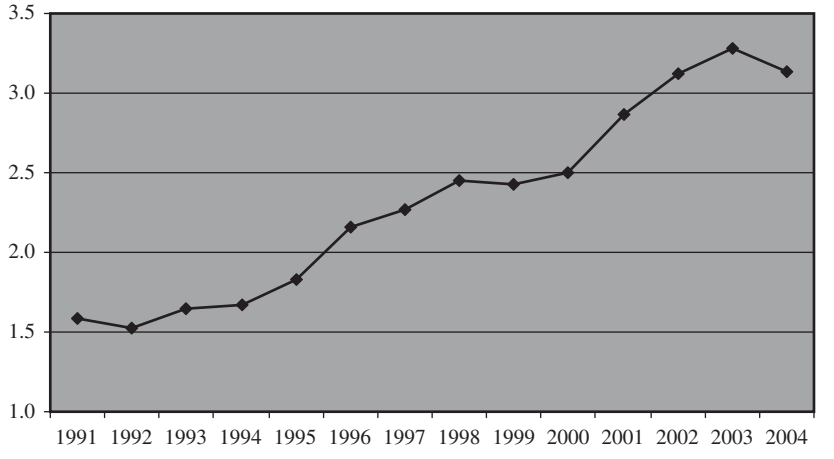

Figure 1. Average number of shiplines per vessel toral US import markets.
Source: Data derived from PIERS *On Board Review*, various issues.

the contestability of the liner shipping industry because it reduces barriers to entry and mobility in the form of reducing the level of financial commitment and risk.

2.2. *Size and size distribution*

As might be expected, the size distribution of liner shipping firms is heavily skewed to the right and has become even more so during the past ten years. In 1995, the top 20 liner shipping companies controlled 74% of container slots deployed on US trades [8]. In 2004, that share had risen to 86% [9] and is bound to rise even further in line with the current round of consolidation in the industry. Consolidation began in the mid-1990s, with large firms swallowing smaller niche players that specialize in a particular market and/or commodity segment.

Industrial economists note that the size distribution of firms is a function of individual firm cost structures. With uniform cost functions, all firms would be the same size but with heterogeneous cost functions, the most efficient firms gravitate towards the top because their relative efficiency improves their competitive position among rivals. Large firms capture efficiencies that simply do not accrue to smaller firms, enabling the largest firms to become larger. This is especially true in liner shipping, which exhibits features that, it may be argued, roughly characterize it as a natural monopoly. In addition to economies of scale in ship size, and other functions, largeness in liner shipping presents several other advantages. For example, large carriers have leverage over ports such that they are better able to dictate terms that may require costly accommodations in fees and infrastructure. Small carriers would not be in such a position and are placed at a significant competitive disadvantage as a result [10]. The process of consolidation, if not welcomed, should at least not be feared by shippers in the short run. Through the competition that remains, at least a fraction of these efficiencies created will be passed along in the form of lower freight rates. Capacity constraints of smaller carriers will bar a full transfer of benefits, but as long as increasing size raises efficiencies and there is some degree of competition among large firms and from the remaining smaller players,

the process will continue. If the trend towards consolidation is left to proceed naturally, however, it is not difficult to imagine over the long run, that at a certain point, these cost savings will begin to be withheld and that the increasingly consolidated industry will begin to extract monopoly rents from shippers. In the absence of conferences, most analysts agree that this is almost inevitable and that, in a practical exhibition of the industry's tendency towards natural monopoly, the world's liner shipping markets will, eventually, be reduced to just a few rent-seeking oligopolies [11].

2.3. *Entry and exit conditions*

There have been few instances of full-scale entry of newly formed carriers into the US liner shipping markets since 1988. A few outstanding examples, such as Mediterranean Shipping and China Shipping Group, are exceptions. What entry does occur tends to be existing firms, often the larger global carriers seeking to expand in the smaller north–south trade lanes. Entry barriers take the form of economies of scale and scope, which have increased to such a level that they have raised the 'critical mass' of operation 'that makes feasible the appropriate quality of service which guarantees market share' [12]. However, barriers to mobility are not prohibitive and expansion of existing carriers into new markets is not uncommon.

Entry was significantly more common in the pre-OSRA period than in post-OSRA, perhaps in part owing to the post-OSRA formation of alliances that share vessel space among themselves but exclude rivals. According to PIERS data, incidence of entry, defined as the achievement of a market share of at least 5% within two years, was 22.7% from 1992 to 1998 and just 9.8% in the period from 1999 to 2004. Moreover, there were fewer instances of exit post-OSRA compared to pre-OSRA. In the period from 1992 to 1998, the exit rate stood at 16.8% but just 13.2% in the six years after OSRA's enactment [13].

The statistics suggest that entry and exit barriers are higher post-OSRA than pre-OSRA [14]. The reasons are two-fold. First, the level of capital commitment to run a string of ships at minimum efficient scale has increased on all trade routes. The average capacity of a containership serving US trades in 1995 was 2206 TEUs but 3353 TEUs through the second quarter of 2005. Fully 56% of all ships serving US trades are at least 3000 TEUs. Over the next two years, the distribution will shift even further to the right. Figure 2 reveals the size distributions of containerships on US trade lanes in 1995 and in 2004.

While an active secondary market precludes characterizing vessel costs as sunk, a significant level of modern liner service costs are. Modern liner firms must invest heavily in a global marketing infrastructure, including advertising, information systems to co-ordinate scheduling, a multi-national sales force and a network of agents to keep the ships full. It may also require extensive investment in port-side infrastructure, such as berthing facilities and so on. These costs are non-trivial and many of them may be considered sunk because by and large they are not recoverable in the long run. Second, it is reasonable to speculate that the emergence under OSRA of long-term confidential contracting creates a significant barrier to entry [15]. Third, the emergence of global alliances that operate with exclusive and extensive network economies reduce the odds of success for new entrants and, finally, the absence of the conference pricing umbrella may create the perception among potential entrants that market prices are not sufficient to cover the high fixed costs of entry.

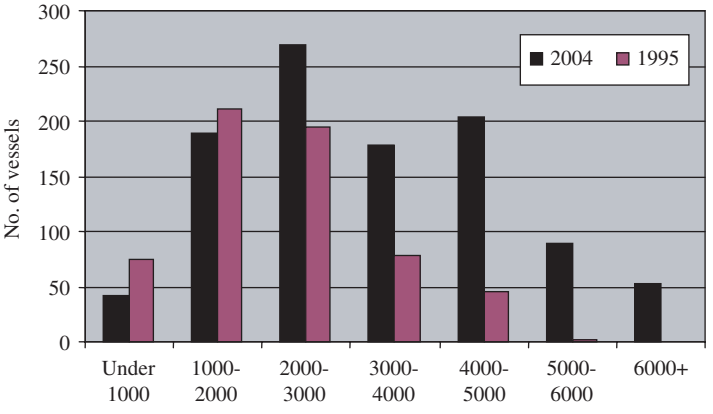

Figure 2. Size distribution of containerships US trade 1995 and 2004.

Whatever the reason, a reduced rate of entry is not welcome news for shippers and regulators concerned about competitive pricing in liner shipping. If barriers to entry have been raised under OSRA, then they at least partially defeat the intent of the reforms. Behind higher-entry barriers, incumbent carriers are free of potential competition that would otherwise deny them supra-normal profits [16].

2.4. *Product differentiation*

Product differentiation permits individual firms to raise pricing above marginal costs because, by differentiating themselves from the competition, they create their own monopoly with a downwards sloping demand curve. But the container shipping industry serves what is essentially a commodity market with little room for differentiation of service. In general, carriers do not handle cargo or assist shippers with logistics beyond minimum service requirements, preferring to instead focus on the ocean transport segment of the shipment. There are areas, such as service call frequency and cargo security, where differentiation or 'branding' can occur, particularly in high-value, manufactured commodities. One means of branding is membership in the global alliances, which may emit a quality signal to shippers. Although there are obvious issues of selection bias, the statistics on capacity utilization reveal that membership in alliances has empirically supported advantages. Figure 3 depicts capacity utilization for the global alliances and for the non-affiliated carriers in the aggregate. Alliance members clearly use space more efficiently than their counterparts on average and this may create the perception among shippers that, alliance members are more efficient and thus provide better service and service call frequency than the non-affiliated carriers.

Another method of differentiation is to vertically integrate. This is discussed in the next section.

2.5. *Vertical integration*

A natural means of vertical integration in ocean shipping is to extend services to port terminals, storage and inland transport. In addition, '... vertical integration of

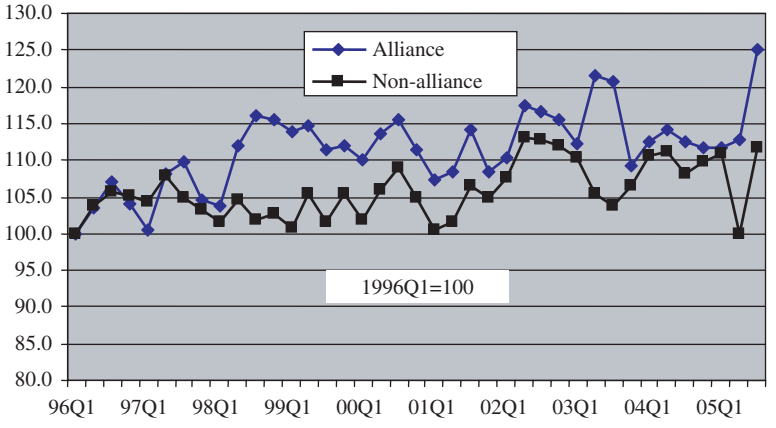

Figure 3. Index of capacity utilization alliance vs. non-alliance 1996Q1–2005Q3.
Source: Data from *PIERS On Board Review*, various issues.

different maritime industries occurs, for example, when a shipping line buys a container leasing company, when a freight forwarder purchases a shipping company, when an international port operator merges with a shipping line or when that an international investor purchases a shipyard and a shipping line' [17]. Yet, with just a few notable exceptions, liner shipping firms serving US markets tend to shy away from vertical integration, preferring instead to concentrate exclusively on providing ocean transport. The barriers to vertical integration are substantial. Notteboom [18] states 'Landside operations are management intensive and generally involve a high proportion of bought-in services'. These include costs to establish the inland transport network and hire and recruit labor and management, the latter two of which can account for 60% of logistic service provider costs [19]. Given the competitive pressures in the US domestic freight transport industry, the profit opportunities in these services are likely to be marginal at best. Liner shipping involvement in port-side infrastructure is, however, an area that has attracted increased attention from carriers. Although relatively few carriers are engaged in them, dedicated terminals may become an important means of product differentiation among carriers because they presumably help to avoid congestion and costly delays.

Competition authorities should be wary of vertically integrated carriers, particularly in highly concentrated markets. Carrier ownership or control over port terminal space and berthing could eventually become an effective means of foreclosing on rival firms and could deter entry or the threat of entry that would otherwise discipline the pricing behaviour of incumbent carriers.

3. Stability of liner shipping services

Stability is a frequently cited feature in the analysis of liner shipping conferences, likely because conference carriers assert that, without the conference system, the industry would be remarkably unstable and shippers would suffer from repeated interruptions in service and volatile freight rates. The intuition for this assertion rests on the character of the industry. Container shipping is by and large a commodity market that is subject to wide swings in demand caused partially by seasonality and

partially by the unstable dynamics of international economics and trade [20]. In addition, its network structure, tendency towards natural monopoly, and the wide geographic dispersal of demand centres, render the liner shipping industry 'exceptionally unstable' [21]. Conference advocates argue that introducing unfettered competition into such an inherently unstable environment would significantly degrade the reliability that shippers have come to expect and demand.

The prevailing wisdom throughout the early years of conferences and one used by conferences today to justify their existence is that that they are and were the best means available to control individual carrier pricing behaviour and thus maintain system stability [22]. In contrast, the European Shippers' Council (ESC) claims, in their submission to the European Commission for the current the review of the liner shipping block exemption, that, conferences actually contribute to instability of freight rates. They cite instances where freight rates charged by individual conference members to large European shippers in major east–west trades have fluctuated by 50% or more on an annual basis. While this is not proof-positive of their contention, it may, if it can be demonstrated that these events are sufficiently frequent, warrant further investigation [23].

Stability of liner shipping services and freight rates is in part a function of the ability of suppliers to adjust capacity to appropriate levels to meet demand. Given the lag time between ordering a new vessel and its delivery, and the rigid sailing requirements to operate a viable service, it is reasonable to conclude that liner shipping supply must be fixed in the short run. This hypothesis would help to explain freight volatility as fixed supply renders the industry vulnerable to wide short-term swings in the supply/demand relationship. Conferences hold tightly to this view and maintain that fixity of supply along with economies of scale form the justification for collective rate setting. But quantitative research on this topic is sparse at best. In Fusillo [24] capacity deployments in the major east–west US trade lanes was revealed to be more flexible and quicker to adjust to demand conditions in the trans-Pacific trades where, incidentally, conference members have historically been less well-disciplined than in the trans-Atlantic. The conclusions provide some evidence to suggest that conferences are a hindrance to achieving supply and demand balance, and that shippers are right to demand they be abolished. The issue, however, is not as simple as that. While the evidence suggests that conferences inhibit stability, the case for the abolishment of all forms of co-operation is not made. Recall that, after OSRA, global alliances rose in significance as did discussion agreements. The use of long-term confidential contracts also increased. Thus the post-OSRA supplier market is not characterized by unfettered competition and consequently it is not yet safe to say that the abolishment of conferences will raise market stability unless carriers are left with other means by which they can co-operate.

In the remainder of this paper, two separate investigations into the concentration–stability relationship are discussed. Both support the notion that more concentrated markets are more stable on the supply-side. Whether that translates into reduced freight rate volatility is left open for further research.

3.1. *An empirical investigation of stability*

The relationship between market share stability and service reliability was tested in a model of the US liner markets. After controlling for entry, exit and market growth, the relationship between industry concentration as measured by the Herfindahl Hirschman Index (HHI) and instability of market shares is negative for a sample of

34 US import and export markets from 1988 to 2004. The stability index was constructed as the sum of the absolute, annual change in share for carriers with at least 5% of the market. Both entry and exit destabilized market shares and so did demand growth of at least 20%. Negative demand growth had no impact on stability at all, suggesting that carriers are more disciplined in their pricing behaviour than traditional cartel theory would suggest. Perhaps the most important result for European policy is that the average level of stability for all US 34 markets studied from 1996 to 2004, the era of closer co-operation among carriers outside of the conference system, was greater than pre-1996. This suggests that at least in part, alliances and discussion agreements in place of conferences have had a stabilizing impact on the liner shipping supply curve.

To augment these results, sales variability was also tested. Following Mills and Schumann [25], an index of sales variability was constructed as the residuals of a regression of the log of carrier volume on time, corrected for autocorrelation when required. The sample was restricted to firms in eight US import markets, including the major east–west trades and three north–south trades from 1988 to 2004. The sample was further restricted to firms that were active for the entire length of the period. The results showed that again, on average, concentrated markets produce higher levels of sales stability. Alliance membership had virtually no impact on stability and neither did OSRA.

Stability, while beneficial to shippers, is also beneficial to carriers and will continue to form one of the industry's major objectives. Stable markets facilitate route and tonnage planning, reduce investment uncertainties and above all permit better freight rate foresight. With respect to the European markets, the results of the two empirical exercises described above imply that given the benefits of stability to carriers, it will be pursued whether the conference system continues to exist or it is eliminated. As shown above, alliances do little to increase stability and as a result may not form a major strategy in the pursuit of stability. But it is clear, however, that higher levels of industry concentration lead to greater levels of supply-side stability. Hence, in the absence of conferences and discussion agreements, the industry is likely to become significantly more concentrated after the block exemption is eliminated, which will subsequently raise the likelihood of oligopoly pricing.

The absence of an appropriate laboratory for the study of unfettered competition in liner shipping precludes a more certain analysis of stability [26]. Therefore, any decision to abolish carrier co-operation must be based either on the limited information offered by an analysis of OSRA or on the basis of theory. Thus far, theory generally supports some form of collusive behaviour in liner shipping, whether it takes the form of price-fixing conferences or co-operation through alliances and discussion agreements. Sjostrom [27, 28], Pirrong [29], Button [30] and Button and Nijkamp [31] each provide invaluable insight on this topic.

4. Conclusions

OSRA forced deep changes on the organization of US liner shipping markets but, in general, it appears to have been a net gain for both shippers and carriers. Markets are less concentrated than prior to OSRA as conferences have been replaced by global alliances, increased vessel sharing arrangements and discussion agreements. These new arrangements have increased operating efficiency and, in general, provided shippers with better service reliability. Although there may be significant

variation across individual carriers, non-contract average freight rates are stable, and it can only be assumed that contract rates are stable as well. Carrier market shares are also more stable, adjustment of capacity to demand is more flexible and profitability is up [32].

But the OSRA regime appears to favour large carriers operating large networks with capacity sufficient to capture economies of scale. Because the pricing cushion offered by conferences has been virtually eliminated, carriers have been forced to seek economies by establishing large networks that require large physical capital to operate efficiently. This has underpinned the shift to the right in the size distribution of firms, as the absence of the conference umbrella has reduced the prospects for smaller carriers. In addition, it has spawned the global alliances and long-term confidential contracts, both of which may serve to raise the barriers to entry and thus the odds of supra-normal profits [33].

The US experience can provide some important lessons for European reformers. In spite of the admitted brevity of this overview, the evidence presented here suggests that the elimination of the block exemption in Europe will spark an intensive round of industry consolidation that could ultimately lead to oligopoly pricing. It is therefore suggested that policy reform in Europe proceed at a more gradual pace than what is currently being promoted by the ESC [34]. Adopting a policy similar to OSRA, that discourages conference membership but does not preclude other forms of non-price co-operation, would, given the uncertainties of a more drastic overhaul, be preferred. If European shippers insist that this is not sufficient, then it may be wise, prior to a complete elimination of the current system, to experiment over time with smaller, randomly chosen trade lanes. This will provide the laboratory in which, the ensuing policy analysis will be infinitely more credible. Failing that, a comprehensive striking out of the block exemption will be a risky undertaking. It will almost certainly lead to more consolidation, in which case shippers will face the risk of supra-normal pricing. The impact on the growth in global merchandise trade could be significant.

References and notes

1. The Shipping Act of 1984, a precursor to the OSRA legislation, significantly weakened the conference system by mandating the allowance for independent action, permitting long-term, non-confidential contracting and ending 'closed conferences'. Antitrust immunity for conferences was, however, retained and conferences maintained their dominance on US trade lanes for the next 14 years.
2. PIERS (Port Import Export Reporting Service) data show that excluding the Maersk–Sealand alliance, which ultimately led to their merger in 2000, the global alliance share of total slots deployed on US trade lanes stood at 46.2% in 2004 and 43.6% in 1998. PIERS, *US Global Container Report*, various issues 1987–2004.
3. Hoffman, J., 1998, Concentration in liner shipping: its causes and impacts for ports and shipping services in developing regions. *United Nations Economics Commission for Latin America and the Caribbean*, May, provides a comprehensive analysis of the causes of concentration in the liner shipping industry.
4. Fox, N., 1994, An oligopoly model of ocean liner ahipping. *Review of Industrial Organization*, **9**(4), 343–357, makes the case that conferences fix prices but individual members subsequently compete with one another based on quality of service or service frequency.
5. Fox, N. R. and White, L. J., 1997, US ocean shipping policy: going against the tide. *Annals of the America Academy of Political and Social Science*, **553**, 75–86, Transport at the Millenium.

6. *Ibid.*
7. Outright entry is relatively rare in liner shipping but, since shipping capital is mobile, there occurs a substantial amount of expansion of existing carriers into other markets.
8. PIERS (Port Import Export Reporting Service), *On Board Review*, various issues 1996–2005.
9. *Ibid.*
10. The ability of some carriers to dictate terms to port authorities may have potentially negative social welfare consequences and deserves close scrutiny from regulatory authorities.
11. The latest study to hypothesize this outcome is that led by Global Insight as part of the EU review 4056/86. See *Global Insight* (Washington, DC, Institute for Shipping and Logistics), Bremen and Workgroup for Infrastructure Policy, Berlin University of Technology, *The Application of Competition Rules for Liner Shipping*, Final Report to the European Commission, 26 October 2005.
12. Cullinane, K., 2005, The container shipping industry and the impact of China's acccession to the WTO. In: *Research in Transportation Economics*, Vol. 12, edited by K. Cullinane (Oxford: Elsevier Ltd), p. 223.
13. The exit statistic excludes the Maersk–Sealand merger but includes acquisitions such as Neptune Orient Lines purchase of APL, Hamburg-Sud's purchase of Columbus Lines and several smaller acquisitions made by CP Ships.
14. The presence of 'sunk costs' precludes the characterization of liner shipping as a contestable market. While there is an active secondary market for vessels, modern liner shipping firms must invest heavily in a marketing and sales infrastructure to remain viable. These costs are unrecoverable in the short run and are thus considered sunk.
15. Yong, J.-S., 1996, Excluding capacity-constrained entrants through exclusive dealing: theory and application to ocean shipping. *The Journal of Industrial Economics*, **44**(2), 115–129.
16. This is the so-called 'contestable markets' hypothesis.
17. See [3], p. 22.
18. Notteboom, T., 2004, Container shipping and ports: an overview. *Review of Network Economics*, **3**(2), 86–106.
19. Krauth, E., Moonen, H., Popova, V. and Schut, M., 2005, Performance indicators in logistics service provision and warehouse management—a literature review framework (Department of Management of Technology and Innovation, RSM Erasmus Universiteit, Rotterdam, and Department of Computer Science, Faculty of Sciences—Vrije Universiteit Amsterdam, De Boelelaan).
20. The 1997 Asian currency crisis and more recently in Argentina are the most obvious examples. Both events disturbed the supply/demand balance in their respective trades.
21. Robinson, R., 2005, Liner shipping strategy, network structure and competitive advantage: a chain systems perspective. In: *Research in Transportation Economics*, Vol. 12, edited by K. Cullinane (Oxford: Elsevier Ltd), pp. 247–289.
22. While it has gone unmentioned in this paper, conferences partially owe their existence in Western nations to the latter's need for a strong domestic fleet of merchant ships that could be called on in time of war and that could also ensure hegemony in international trade relations.
23. The ESC has not been forthcoming with any statistical evidence to support claims of instability but instead relied upon anecdotal evidence to make its case.
24. Fusillo, M., 2003, Is liner shipping supply fixed? *Maritime Economics and Logistics*, **5**, 100–115.
25. Mills, D. E. and Schumann, L., 1985, Industry structure with fluctuating demand. *The American Economic Review*, **75**(4), 758–767.
26. The conference in the Europe–East Coast South America trade vanished in 2004. The joint Global Insight/ISL/WIP report to the European Commission [see note 11] looks at this route and finds that there has been no adverse impact as a result. While this is interesting, sufficient time has yet to elapse before any summary judgements can credibly be issued.
27. Sjostrom, W., 1989, Collusion in ocean shipping: a test of monopoly and empty core models. *Journal of Political Economy*, **97**(5), 1160–1179.

28. Sjostrom, W., 1993, Antitrust immunity for shipping conferences: an empty core approach. *The Antitrust Bulletin*, **Summer**, 419–423.
29. Pirrong, S., 1992, An application of core theory to the analysis of ocean shipping markets. *Journal of Law and Economics*, **35**, 89–131.
30. Button, K., 1999, Shipping alliances: are they at the 'core' of solving instability problems in shipping? In: *Liner Shipping, What's Next?* International Association of Maritime Economists, Proceedings of the 1999 Halifax Conference, edited by M. Brooks (Halifax, Nova Scotia: Dalhousie University).
31. Button, K. and Nijkamp, P., 1997, Network industries, economic stability and spatial integration, Tinbergen Institute Discussion Papers, Tinbergen Institute, No. 97-043/3.
32. Fossey and Ajala report in the October 2005 issue of *Containerization International* that liner shipping profits soared in 2004 thanks to higher freight rates, strong cargo demand and strict cost control. Fossey, J. and Ajala, L., 2005, Record breakers. *Containerization International*, October, 44–45.
33. The contract system under OSRA could also potentially shut smaller shippers out of the markets. While the proliferation of the third-party logistics industry and shipper associations act to counterbalance this risk, it remains a threat to small exporters.
34. The ESC advocates a complete and abrupt abolishment of all forms of supplier co-operation and the immediate introduction of unfettered competition. See Haralambides, H., Veenstra, A., Fusillo, M., Hautau, U., and Sjostrom, W., 2003, *Final Report for the European Commission (The Erasmus Report)* (Rotterdam: Erasmus University), 12 November.