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A Study of Market Structure in Liner Shipping under the influence of Government Policies

Peter C Wong^{1*} and Colin Bamford^{}**

The peculiar operational mode and involvement of international carriers granted liner operators special exemption from Anti-trust regulations globally. The changes of policy from USA and EU in recent years forbidden liner operators to form Liner Conference (LC) which seems to possess oligopoly power in the trade. This paper use the freight rate to verified the change of Government policies cannot stop the liner operators to form in their natural formation - Liner Conference.

Field of Research: International Business, Economic Policy

1. Introduction

In international trade, liner shipping is one of the oldest operational modes of sea transport, with regular sailings and published tariffs. The liner services provide stable transport requirements between the origin and ports enroute to the destination, which are essential for the smooth functioning of global international trade.

It is obvious and natural that liner operators in specific geographical regions will form a “liner conference” for convenience of operation and fleet management. The pre-determined tariff in the trade route under the liner conference gives a strong indication that it is operating in a collusive market situation and possesses powers of oligopoly.

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The practice of liner conferences has long dominated liner trade routes. In the 1950s, there were over 350 conferences in existence (Wang 2006, Wong 2009). There was general political agreement to adopt published price-fixing within the Organisation for Economic Co-operation and Development (OECD) which lent some measures of long-term stability to the liner shipping industry. The liner shipping conference is a measure that traders seek in order to engage in long-term transport supply relationships at known prices. While most OECD countries provided conferences with antitrust immunity, within the OECD these policies have not been harmonized in spite of considerable efforts to do so (Brooks 2002). Hard harmonization, which requires governments to legislate identical regimes, seems an unrealistic expectation in an international environment where some countries seek improved consumer welfare (e.g. the US) whilst others seek multilateral integration (e.g. European Union).

The nature of liner operations requires liner companies to provide fixed schedules, publish tariffs and regular sailing (Stopford 1997). This obliges liner companies to form trade groups to fulfill such requirements in the trade route that they are serving. Such trade groups create speculation among outsiders that they will possess the power of cartel in their aggregated supply volume. However, if the trade groups are forbidden from operating alongside the liner trade, then the supply of tonnage will fluctuate greatly depending on the capabilities of individual operators, as it is fairly easy for a liner company to switch from one trade route to another. Various legal measures have been enacted in the USA (US Merchant Shipping Act 1984), the UK (Rochdale Report 1970) and even the United Nations (UNCTAD Code of Conduct for Liner conference 1964) and they all concluded that the Liner Conference was a trade organisation that can actually facilitate the operations of liner trade.

The abolition of the liner conference reset the liner market structure back to 1875 when the first UK-Calcutta conference was formed (Sjostrom 2002). At that time, the inter-carrier agreement (i.e., the conferences), was formed to end price wars and as a result, excessive shipping capacity built up. Carriers developed a multilateral conference system under which participating carriers operating in specific trades co-operated to reduce price competition.

The demise of the Liner Conference in Transpacific trade after the implementation of the Ocean Shipping Reform Act (OSRA) 1998 in the USA had a tremendous impact on Far

East-Europe trade. It eventually caused the closure of the Far East Freight Conference (FEFC) on October 18, 2008. Despite the desire of many governments to control the existence of market power by introducing antitrust legislation over various industries, liner shipping conferences have been immune from these objectives largely for historical reasons.

The FEFC (Far East Freight Conference) was abolished in October 2008 so as to give the users (shippers) of liner shipping more flexibility in choosing the liner service. This paper analyzes the data collected before and after the above period to evaluate the extent to which this market has or has not become more competitive.

The capital intensive nature of liner shipping operations has gradually resulted in the industry becoming an example of the market structure of oligopoly (Graham 1985; Harlaftis 2002). This is particularly characterized by the existence of a few sellers and inter-firm rivalry, although other characteristics are also evident.

2 The Liner Conferences

There are two types of liner conference existing for various trade routes. They are the open and closed conference.

2.1 Open Conference

A conference that merely sets freight rates without restricting membership is termed an open conference (Graham 1987). In the USA, membership of a liner conference has been open but monitored closely by a government agency. The 1916 Shipping Act allowed an American version of liner conferences by exempting members from antitrust legislation and putting them directly under the supervision of a government agency (Fleming 2002). To oversee the industry, the 1916 Act also created an independent agency, known as the Federal Maritime Board. This regime was overhauled with the passage of the US Shipping Act 1984 which introduced the concepts of independent action and service contracts as the means to limit the market power of the conferences, and was reviewed favorably by the Federal Maritime Commission (Brooks 2002).

The Ocean Shipping Reform Act (OSRA) in 1998 introduced a new type of agreement, the confidential service contract, into the trade practices. The OSRA 1998 allows shippers negotiate directly with the carriers. After the Act came into effect, the non-competitive oligopolistic market structure of the liner industry was established and freight rates became set on the basis of the competitive market condition (Wang 2006).

2.2 Closed Conference

In contrast to the USA, the liner conference in Europe is described as a closed conference with limits on membership and capacity provision (Graham 1987). As mentioned by Urrutia (2006), there are minimum regulations governing the provision of the shipping services in Europe. Member States of the EU are, to a large extent, free to follow their own national shipping policies and create the economic and fiscal framework that they consider most appropriate for the development of shipping activities. In addition to the legality bestowed by individual member states, the geographical nature of the EU allows small (even single ship) liner companies to provide an effective service.

Regulation 4056/86, which was intended to supplement the rules of the United Nations Conference on Trade and Development (UNCTAD) Code of Conduct for Liner Conferences, came into force on July 1, 1987 and marked the first step in imposing effective regulatory constraints on a sector that had previously been largely self-regulated (Benacchio, Ferrari and Musso 2007). It is grounded on the acceptance of liner conferences as legitimate, and indeed, the most common form of organization of liner shipping. Since the adoption of Regulation 4056/86, there has been an increase in the number of consortia and alliances as a means of sharing costs and reducing risks in the EU trade routes. The growth of these operational arrangements has been accompanied by a decline in the significance of conferences.

However, the conference system has been progressively and gradually undermined by the strong purchasing power of multinational shippers. Today, an increasing number of shippers fail to see differences between a conference and non-conference arrangement when they select the carrier for their overseas consignments. As a result, the role of the conference has diminished (Brooks 2006). Shippers expect greater transparency (Bate 1999) and an understanding of the operational features of the liner shipping industry and better awareness of their business from the carriers. Shippers expect more co-operation

from carriers to overcome difficulties in the supply chain, find longer-term solutions, and co-operation to achieve cost reductions (Nicolette 2007).

In 2005, the European Commission (EC) proposed the establishment of an alternative regime that allows other forms of co-operation between carriers (Urrutia 2006). The Tripartite Shipper Group, a collective of shipper organizations in North America, Europe and Asia, gave their support to the repeal of Regulation 4056/86. The group also called for greater transparency in terminal handling charges and encouraged governments to co-ordinate the development of supply-chain security efforts (Edmonson 2004). In 2006, the EU Competitiveness Council granted the liner carriers a two-year grace period and allowed liner conferences to continue operating on routes to and from Europe until October 2008. Subsequently, conference activities and in particular price fixing and capacity regulation, were no longer permitted (Leach 2006a). The European Liner Affairs Association (ELAA), which represents most of the major carriers that serve Europe, had already agreed to give up the antitrust exemption in the hope that the EC would adopt its compromise proposal to allow carriers to share information on rates and capacity (Leach 2006a,b). From a carriers' perspective, sharing information was necessary to justify the large investment made in new ships. The Council's action could possibly trigger the abolition of conference systems worldwide, even in Asia (Leach 2006c) where they have been supported by the governments of China and Japan.

2.3 The Economic Context

The term 'market structure' is one that is used by economists (Berry 2007, Sutton 2007,) to describe how a market is organised, in particular in terms of the number of firms and the barriers to entry for new firms that might wish to enter the market.

The benchmark for empirical investigations is invariably that of perfect competition, a set of market conditions where resources are allocated in the best possible way and where in the long run, firms earn normal profits. In many markets, the requirement of a homogenous product, one of the conditions for perfect competition, does not exist largely on account of branding, advertising and consumer perception. This is much less of an issue in shipping businesses where the provision of liner services for container transport is a relatively standardised product. In practice, though, the conditions that are central to perfect competition do not exist. Deregulation, which involves the removal of barriers to

entry, has been widely used by governments to open up markets to competition by making them more contestable. This is not the same as if there were perfect competition.

It can be argued that a liner conference is in many respects the antithesis of a contestable market. Although evidence is hard to come by, the rationale that underpins a liner conference is that it provides a means by which shipping lines can collude on rates, route and hence, safeguard profitability. By restricting competition, it is in the longer term business interests of all of its members to collude or at least agree on the broad basis for business to take place. It is also within the scope of a conference to take protective action if its power is challenged by a non-member or by a member breaking ranks.

3 Methodology

3.1 Sources of data

Despite various shippers negotiating with carriers, either through a Liner Conference or direct contact if the carrier is a non-conference carrier, the freight rate agreed upon in the contract invariably reflects the normal rate indicative of the fluctuations in the spot market.

The original analysis in this paper uses the China (Export) Containerized Freight Index (CCFI). The reasons for using the CCFI (CCFI 2001) are, firstly, that China's container transport market is fast developing and, secondly, the CCFI is sponsored by the Ministry of Communications of the PRC and formulated by the Shanghai Shipping Exchange and was first published on April 13th 1998. Finally, owing to its scientific and authoritative approach, CCFI is deemed as the second world freight index following the Baltic Dry Bulk Freight Index and has been cited as authoritative statistics by the shipping annals of UNCTAD.

Formulation and publication of CCFI:

- Base period. CCFI took January 1, 1998 as the base period with the basic index of 1,000 points.
- Selection of sample trade lines. As per the three major principles of typicality, relativity and regional layout, 11 shipping lines were chosen for the sample, namely Hong Kong, South Korea, Japan, Southeast Asia, Australia & New Zealand, Mediterranean, Europe, East and West Africa, USWC, USEC and South Africa & South America services. Their ports of departure in China include ten hub ports i.e. Dalian, Tianjin, Qingdao, Shanghai, Nanjing, Ningbo, Xiamen, Fuzhou, Shenzhen and Guangzhou.
- Collection of freight information. At present, 16 domestic and foreign shipping companies with high international prestige and large market shares have voluntarily established the freight rate formulation committee. They are (in English alphabetical order): CMA-CGM, COSCO Container Lines, China Shipping Container Lines, Hanjin Shipping, Hapag-Lloyd, Kline, Maersk, MOL, NYK, OOCL, P&O Nedlloyd, PIL, Shanghai Hai Hua Shipping, Shanghai Jin Jiang Shipping, Sinotrans Container Lines and SITC Container Lines.

- Publication: The Shanghai Shipping Exchange issues CCFI and the individual freight indexes of these 11 shipping lines are published each Friday

3.2 The Structure – Conduct-Performance paradigm

The Structure-Conduct-Performance (SCP) paradigm is a model used to link elements of market structure to business conduct and performance in industrial economics (Bain, 1951,1956, Gilbert 1984, Schmalensee 1989, Hannan 1991). The SCP hypothesis states that (1) the exercise of monopoly power should increase as concentration increases and (2) the greater the barriers to entry, the greater the exercise of market power. The paradigm asserts that the certain market attributes affect corporate conduct, which in turn impacts upon profitability, and market concentration which influences the level of competition among companies. The more concentrated the market the lower the level of competition and the higher the profits firms earn. Market structure, conduct and performance are the three elements of the SCP paradigm.

Market structure is how a market is organised in terms of the number of sellers and buyers, product differentiation and barriers to entry into a particular market. For a market to be characterized as being perfectly competitive, certain pre-set conditions must be met as explained above.

Market Conduct is the actual behavior of buyers and sellers in a market. It includes pricing policy (collusive or predatory and discriminatory), activities to raise entry barriers, and “rent seeking” activities to establish regulations to limit competition.

Market performance is the end result of firms operating in any market. The most important characteristics include efficient resource allocation, equity (generally viewed as low consumer prices), employment, technical progress, a generally higher standard of living, and some special social goals.

3.3 Hypothesis 1- change of market structure

The first hypothesis to be tested was that the market structure of Far East to Europe trade has changed from oligopoly to a more perfectly competitive state after the abolishment of FEFC.

With a stable freight rate observed before 2008, it is believed that the liner conference possess and behaves like an oligopoly market structure.

The Chow breakpoint test was carried out to test for structural change on the 18-October-2008 by examining whether significant differences can be observed in the samples and if such significant differences are observed, then do they indicate a structural change in the relationship.

Table 1: Chow Breakpoint Test

Chow Breakpoint Test		10/24/2008	
F-statistic	5.321345	Probability	0.000001
Log likelihood ratio	51.55187	Probability	0.000000

Since no CCFI Europe Service data were issued on 10/18/2008, the next available data is dated 10/24/2008. It is clear from table 1 that the p value, (probability value) is significantly lower than 5% (Significance level), which means there is a higher probability that the date 10/24/2008 was a breakpoint, when the shipping market structure greatly changed.

In addition to Chow's test Figure 1 shows that the freight rate for this route suddenly experienced large fluctuations with a trough and peak stage. The financial crisis in 2008/09 might have been responsible so, to compensate for any distortion, data collected from the Europe Service Index from 2008-10 has been adjusted according to the United Nations Conference on Trade and Development (UNCTD) assessment of the impact of the financial crisis on world container shipping. Figure 2 provides good evidence to indicate the market structure change from oligopoly to perfect competition in so far as after the abolishment of FEFC, there was a sudden large decrease in the freight rate index of over 40 per cent.

Figure 1: Europe Service 2008-2010

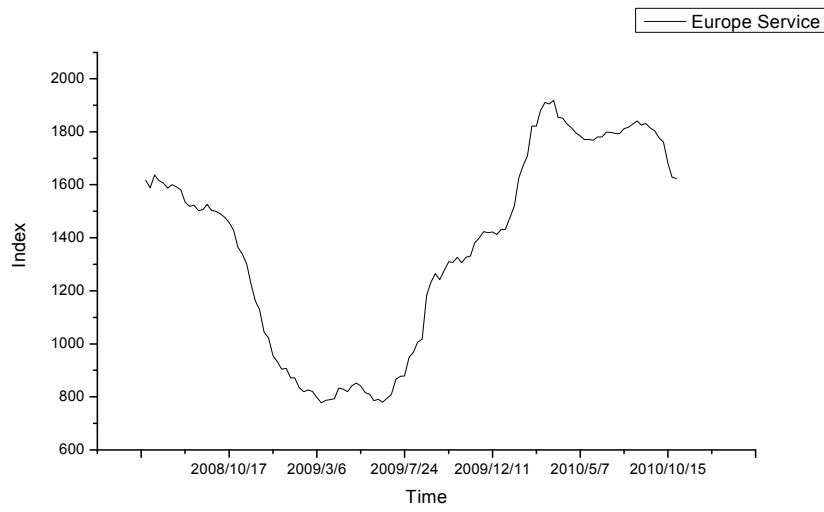
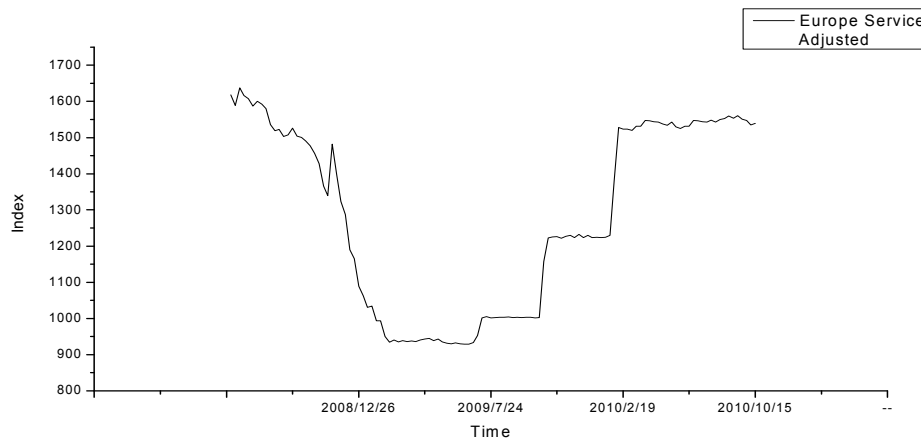


Figure 2: Europe Service 2008-2010 adjusted



The Chow Breakpoint Test appears to support the hypothesis that after 18-October-2008, the abolishment of FEFC produced a change in the structure of the Europe-Asia liner shipping market.

3.4 Hypothesis 2- closely related market

If the above hypothesis is proven then the market structure will obviously move towards that of perfect competition, as the individual carrier is forced to provide a basic liner service during a period of uncertainty. Without any industrial information, as restricted by ELAA, carriers can only manage to provide a basic (homogenous product) liner service until they feel confident about the trend of the future market. Service contracts signed previously between shippers and carriers (through Liner conference) need to be put aside as the market is taking the spot rate for the freight calculation.

For perfect competition to be present, it is necessary to analyze behavior during the transition period. Therefore, in the following section, the study seeks to show that the liner company's behavior after the European liner shipping market structure changed. The assumption made is that each freight rate index of CCFI has a close relationship. A set of formula is thus constructed:

$$\begin{cases} F_{eu} = \sum_1^{10} C_i F_i + Adj + \varepsilon & \dots\dots\dots (1) \\ \alpha_{eu} F_{eu} + \alpha_1 F_1 + \alpha_2 F_2 + \dots + \alpha_{10} F_{10} = CCFI \times 1 + X & \dots\dots\dots (2) \end{cases}$$

Where:

F_{eu} represents freight rate index in Europe service route;

$C_1, C_2 \dots C_{10}$ represents coefficients;

$F_1, F_2 \dots F_{10}$ represents other 10 freight index issued as parts of CCFI;

Adj represents various adjustment items;

ε represents the standard error of the equation;

$\alpha_{eu}, \alpha_1 \dots \alpha_{10}$ represents market share in each shipping route;

X represents the differences between academic study and real practice

Equation (1) shows the relationship between the freight rate of each shipping route; the Europe service route is given as an example;

Equation (2) shows the connection between different shipping markets within a certain period when the total market share remains constant;

With CCFI data from the year 2002 to 2010 and application of the regression analysis, the relations between the 11 shipping lines' freight rate change is tested, including JAPAN SERVICE, EUROPE SERVICE, W/C AMERICA SERVICE, E/C AMERICA SERVICE, HONGKONG SERVICE, KOREA SERVICE, SOUTHEAST ASIA SERVICE, MEDITERRANEAN SERVICE, AUSTRALIA/NEW ZEALAND SERVICE, SOUTH AFRICA/SOUTH AMERICA SERVICE, WEST EAST AFRICA SERVICE. Since the equations above are indeterminate equations, the following test only demonstrates a possible solution for the equation (1), which is used to elaborate the whole assumption.

Table 2: Results of the regression test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SEASIA	0.420089	0.094210	4.459076	0.0000
SA	-0.620376	0.084370	-7.353065	0.0000
MT	0.881111	0.030263	29.11555	0.0000
KO	-0.533305	0.114553	-4.655528	0.0000
JA	-0.156762	0.077322	-2.027383	0.0444
HK	-0.402207	0.129751	-3.099843	0.0023
EWAF	0.162063	0.081252	1.994567	0.0479
AU	0.435347	0.096143	4.528121	0.0000
AMEWS	0.520204	0.087689	5.932351	0.0000
AMEES	-0.165846	0.077724	-2.133788	0.0345
R-squared			0.985609	
Adjusted R-squared			0.984751	

Where:

SEASIA represents SOUTHEAST ASIA SERVICE;

SA represents SOUTH AFRICA/SOUTH AMERICA SERVICE;
MT represents MEDITERRANEAN SERVICE;
KO represents KOREA SERVICE;
JA represents JAPAN SERVICE;
HK represents HONGKONG SERVICE;
EWAf represents WEST EAST AFRICA SERVICE;
AU represents AUSTRALIA/NEW ZEALAND SERVICE;
AMEWS represents W/C (West Coast) AMERICA SERVICE;
AMEES represents E/C (East Coast) AMERICA SERVICE;

4 Regression test: report and analysis

Taking the freight rates of JAPAN SERVICE, W/C AMERICA SERVICE, E/C AMERICA SERVICE, HONGKONG SERVICE, KOREA SERVICE, ... WEST EAST AFRICA SERVICE as independent variables, and the freight rate of EUROPE SERVICE as the dependent variable, the regression test results are shown in table 2. This table clearly indicates that the R^2 and adjusted R^2 is over 0.98. This is indicative that the independent variables in the equation explain about 98% of the changes in the dependent variable, which means that the ten independent variables have a particularly strong relationship with the formulation of freight rates for the EUROPE SERVICE. The p value, i.e. probability value, is known as the observed or exact level of significance and defined as the lowest significance level at which a null hypothesis can be rejected (Gujarati 2003). The lower the p value, the higher the probability. This study indicates that the total 11 freight rate indices are significantly related to each other. Among these indicators, the HONGKONG SERVICE is most significant, with a p value = 0.0479 (Significant level 5%). The JAPAN SERVICE is the next with p value = 0.0444, and E/C AMERICA SERVICE is the third with p value = 0.0345.

The results of the test not only confirm a significant relationship between the independent variables and dependent variable, but also indicate the changing tendency between the independent and dependent variables. As shown in table 1, the positive and negative coefficient of each independent variable indicates that some of the rise of the variable (with positive coefficient) will lead to a increase in the dependent variable, and some of the rise of the variable (with negative coefficient) will lead to a decrease in dependent variable.

Finally the equation becomes:

$$\begin{aligned}
 EU = & 0.420089SEASIA - 0.620374SA + 0.881111MT - 0.533305KO \\
 & - 0.156762JA - 0.402207HK + 0.162063EWAF + 0.435347AU \\
 & + 0.520204AMEWS - 0.165846AMEES \quad \dots\dots\dots(3)
 \end{aligned}$$

When the market structure in liner shipping changes from oligopoly to perfect competition, after the abolishment of FEFC, fierce competition is expected to occur. Theoretically, under perfect competition, the supplier will lower the price in order to capture a larger market share since they all selling a homogenous product. With the demise of FEFC case, the study found that carriers initially lowered their freight charge and the rate remained stable hereafter.

The majority of liner operators, usually global carriers, are operating in nearly all the shipping lines world-wide. If a liner company mainly serving the European region wants to capture business in other regions, it usually will choose a low price strategy to gain market share from its rivals. Adjusting the freight rate downward seems the only means to achieve that objective.

For example, if the company wants to increase the market share in region i , then F_i would be lower than before; to keep the equation (2) balanced, the α_i would be higher as the company expects. The company gains high market share in region i by offering the lower price F_i . This seems reasonable in a given period, but considering the relationship stated in equation (1) there might be some problems. If F_i is lower than before, clearly it might result in the decrease of F_{eu} (the coefficient of F_i is positive) or the increase of F_{eu} (the coefficient of F_i is negative). But F_{eu} should neither be decreased nor be increased if the company seeks to maintain stability in its market, then it will have to sacrifice profits in other shipping regions, such as region j , by increasing or decreasing the F_j (determined by whether C_j is positive or negative) to ensure the F_{eu} is unchanged. If the C_j is positive, then the high price strategy provides an opportunity for its rivals to attack region j , which the company seeks to avoid. This kind of situation is true if a company wants to attack a market. It therefore needs to re-allocate its own resources to serve this purpose, since the resources of the company are limited within a period, so there would be some sacrifice

and damage to its original business sectors when launching such kind of action. Similarly, if C_j is negative, then the low price strategy in region j will impede a company's development as it has to cover various costs to support its expansion. This situation is what the company needs and wants to prevent.

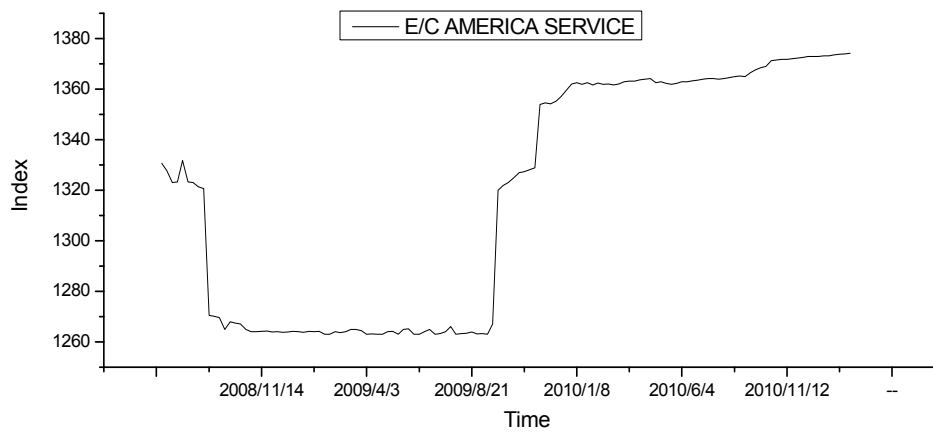
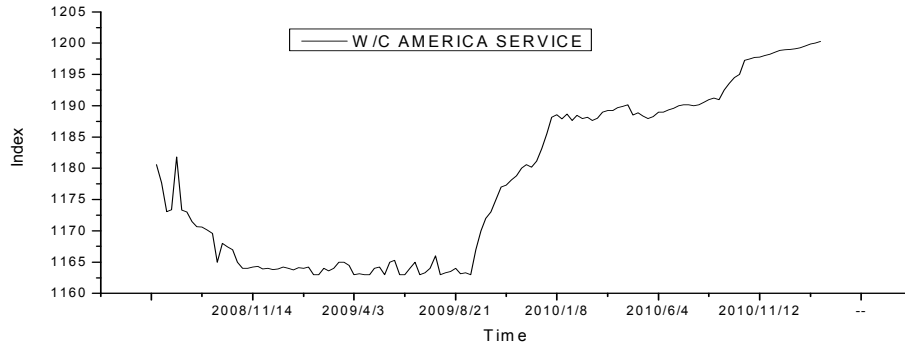
4.1 Multimarket contact (MMC)

The above calculation demonstrates that the freight structure in the liner market moved to perfect competition but the freight rate remained stable. The study can explain this outcome by using the Multimarket Contact (MMC) (Bernheim, & Whinston 1990, Gimeno 1999, 2011) which occurs when firms meet the same rivals in multiple markets. When firms compete with each other in more than one market their competitive behavior may differ from that of single-market rivals. Multimarket competition may result in the reduction of competitive intensity among rivals, an effect known as mutual forbearance.

Multimarket contact gives a firm the option to respond to actions or attacks by a rival not only in the market where it is challenged, but also in other markets where they both compete. As a result, multimarket competitors may hesitate to attack in one market for fear of retaliation in other markets where they hold a higher market share. This is quite typical of how oligopolies compete.

Figure 1 above shows that between 2009 and 2010, many shipping freight rates were nearly stable, with only slight fluctuations, which is believed to be good evidence that liner shipping companies are subject to multi-market contact. Figure 3 shows that for W/C AMERICA SERVICE and E/C AMERICA SERVICE, these two major line hauls maintained a stable situation on freight rates during the economic crisis when demand had fallen.

Figure 3: W/C & E/C AMERICA SERVICE Freight Rate Adjusted 2008-2011



5. Conclusion:

When the EU governments abolished FEFC in 2008, the liner carriers on Europe-Asia trade routes faced drastic changes in market structure from oligopoly to perfect competition due to constraints imposed by ELAA. Without any information about the current freight market, carriers are forced to provide a basic liner service to all shippers. Hence the freight charge drops to a lower level.

Unlike the situation in other perfectly competitive markets, in liner shipping the players do not aim to capture larger market share in a particular route by consistently lowering the freight charges. Instead, the liner carrier will lower the freight charges to a certain level and stay there. The stable freight charge is achievable due to the loyalty established through the past business experiences of many shippers and unique liner services that shippers enjoyed before. In addition, multi-market contact helps to affect the liner firms' behavior in lowering the price, as firms lowering freight rates in one market might get revenge in another market. Therefore, the perfectly competitive market gradually turns back to an oligopoly again. In addition, it is also due to the MMC consideration that an individual liner will not engage in cut-throat pricing when the market is in a perfectly competitive state.

However, the new oligopoly stage after the demise of liner conference is slightly different from the former oligopoly format, as the former oligopoly stage in the Europe-Asia shipping route is a direct result of the liner conference. Following the abolishment of FEFC, collusion on freight rates is illegal and the market experiences a perfect competition stage and eventually enters into a newer oligopoly stage. This is a natural evolution in the liner shipping business, liner participants operating in the same shipping route inevitably tend to group together and act in harmony with each other. Therefore the market is deemed to be an oligopoly. The regulation that forces a breaking up of the market structure in the liner Europe-Asia shipping route turns out to be a failure, and evidently any regulations on the liner shipping business would not work since oligopoly is the natural tendency of how the market structure evolves. This is in many respects typical of transport markets in general.

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