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[Short Communication]

Studies on Problems Caused by Distribution of Larger Vessels in World Shipping Market

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Abstract

Purpose – The purpose of this paper is to seek some alternative to overcome difficult shipping situations for overcapacity pursuing economy of scale, which is widely spread in world shipping.

Research design, data, and methodology – The research method to be adopted is first to review evolution of larger ships in terms of theoretical overview, and shipping market is examined, and it is studied some problems and solutions in relation to larger ship as field research aspects.

Results – Supply and demand of shipping market is flexible and unpredictable nature of market. Sometime fierce competition has spread out the market, and shipowner may deploy mega ship in terms of economy of scale, etc., to overcome the difficult market situations. Both carrier and shipper have their own positions in this matter concerned. However, it causes some problems in the market including port matters, etc. Therefore, it is asked to solve this problems of larger ship employed in the markets, throughout shipping alliances, etc.

Conclusions – Over tonnage done by larger ship has caused some problems in the shipping markets, forming monopolistic market by small number of larger shipping companies, destroying oligopolistic nature of shipping business, therefore, the answer is strategic alliance to collaborate each other.

Keywords: Over tonnage, Mega ship, Larger Ship, Rates, Shipping, Alliance.

JEL Classifications: E30, E32, L13, R40, R41.

1. Introduction

Shipping market is very much influenced by supply and demand, which means capacity of tonnages and trade volumes according to world economic situations. Company involved in this business has been faced on fierce competition in the shipping markets, and other competitors have struggled to get over such a difficult and survival situations. In terms of competitive advantages, parties in this business have to reduce unit rates based on economy of scale, making bigger ship being employed in the shipping routes.

Supply and demand of shipping capacity is key component in shipping, so that shipping company and other parties got involved in maritime business have to be concerned with, and follow what is going on shipping market because of shipping rates in relation to shipping company as well as shipper in export and import management(Kim, 2017). Due to various reasons, maga-ship is not only the matters for shipping markets but it has something to do with all maritime environment.

Deploying mega-ship has some environmental factors around shipping business, and it also produces other problems and disadvantages that distort the shipping market. Therefore, some productive discussion or coordination should be done to solve the problems raised from shipping field, following the over tonnage of shipping capacity.

In this paper, it will examine development of larger ship in terms of economy of scale, ship's sizes and shipping costs, with theoretical and practical explanations, then container shipping market is reviewed into supply and demand of containerships as well as scrapping of tonnage, which gives over tonnage in the shipping markets. Third, some positions those who both carrier and shipper have will be described. Fourth, problem and disadvantages can be studied in view of externalities of mega ship and port matters, etc., finally looking for potential solutions of the

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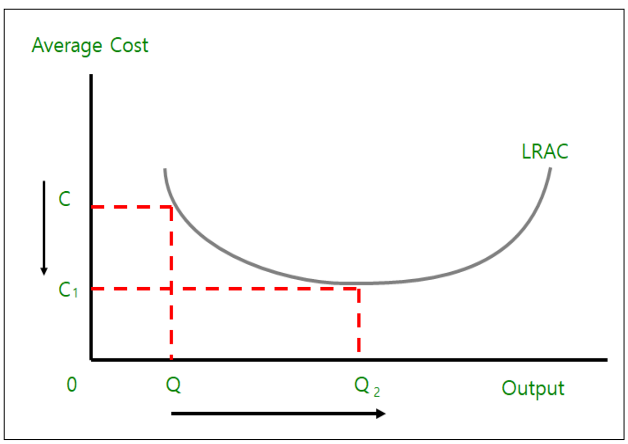
mega ship, such as needs of consultation, forming of alliances, etc.

2. Evolution of Larger Ships

2.1. Economy of Scale

In microeconomics, economies of scale are the cost advantages that enterprises obtain due to their scale of operation (typically measured by amount of output produced), with cost per unit of output decreasing with increasing scale. Economies of scale can apply to a variety of situations with organizational and business aspects, and at various levels, such as a business or manufacturing unit, plant or an entire enterprise. When average costs start falling as output increases, then economies of scale are occurring. As a service business like continer shipping can also apply to one of these categories). The graph below plots the long run average costs faced by a firm against its level of output. When the firm expands its output from Q to Q2, its average cost falls from C to C1. Thus, the firm can be said to experience economies of scale up to output level Q2 (Figure 1).

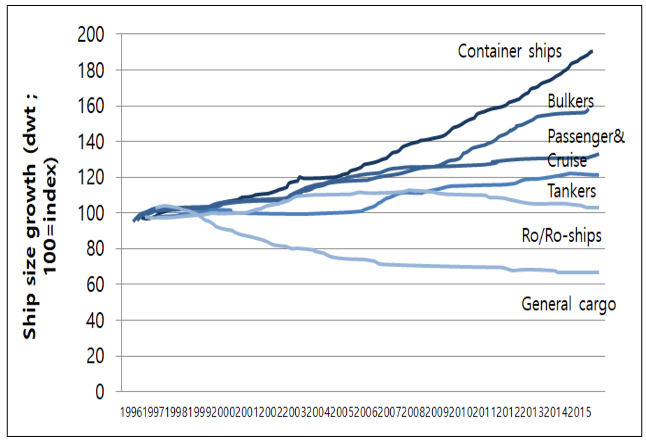


<Figure 1> Economies of Scale

The economy is on the rise mainly primarily effectiveness of production process, where a number of products increases as more units of the average production cost per unit declines. Container ships give a good model of economies of scale in action. Cost factors give details the rise: transport adds nothing to the final value of a good so cost minimization is important. Because the shipping cost per container ship keeps on diminishing as ship size rises, container ships are set to keep rising (Anwar & Ali, 2015).

Container shipping benefits from economies of scale in maritime shipping, transshipment and inland transportation. The rationale of maritime container shipping companies to have larger ships becomes obvious when the benefits, in terms of lower costs per TEU, increase with the capacity of ships. There is thus a powerful trend to increase the size of ships (Rodrigue, 2017).

The development of ever larger ships is driven by the search of economies of scale by shipping companies. Considering that the container shipping industry is mainly driven by price competition, the decision by one shipping line to increase ship size (Figure 2) leads to a wave of similar decisions by competing shipping lines in order not to “stay behind” by not reaping the same economies of scale (OECD, 2015).



Source: OECD (2015).

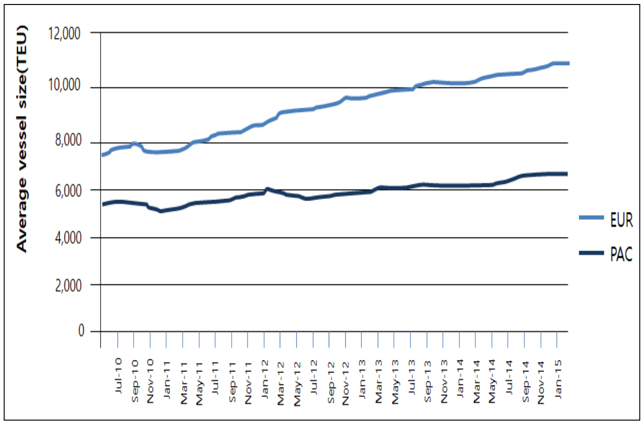
<Figure 2> Ship Size of Ship Types 1996-2015

However, in order for economies of scale for these larger vessels to actually work, “shipping lines either need to reduce the number of port calls or they need to get handled faster by increasing berth productivity,” which greatly impacts ports and terminals around the world (Hacegaba, 2014).

2.2. Vessel Sizes

Over the last 50 years the vessel size (Figure 3) increased by 1,200% from a maximum vessel capacity of 1,530 TEUs in 1968 to more than 19,000 TEUs capacity today (with some estimates for the next generation of container vessels reaching 24,000 TEUs). Large size vessels (a.k.a. mega-ships) may be more advantageous for liner shipping companies primarily due to their economies of scale, emissions reduction, and reduction in fuel consumption (Dulebenets, Pujats, Mihalis, Gkolias, & Mishra, 2015).

Vessel sizes had a slow growth period from the 1970s through the 1990s; however, vessel sizes gained rapid momentum in the early 2000s. First came the ultra large container vessels (ULCVs), defined as a vessel with a carrying capacity over 10,000 TEUs. Soon after, vessels coined by the term mega-ships began entering the market place. These behemoths are noted for their carrying capacity of more than 18,000 TEUs.



Source : World Shipping Council (2015).

<Figure 3> Changes in Vessel sizes

However, the pattern of the optimum ship size over time is of interest to shipbuilders, shipowners and port authorities. A shipowner has to consider a time-average of the static optimum ship size for the 20 to 30 years' economic life of the ship. Infrastructure investments in ports have almost indefinite physical lives. To avoid premature obsolescence of port facilities, long-term forecasting of developments in shipping should include the optimum ship size.

2.3. Shipping Costs

Carriers have competed throughout the years in order to meet trade demand by providing the lowest transport cost (Pinder, 2016). At the time of year 2107, it is noticed that three shipping companies have operated 10 biggest ships in the world container shipping market. These are OOCL, Maersk and MSC, in the capacity of more than 20,000 TEU and OOCL HongKong has been named as best shipping carrier, carrying capacity at 21,413 TEU.

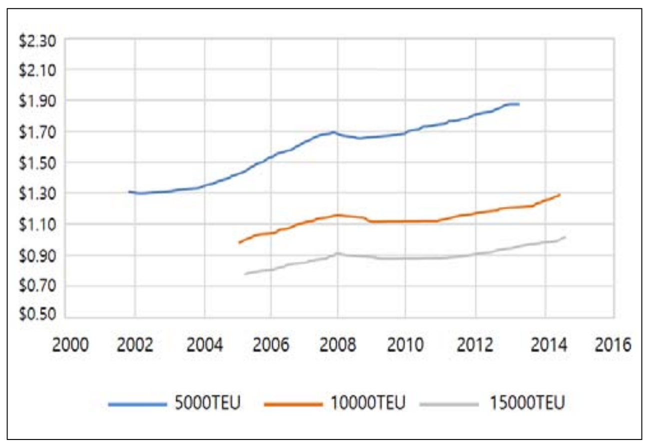
In order to benefit from low transportation costs, shipping companies looked to increase the carrying capacity of vessels. In doing so, companies could achieve economies of scale: larger ships provide cost advantages for shipping lines because the scale of the operation lowers the overall cost per unit. For example, one operation cost is fuel. Ultra large container ships with capacities of more than 10,000 TEUs promise higher rates of profitability for operators because they offer reduced fuel consumed per freight unit.

For Example, a 5,000 TEU containership has operating costs per container 50% lower than a 2,500 TEU vessel. Moving from 4,000 TEU to 12,000 TEU reduces operating costs per container by a factor of 20%, which is very significant considering the additional volume involved. System-wide the outcome has been costs reductions of about 35% by the use of containerization (Rodrigue, 2017).

The shipping cost can be reviewed in three major categories in terms of the economy of scale, which is capital cost, voyage costs and fuel consumption, and operating cost (Murray, 2016). Frist, while larger vessels are more expensive, their increased capacity greatly drives down the per TEU cost. However, mega ships continue to offer considerable advantage of smaller vessels. Second, Increased fuel efficiency and the shift toward slower steaming are being outpaced by the demand for larger ships. Larger ships fuel costs per TEU are lower than those on smaller vessels. Lastly, in 2015, a 5000 TEU vessel had a daily per TEU operating cost of $2.19, a 10000 TEU ship a cost of $1.45, and a 15000 TEU ship of $1.14 : larger vessels undoubtedly have a cost advantage in operating costs.

However, when estimating total cost savings, it is necessary to account for port congestion, equipment costs, administrative costs, etc. If all these cost components are considered, the total savings from an 18,000 TEU over a 14,000 TEU vessel reduce to 6.6%, as compared to 40% estimated by liner shipping companies solely based on the voyage costs (Dulebenets, 2015).

The graph below shows the average cost for vessels of 5000, 10,000, and 15,000 TEU (Figure 4).



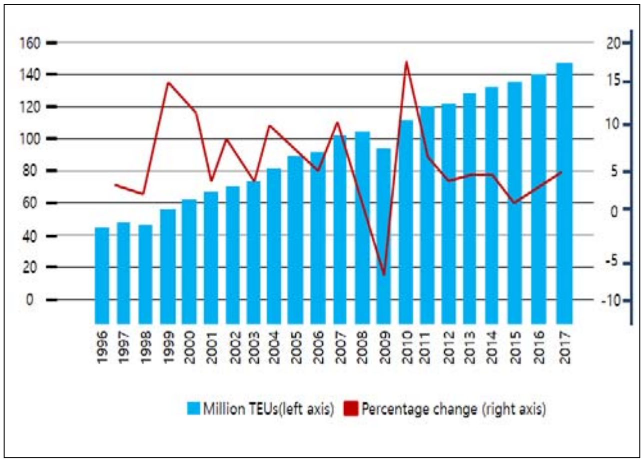
Source : Murray (2016).

<Figure 4> The Average Cost for Vessels

3. Container Shipping Markets

3.1. Demand of Containership

As shown in figure 5, following a modest expansion of 1.2 per cent in 2015, global containerized trade expanded at a faster rate of 3.1 per cent in 2016, with volumes attaining an estimated 140 million 20-foot equivalent units (TEUs) (UNCTAD, 2017a).



Source : UNCTAD (2017a).

<Figure 5> Global Containerized Trade, 1996–2017

Global container market demand growth from 2008 through 2019. Between 2016 and 2019, global container market demand is projected to increase by around 4.7 percent (Statista, 2018).

Recovery was driven by volume growth in the peak leg of the Asia–Europe trade, where volumes contracted in 2015. Other contributing factors were accelerated growth in intra-Asian cargo flows and positive trends in the trans-Pacific. Together, these developments contributed to raising overall containerized trade volumes. In contrast, limited growth on North–South trade routes caused by reduced import demand of key fuel and non-fuel commodity exporters hindered overall growth.

3.2. Supply of containership

In terms of supply, the containership fleet has already expanded by 1.2% in the first month of 2018. In 2018, the focus will be on the deployment of ultra-large containerships. There are 53 ships larger than 13,500 TEU are scheduled for delivery, with new orders being placed at an increasing pace (Statista, 2018).

Ship upsizing and cascading of capacity continue to affect containerized trade, while the opening of the expanded Panama Canal locks is creating a shift in ship deployment patterns, which could affect seaborne trade (UNCTAD, 2017a), Nominal fleet growth level for the container shipping industry over the next few years is set for around 4%, which leaves little room for fundamental market balance improvements.

The figure 6. above describes global supply and demand balance, which has presented compound annual growth rate (CAGR), that is supply growth CAGR 2004-19 is 9.7%, and demand growth CAGR 2004-19 is 6.1%.

Source : Drewr (2015).

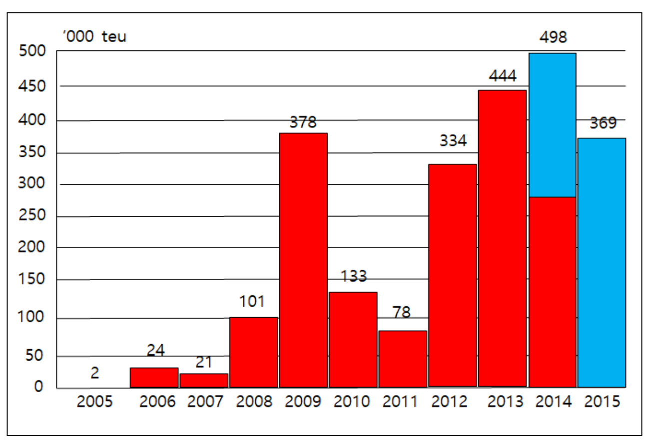
<Figure 6> Global Supply and Demand (2004-2018)

3.3. Scrapping of Containership

The average age of the containerships sold for scrap in the first half of 2014 is 21.2 years, including 24 ships of less than 18 years old. In comparison, the average age of boxships scrapped 2013 is 22.8 years (Figure 7).

The containership scrapping activity has slowed dramatically from the frenetic pace of 2016 and early 2017. Full-year scrapping estimates for 2018 have been adjusted to only 200,000 TEU. 413,982 TEU of container tonnage were recycled in 2017 and 654,862 in 2016. A further reduction in the rate of vessel scrapping could therefore make this year's container ship-breaking volume the lowest in record since 2011.

While the overall idle containership capacity has been reduced significantly from a record high of 1.60 MTEU in October 2016 to 340,000 TEU as of today, the overall market remains delicate with any slackening in demand threatening to disrupt the fragile recovery in the containership charter markets, even as freight rates have started to tumble under the pressure of excess supply.



Source : CRS (2014).

<Figure 7> Containership Demolition Activity

3.4. Carriers and Shippers

Ocean carrier have been depended upon the size of vessel in their business activities, which means it is closely related to shipper's way of choosing a certain size of vessel on the routes, at the same time shippers have considered cost or frequencies in their physical distribution process of transportation.

Container service operators have to make a trade-off between frequency and volume on the trunk lines: smaller vessels allow meeting the shippers' demand for high frequencies and lower transit times, while larger units will allow operators to benefit from economies of vessel scale. However, shippers sometimes impose bounded rational behaviour on shipping lines, e.g. in case the shipper asks to call at a specific port (Ducruet & Notteboom, 2012).

3.4.1. Carriers in larger ship

Liner ship fleet is developing quickly due to the huge world trade. This also leads to the forming and developing of the spoke line transportation, since the large-scale containerships cannot reach the small ports. For shipping companies, facing the competition in global market, they should not ignore the optimization for feeder ship schedule. Therefore, it is an important strategic issue to design the containership routes rationally so as to improve the service efficiency, and to save the transportation cost (Mingjun, Lixin, Baishun, Yanyan, & Fei, 2015).

Relatively to bulk shipping, container transportation has reduced transport costs remarkably, about 20 times less. While maritime transport costs before containerization could account between 5 and 10% of the retail price, this share has been reduced to about 1.5%, depending on the cargo being transported. The key factors beyond costs reductions reside in the speed and flexibility occurred by containerization. Similar to other transportation modes, container shipping has been benefiting from economies of scale with the usage of mega containerships (Rodrigue, 2017).

However, Mega-ships increase loss potential mainly on two grounds. First the costs to salvage hulls of largest existing containerships in case of accident will increase because of the lack of salvage equipment and technology capable of removing a wreck of this size. Second, exposure to risk for shippers also increases in a linear way with the capacity of ships (OECD, 2015).

3.4.2. Shippers in Large Ship

The growth of mega-ships across many liner shipping routes has wide ranging implications for competition for shippers, between shipping lines and total supply chain efficiency. In particular, shippers have expressed concern that the fundamental industry movement towards increasingly large ships, a movement that impacts shippers as well as industries that facilitate shipping (eg port and terminal facilities, port and terminal handling), has typically been carried out without consultation (GSF, 2016).

By selecting a larger ship to transport cargoes to be delivered from port to port, it is clearly some advantages for shipper to obtain in their export and import management process. Especially in terms of cost matters, shipper can have a chance to save the expense previously they have been charged by ocean carriers. This is strongly something to do with larger ship.

Most other actors in the transport chain are not necessarily favourable to mega-ships. Shippers are interested in frequent and reliable maritime transport links, but bigger ships would reduce the service frequency, unless cargo streams growth at the same pace of ship size development; moreover, large shippers might have a preference to hedge risks by parceling out deliveries in different ships rather than concentrating everything in one ship (OECD, 2015).

4. Problem and Solutions

4.1. Externalities of Mega Ship

There has been a remarkable trend in increase of container ship size. The theory of optimum ship size (Kendall, 1972) holds that the optimum size is one which minimizes total transport costs. In practice this is a tradeoff between ship costs of larger vessels to achieve economies of scale (Cullinane & Khanna, 2000) and terminal costs. The potential challenges have been highlighted in larger vessels to be able to pose for port and terminal infrastructure around the world (Kidson, Rutherford, Malarz, & O'Mahony, 2015).

In this context, the adoption of mega-ships may be occurring negative externalities beyond the level which is economically efficient, to the extent that shipping companies predominantly focus on the benefits that they experience, but do not take account of the costs being borne by other parties across the supply chain as a whole (GSF, 2016). Having established that the increasing move towards mega-ships has benefitted carriers, but is imposing costs on shippers across the supply chain.

4.2. Port Problems

As the bigger ship brings a greater volume of cargo into the port, and it consequently needs a bigger port time. The economy of scale for larger ships is coupled with diseconomies in port.

Mega container ships undoubtedly create big challenges for ports. There are four types of major problem on port facilities when mega container enters to port. Firstly, the draft limitation is common problem because most hub ports do not have enough draft which mega container can berth easily without any draft limitation. Secondly, lack of crane ability can be another reason escalating the lack of port facilities Thirdly, the limited berth size is other demerit for mega ship, Finally, less developed hinterland facilities are one of drawbacks for mega container ships in port (Helmy & Shrabia, 2016).

For port terminals the growth in ship capacity comes with increasing problems to cope with large amounts of containers to be transshipped over short periods of time as shipping companies want to reduce their port time. Larger cranes and larger quantities of land for container operations, namely temporary warehousing on container yards, may become prohibitive, triggering diseconomies of scale to be assumed by port authorities and terminal operators (Rodrigue, 2017).

4.3. Global Economic Matters

Due to the strong growth rate of industrial production in China, and the emerging of some Asian countries, the trade imbalance is widening in the majority of the east/west and north/south trades. The uncertainty of world economy is also a problem, the weakening of the US economy may reduce consumer demand, and rely much on China industrial economy very vulnerable when the supply for the market bases on it (Helmy & Shrabia, 2016).

Therefore, it is clear that some matters could be raised in relation to the imbalance of trade and uncertainty of global economy, and it have directly influenced with supply of shipping capacity as far as mega-ship is concerned. According to fluctuation of global trade volumes, supply and demand of ship capacity is also influenced by volatile characteristics of shipping markets, so that G2 economy will have strong impacts in this matters concerned (OECD, 2015).

4.4. Potential Solutions

4.4.1. The Needs of Consultation

Container shipping companies have traditionally not consulted someone on new mega-ships, before they ordered a larger ship. A constructive discussion should be needed to exchange ideas and opinions with the related transport stake-holders, including governments, regulators, port authorities and all interested constituents. The objective could be to facilitate an exchange of views, an understanding of objectives and plans, and ultimately better coordination to ensure optimum supply chain configurations, including optimized use of mega-ships (GSF, 2016).

A significant contributor to this overestimation is underutilization, as global trade demand does not support existing capacity. One final claim (on the advantage side of the argument) is that mega-ships provide more flexibility for liner shipping companies to optimize capacity sharing between their alliances (Dulebenets, 2015).

The freight rates market remained under pressure, and carriers struggled to recover operating costs on certain trade routes. Container spot freight rates were generally low and unstable throughout 2016, witnessing record declines in the first part of the year and more positive trends in the second half. The momentum gained in the second half of 2016 was mainly driven by measures taken by shipping lines to manage supply side through network optimization, scrapping and more careful vessels deployment around the peak season.

Carriers could also see the benefit of such cooperation by sharing resources, including port calls and networks and developing new services. For example, sharing vessels would allow member carriers to operate without having to increase the number of ships. The advantage is that these shipping lines can also offer more services together than what they can generally offer alone, as a single shipping loop can tie up a vessel for weeks.

4.4.2. Forming of Alliances

The new mergers and acquisitions and mega alliances that took place in 2016 and 2017 should lead to better handling of supply and better utilization of fleet, and in turn to better market conditions, improved earnings for the container shipping sector and better services for shippers. Such alliances have become increasingly important in the global shipping industry, as carriers are seeking to improve utilization of capacity associated with larger vessels and to reduce operational costs by sharing vessels and capacity, for example.

In addition to mergers and acquisitions, shipping lines have undergone a transformation by reshuffling existing alliances and creating new ones. The top 10 carriers joined forces in three global alliances, down from four at the beginning of the year.

Two new alliances, the Ocean Alliance and "The" Alliance were formed (Table 1), in addition to the 2M Alliance. The three alliances, which include the top 10 container shipping lines plus K-Line – the fourteenth largest container shipping line in the world – collectively control 77 percent of global container ship capacity, leaving a 23 percent market share for the world's other container shipping lines. The three alliances also control as much as 92 percent of all East–West trade (UNCTAD, 2017b).

The Ocean Alliance will be the dominant player on the East–West routes, with about 34 per cent of total capacity deployed on these trade routes, followed by the 2M Alliance, with a share of 33 per cent, and "The" Alliance, 26 per cent (UNCTAD, 2017a).

<Table 1> Status of Global Shipping Alliances

2 M Alliance	Ocean Alliance	"The" alliance
Maersk (with Hamburg Sud) and Mediterranean Shipping Company	CMA CGM,Evergreen,China Ocean Shipping(Group) Company, and OCCL	Hapag-Lloyd (with UASC), Ocean Network Express (K-Line, NYK, MOL) and YML
Controls 37% of the global shipping market	Control 33% of the global shipping market	Controls 21% of the global shipping market

Source : UNCTAD (2017b).

4.4.3. Port in Larger Ship

Ports should formulate policies and devise plans on how best to adapt to the requirements of the changing liner shipping market environment. The bigger shippers has deployed on the routes, the cost of port has risen. Terminal operators, ports and shipping lines should engage in closer cooperation to mitigate the negative impact of growing cost pressures. Of concern is that cost pressures may lead to increasing port charges, although this may prove difficult, given the current market conditions. Also, if terminal operators are forced to leave the market because of lower margins or refrain from investing in new capacity because of uncertain returns, the container port industry may find it difficult to service the liner shipping sector, in particular larger ships.

With carriers increasingly requiring less fragmented terminal capacity – fewer but larger terminals are needed in each port–physical and ownership consolidation of terminals will probably become necessary. Some observers expect to see increased cooperation between neighbouring ports, as in the case of the ports of Seattle and Tacoma (UNCTAD, 2017c). More mergers and acquisitions are also expected, as illustrated by the takeover by APM Terminals of the Spanish Group TCB and Yilport's purchase of the Portuguese group Tertir, and others.

5. Conclusion

World shipping industry has been fluctuated into freight rates since financial difficulties in 2008, due to supply and demand of capacity in the shipping markets. Accordingly, the strategy preformed by shipping company has been focused on earning income and saving the cost, which means it has planned to build much more bigger ship and deployed on the profitable routes. Then, fierce competition has widely spread and the bigger survives, the smaller suffers.

Over tonnage is easy way to escape from difficult and competitive market situation, which has been achieved by world shipping companies, pursuing economy of scale, influencing ship's sizes and shipping costs, finally causing surplus of shipping capacity.

The supply, demand and scrapping of container shipping market are examined, and carrier and shipper in trade has been viewed in terms of over tonnage. It is also important matters to be looked into this problems that there are many problems and disadvantages following mega ship in the shipping market.

The answer or solutions the parties in the shipping industry to seek is to collaborate and work together, that is strategic alliances to be established in the market to rationalize and optimize the capacity of world container vessels.

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