SHIPPING BUSINESS AND ITS TECHNICAL REQUIREMENTS

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1. In shipping business, many factors are supposedly responsible for the determination of the technical requirements of ships, which are the very equipments to be used for rendering transport services. It is however needless to point out that the conditions of the shipping market in which the shipping business act as suppliers is certainly one of the most important factors responsible for the above-mentioned determination.

Indeed, demand, competition and other conditions of the market are always taken into consideration as a determining factor of the technical requirements of the shipping business, as in the case of other businesses. It should, nevertheless, be remarked that a very peculiar relation is in existence between the shipping market on the one hand and technical requirements of the shipping business on the other. It is supposed that such a relation is originating from the peculiarities of transport services which are the products resulted from using ships.

It seems to me that no comprehensive study has ever been tried concerning the essentials of transport services and their production. The study made by Prof. Tominaga is therefore the first one ever tried in this field.[1] For the reference in the sequel, we summarize the results he has obtained as follows: In the first place, the final products of transportation are, as in the case of communication, transport services, which make it possible to realize special movement of the transport objects (human being and goods). In the second place, transport services are not materialized as some physical goods because of the nature of service in general, and, therefore, no method is available for their storage. In other words, they constitute so-called *instantaneous commodities*, which are to be consumed

[1] Y. Tominaga, "*The development of capitalism in transportation*," 1953. As is clear from the title, the author is not primarily concerned with the studies on economic principles of transportation. But he is well conscious of the peculiarities of transport services and their production as here outlined in analyzing the subjects of his studies. One of the characteristics of the author's transportation economics as presented in this book is also found in his confinement of the objects of the study to the explication of the "economic laws peculiar to transportation." Thus the relation between the development of transportation and the location of industries, which used to be one of the most important subjects of transportation economics, are not included in the subjects to be discussed in transportation economics proper.

instantaneously as they are produced. Thirdly, transport services are produced successively as the producing equipments, i.e. ships, move. Thus transport is a continuous repetition of the act of producing transport services, which is to be completed at each repetition.

Such transport services produced by a shipping business are not necessarily of homogeneous quality. The quality of transport services are determined in most cases by technical requirements of ships including their speed and accomodation as well as by the method of their operation. In other words, the difference of the technical requirements of the producing equipment as well as of the method of its operation directly results the inhomogeneity of transport service because of its not being materialized. On the other hand, the homogeneity of transport services is not demanded by the consumers as well. The characteristics of the demand for transport services are in each case determined by the attributes inherent to the transport objects as well as by the economic circumstances for example the specific situations concerning the bargaining of the transport objects; in case of passengers transport they are determined by their psychological conditions. The demands of the former category are met by transport facilities of ships such as tanks and refrigerators, while that of the latter category are met by using ships suitable in their speed and operation for their purposes. It is, of course, needless to point out that a demand for transport services is sometimes met by a simultaneous realization of the above-mentioned two kinds of technical requirements.

Such being the relation of demand and supply in the shipping market, in case consumers have a preference for the quality of transport services which satisfy their wants, only those boats provided with some special technical requirements can meet their demand as exclusive suppliers. In the event that any substitute is available, the boats built for different technical requirements will come to the scene as competitive suppliers. In other words, these boats are in relation of competition to each other, irrespective of their difference in technical requirements so far as such a demand is concerned. Otherwise, there would be no sphere of competition common to these boats. However, it should be remarked in this connection that it is not technical requirements of ships alone that determines the extent of their competition. In addition to them, the formation of monopoly among shipping businesses and legislations are also one of the many determining factors of the sphere of competition.

The shipping market is thus subdivided into submarkets due to the fact that the consumers have a preference in for the quality of the service. Thus,

[2] The characterization of the products of transportation as *instantaneous commodities* is already seen in A. C. Pigou and M. Bonavia. (cf. M. Bonavia, "*Economics of Transport*," London 1934, p. 106.) However, no comprehensive analysis of the peculiarities of transportation economy is comtemplated there starting with this characterization.

there are a market of liners (passenger and cargo liners), that of tramps as well as that of specialized boats (tankers and reefers etc.), each of which has own peculiarities. In the following, we shall therefore be concerned with the description how these peculiarities of each of these markets will act on the technical requirements of the boat which supply transport services in each market.

Before taking up the above-mentioned subject, we have to say one word about another subdivision of the shipping market into coastal and ocean shipping markets. This sub-division originates from the difference in area covered, not in the quality of services circulated. The formation of such a subdivision is also in close relation with technical requirements of ships. The close relation between the extent of the geographical circulation of transport services and technical requirements of the producing equipment of the services arises from the peculiarities of production of transport services, which as the producing equipment itself moves.

The range of supply of transport services of one boat is confined within its cruising radius. The cruising radius is in turn determined by various technical requirements of the boat, in particular, by its size. The cruising ability, of course, increases in proportion to the size of the boat, the larger boats enjoy less access to ports because their size might be too big to be accomodated. Thus, larger boats is obliged to limit their sphere of activities. Of these two factors, more important is the former. In other words, those boats smaller than that of a certain size are placed in service in coastal regions, because they cannot be placed in ocean going services for technical reasons. The cruising range of a boat is not determined by the technical considerations only. The safety of navigation is, also, taken into consideration from the standpoint of which the crusing radius is usually restricted by law within the actual limit. Thus it is possible for every boat to cruise not only for coastal service but also for ocean going, if it is large enough. However, once its cruising range is determined, the change of its status from that of a ocean going to that of a coastal vice versa is practically impossible for the following two reasons. Firstly, such a change of status is placed under a restriction by law. In other words, the entrance of ocean going boats to coastal ports is restricted, while coastal boats are allowed to go into ocean going services only after the completion of some official procedures, even of their operation in oceans would be technically possible. Secondly, the use of ocean going boats as coastal ones necessarily involves some economic disadvantages.[3] In general, there are many factors besides technical considerations, which make coastal boats small sized ones

[3] The ship classification by the classification society has nothing to do with the subdivision of shipping markets as here outlined. At most, it plays a minor rôle in the competition, in which so-called classified boats have advantages over other boats with respect to insurance and the collection of cargoes.

having a low speed. In fact, the small size makes it easier for them to collect full cargoes, while the low speed makes it possible for them to transport at lower cost. Ocean going boats which are comparatively large and high speed are, therefore, no match for coastal ones, because of the difficulty of collecting full cargoes and the high transport expenses due to high speed, although the latter might be compensated by their larger size to some extent. The disadvantage of such a use is further multiplied by the difficulty of their gaining access to coastal ports, which are not provided with facilities large enough for such boats.

Therefore, there is usually no competition between ocean going and coastal boats. Thus the shipping market constitutes of a ocean shipping market and a coastal shipping one, which are different from one another in the area covered. Each of these twos is further subdivided, in accordance with the difference of the quality of transport services, into liner, tramp and tanker market etc. There are however rare market for passenger boats in the coastal shipping, except in case no land transportation take part in the competition. Analogously, in the ocean shipping market the passenger boats is losing its importance as a result of the development of air transportations.

Ocean going and coastal boats have, therefore, no common sphere for their mutual competition. But, the use of ocean going boats on coastal service vice versa may be possible, as far as such a use is made possible from the technical as well as safety standpoint. Such an improper use would be made possible, if and only the disadvantage involved in the use could be compensated by the difference of freights in these two markets.

2. One of the deepest concerns of any shipping business is the fullest possible employment of the boats. In other words, the most profitable operation of the boats is to put them in operation continuously in full cargo. Such an operation is made possible only by securing the demand which is equal to the amount of production of transport services. The requisition for keeping such a continuous equality in the management of a shipping business is due to the fact that transport services are the products to be consumed instantaneously being unable to be stored as a result of their nature as instantaneous commodities.

The formation of the demand for marine transport is under the influence of the movement of cargoes and passengers as well as of the competition by other means of transportation, and, therefore, the demand is subject to quantitative as well as qualitative variation as time passes. It is however sometimes the case that the demand for some specific transport on a given area remains fairly constant as a result of constant and stable movements of transport objects which are taken care of only by some boats provided with technical requirements suitable for the purpose. Such a demand is met on

the part of the shipping business concerned by a fixed and repetitive operation of boats in one and the same route. Although the operation in full cargo is not always realized, if the operation is subject to a competition, nothing but such an expectation for securing full cargo will certainly induce the operator to fix its boats on a given line. On the other hand, the above-mentioned full employment of boats is not realized in case such a constant demand is not in existence on a given area. It is, however, possible for operators to combine several demands which take place in different times and locations into a fairly constant and stable flow. Therefore such a combination is made possible in case the route of operation could be changed in accordance with the formation of the demand.

In case the demand is fairly constant and stable in amount and requires regular transport, boats are put in operation as liners meeting such a demand. The demand is as a rule constituted of the individual demands of comparatively small quantity and their transport objects are of a large variety, in most cases finished or half-finished goods of many kinds. In order to secure the demand which quantitatively corresponds to the amount of production of transport services, it is necessary for operators to secure simultaneously several demands and of various kinds. Under this circumstances requirements naturally arise for transport and loading facilities of different kinds. In other words, the provision of such facilities enables operators to extend the scope of meeting demands covering a large variety, which would not be secured otherwise. This is indeed one of the reasons why liners are provided with a variety of transport and loading facilities. And the extent of this specialization depends upon the situation, under which the demand is formed.

In determining technical requirements of liners, the conditions on the part of the supplier is also one of the determining factors along with those of the consumers. Usually, a conference or a shipping cartel is formed joined by those shipping businesses, who are operating liner services on the same line. Except some rare cases in tankers and tramps, the successful formation of cartel has been restricted to that in the liner market. This is because a large amount of capital being required for the operation of liner services, competitive business in each liner market are restricted within small numbers and consequently co-operation among members is more easily obtained.

Of the various agreements which are attained by the members of the conference, the most basic is the rate agreement. Except in case of the so-called differential rate agreement, which stipulates different rates in accordance with the quality of the services to be provided, one and the same rate is provided for in the agreement irrespective of the difference in the quality of services. However, the cartel is not so almighty as to eliminate once for all the competition among the member operators; the

control to be exercised by it being different in accordane with the cartel agreement in question. The member operators are at liberty of concentrating their effort upon the supply of better services at the approved rate for the purpose of securing as much demand as possible, though they are not allowed to reduce the rates. The qualitative improvement of transport services means high regularity and rapidity of transport. Such improvement is realized by the technical improvements of the boats in operation. Above all the provision of high-powered engine is indispensable for the maintenance of a required rapidity and regularity of transport in all weathers. Such being the case, the speed of liner boats is being promoted by the competition within a conference, the degree of which is in proportion to the intensity of competition.

There is little transferability of transport services among consumers[1] the discriminative monopoly is easily formed in shipping market, and, therefore, rates are discriminative monopoly ones. As a result, the advantage of the same amount of each demand to member operators is not equal. This is so, even if we take into consideration the difference in its transport cost. Such being the situation, it is a matter of course that each member operator will try to secure more profitable demands in selecting them. In case more profitable selection of demands is made possible by providing boats with special transport facilities, the business does not hesitate to do so. So far as this advantage is not set-off by the high expenses accompanied with this specialization. Here again the degree of the specialization is dependent upon the conditions under which the demands are formed and the degrees of the discrimination of rates.

The improvements of transport facilities and other technical requirements of boats induces in turn the rise of transport cost through the rise of the cost of their construction and operation, and consequently the unit cost of transport services. The uprising of unit cost involved in such a change is compensated by making boats larger, i.e. by the mass production of transport services. There is, however, a limit to the size of boats. On the one hand, it will become more and more difficult to secure the demand corresponding to the increased supply of services. Further, there will be a restriction to be imposed by the capacity of port facilities. However, it is possible for operators to shift the increased cost due to impossibility of making ships large enough upon the consumers, because these consumers generally have a large capacity of bearing transportation charges.

As is clear from the above, the technical requirements of liners are determined by the situation of the market (and the capacity of port facilities with respect to the size of boats). The situation is however, not the same for individual services. The technical requirements of liners are,

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[1] cf. A. C. Pigou, *Economics of Welfare*, London 1952, p. 275.

therefore, different from each other in accordance with the special situation of the respective service. In other words, a specialization of the technical requirements for the liners is seen in each service.

Such a specialization of the technical requirements of liner boats in one service presents at the same time the difficulty of transferring them to other services. Futhermore, the formation of a conference in almost every service makes this transference difficult. Such a situation results in the formation of a respective market for each service of liners.

Lastly it is to be remarked that the preference for the regular and rapid service by each demand is not equally strong in demands. In case the preferrence is not so strong, there may be a possibility to employ tramps as substitutes. On the contrary, the demands for tramp which do not prefer the quality of transport services may sometimes induces liners to take the place of tramp. Here we see a competition taking place among liners and tramps as a result of the failure on the part of the former to secure sufficient demand for their services. For instance, a liner which is forced to be put in operation in one way cargo is usually operated as a tramp in her return voyage.

3. The demand for transport services which do not necessarily require the regularity and rapidity of the services is that for tramps. There is such the demand for tramps as prefers a transport service to be supplied by a boat provided with some special facilities. This will be dealt with in the next section. Therefore, we shall be concerned in this section only with those demands for tramps which do not require any special quality of the transport services to be supplied. The formation of such demands are determined by the situation, in which transport objects are produced and consumed. Observing the movement of some specific transport objects in an area, it will be found that there are two kinds of them. One is those whose transport is relatively constant, while the other is not transported in a constant flow, but spasmodically. For instance, iron ore belongs to the former category, while wheat to the latter.

Even in case of tramps, the constant security of the demand corresponding to the production of transport services is a requirement for the profitable operation of boats, just like in case of liners. Of these two kinds of demands for tramps, for the demand of spasmodic formation on an area the repetitive operation of boats in one and the same route can not meet the above request. For such demands it would be necessary to combine the similar demands to be formed in different localities and times into a constant flow, and to operate boats by following different routes in accordance with this flow. In such a case, boats are operated in a typical way of operation of tramps. In case demands of similar kinds take place continuously in a comparatively constant quantity in an area, they are met

by operating boats repetitively in one and the same service. In most cases, these demands rarely take place in both direction of the services and usually only in one direction. The boats are, therefore, forced to be operated in one way cargo in such cases. For fuller employment of boats avoiding the operation in one way cargo, boats should be so operated as to make such a demand form a link of a constant flow constituted of spasmodic ones. In case the disadvantage originating from the operation in one way cargo would be compensated by the advantage of the use of boats provided with special transport facilities, which results in lowering the transport cost, such boats, that is specialized ones, would be constructed for the repetitive operation in some specified service. This is for instance the case of ore carriers, the demand for which is usually large enough to justify the entire specialization of facilities. There is no reason to suppose such specialized boats would be preferred by the consumers. Therefore, these ships are also in competition with other tramps of ordinary type for these demands. The operation of these boats are however of some managerial significance, because these boats have an advantage over other boats, as far as the transport cost of some special objects concerned. Of course, they have to suffer from a disadvantage originating from a specialization of transport facilities, which will restrict their sphere of securing transport objects. It is seen however in many cases that these boats are operated by the producer or consumer of these transport objects, who is therefore acting as industrial carrier of these boats of a special type. No matter whether they are owned by an industrial carrier or by a common carrier, an observation similar to that to be made in the next section can be applied with respect to the relationship in which the technical requirements of specialized boats other than transport facilities, i.e. speed and size, stand with the situation of their demand and supply.

In case of securing a constant flow of demands by combining the demands which take place in different localities and times spasmodically or irregularly, for such transport the technical requirements for the boats to be employed are as follows.

In the first place, it should be pointed out that there is a large variety of transport objects in these demands, although no regular service is required. It is therefore necessary to enlarge the scope of the kinds of transport objects so as to make it easier to form a continuous flow. The transport facilities are also required to cover a large variety of these transport objects. In other words, no specialization of transport facilities is allowed in this case; demand in one lot for these services is usually large enough to occupy the whole transport capacity of boats.

Secondly, more ports must be called in order to secure a constant flow by combining these demand which are formed in different localities and times. As a result, only those boats of a size within a certain limit are

operated, because otherwise the ports provided with poor facilities would not be called. In general, poor facilities of the ports to be called by tramps are responsible for the smaller size of these boats, whose access to them would not be possible otherwise. However, this is not the only factor which determines the technical requirements of tramps boats. Moreover, usually operators do not construct the boats for the purpose of their universal use and operation alone. Sometimes they have an area in which they can operate them more profitably; this facts represents the imperfect competition among tramp operators. Taking into consideration the operation in such an area, the operator will naturally determine the size of boats, which are more suitable for the operation in the area meeting the technical requirements arising from the particular situation there.

Thirdly, there is a reaction of the conditions on the part of tramp operators upon the technical requirements of these boats. The tramp market is extensively participated by a large number of operators. At the same time, it is open to new comers, because the operation of tramp can be started with a small amount of capital—its typical examples are single ship owners—and the small-sized management is sometimes even more profitable from managerial standpoint. Thus no co-operation is maintained among these operators and except in some rare cases monopoly is not successfully formed. As a result, the tramp market is the arena of a very intense competition by a large number of operators. There are the intense competition among them and the lack of preference for the quality of transport services, in particular between speeds, and small ability of bearing high transport charges on the part of consumers. By these facts operators are compelled to reduce the transport rates as the only means to survive in the competition. Consequently, tramps are required to perform the transport at cost as low as possible. And so there is a tendency to construct so-called economical ships. The high speed is not required in general and there is no motive for having a large boats in order to compensate the uprising of operating cost due to the speed-up.

4. In case the demand have a preference for the transport services by a boat provided with special facilities its transport will be exclusively taken care of by so-called specialized boats. Under the category of this kind of boats, there come tankers and reefers. [Ore carriers do not come, under

[1] Given a size of a boat, it is theoretically possible to determine its speed, at which it is most economically operated. In case of tramps, the size is determined by the aforementioned situation on the part of its demand. It is said that the size and speed of tramp boats is in general in a tendency to increase. Such an increase has been made possible by the progress of ship building technique as well as by the improvement of port facilities. By the former, the speed-up has been made possible without involving the rise of operating costs, while easier access to ports has been made available for larger boats by the latter.

this category, as has been already pointed out.] As tankers are the most important of them, special emphasis will be placed on them as follows.

The transport objects of these specialized boats are in most cases natural products, for instance, oil and banana respectively in case of tankers and reefers. Their place of production, processing and consumption are maintained almost the same so far as the localities of these materials and the international trade relations unchanged. The movement of these materials is therefore confined within certain area. The amount of their movement analogouse to demand, is of course subject to seasonal variations and other business conditions. But there exists a part, which is maintained constant uninfluenced by those variations.

Under these conditions, the operation of the specialized boats will necessarily take the following forms. For meeting the invariant part of the demand, boats are repetitively operated in one and the same service. On the other hand, the variable part of the demand in shorter span of time is met by the operation which is just like that of tramps of ordinary type and changes its route looking for the demand. Of course, they are sometimes operated several times in one and the same route, but this is only of rare occurrence.

In many cases, the consumers of these transport services—producers or sometimes processers or sellers of this kind of transport objects—are engaged in large-scaled businesses, for instance, Standard Oil Companies in oil industry or the United Fruit Company in case of banana plantation. In these cases, such companies usually combine and control their transport department and become industrial carriers. Sometimes, the operation of these ships is made indirectly through an independent concern, which is put under their control. At all event, they are acting as industrial carriers all the same. And as in the case of common carriers, it is needless to say that full use and employment of ships are required from the managerial point of view. The above-mentioned invariant part of its own demand (more exactly, the part which is empirically expected to be so) is thus met by the ships owned by industrial carriers. In other words, such businesses are only interested in keeping the boats sufficient for meeting such a demand. Of course, if the capital could be invested more profitably, i.e. if the marginal efficiency of the capital invested to tankers is relatively small, the actual possession of tankers by the business would be within the limit thus made. In any event this is the upper limit for their total tonnage. That part of the demand which is not met by industrial carriers constitutes the demand for so-called free or independent tankers. Thus in the part are included the above-mentioned variable part and the invariant demands which are not met by the industrial carriers as well as those by the oil companies not possessing tankers.

Such being the relationship between the demands for tankers and their

supply, it is easily seen that tankers belonging to industrial carriers are operated in one and the same route, while free tankers are not so operated. It is also seen that larger and larger tankers are required by industrial carriers, as far as their operation is made available by the port facilities and other route conditions. This is indeed the reason why many industrial carriers should have so-called super tankers. In this connection, it should be pointed out that, besides loading and mooring facilities, these for storing oil is one of the important factors of port facilities. [It should also be remarked that the use of super tankers is restricted to a certain extent by the existence of canals.] On the contrary, such a tendency is not taking place with respect to free tankers for the same reason as mentioned with respect to tramps. But their larger size in comparison with ordinary tramp cargo boats is usually due to a large amount of the demand for their services as well as to the fact that even poor equiped ports would allow their access. However, a super tanker may sometimes be used as free tanker. Such takes place, only when the tanker company has some connection with the oil company, from which continuous and constant demands can be secured, and when route conditions for their operation is favourable.

Next it should be pointed out that tankers have in general a high speed. There are two reasons for it. In the first place, their large size can prevents the relative rise of transport costs by a high speed. Secondly, tankers need only a short time for handling at the harbours. In fact, far more frequent rotation in operation of ships is made possible by their high speed, than the ordinary cargo boats which need a longer time for handling their cargoes. They are thus operated more efficiently.

Lastly it is remarked, that consumers of these transport services, i.e. charterers of tanker tonnage are in a more advantageous position than their suppliers in the tanker market, where not only these tankers belonging to common carriers but also those hired out belonging to industrial carriers must be taken into consideration as suppliers. Such relation is perhaps originating from the following facts. In the first place, the consumers are confined to relatively a small number of big oil companies. Secondly, the transport charges are all fixed after those shipping brokers, who represent the interest of these companies for instance the "London Tanker Brokers' Panel Award." Thirdly, it should be pointed out that the success of the International Tanker Pool in 1934 was due to the co-operation of all the oil companies concerned. In other words, common carriers are allowed to form a cartel, if and only its fomation is not against the interest of consumers. Above facts seem to indicate that the tanker market can be inferred as a buyers' monopoly market. It is however not clear, in what relation such a situation in the market of tankers stands with the technical requirements of free tankers.

5) We have studied the close connection between the conditions of the

shipping market and technical requirements of ships, starting with the peculiarities concerning the production of transport services. However, these conditions do not remain invariant, but are subject to change in the passage of time. The shipping business is therefore required to take into consideration not only the conditions of the market at the time of building boats, but also its possible change, which might take place during their endurance. Of course, it is needless to say that the conditions of the shipping market are not the only factor in determining the technical requirements of ships, as mentioned above, but are one of the most important.

Such technical requirements of ships are one of the main subjects of the studies on the science of shipping management. In these studies thus far, they dealt with at most their relations with transport cost, if not mere descriptions. However, it must be clearly understood that the ship is a means of achieving business purposes, that is gaining the largest profit. Then its technical requirements are not determined arbitrarily, but through the rational consideration of the business. Therefore, in dealing with their technical requirements, the science should endeavour to explain this connection. The writer's present essay is an attempt along this line.