THE COSTS OF OPERATION OF THE TRAMP SHIPPING FIRM

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I. Introductory Remarks

A shipower combining factors of production in various ways is seeking if possible, to ensure that in the long rum revenue will exceed costs. Thus, a brief examination of the nature of the cots of operation is we think essential for the understanding of the functioning of the shipping firms as well as for the understanding of development in the tramp freight market.

As we know, the theoretical basis, of the concept of economic cost is that something must be foregone as a result of the use of a certain resource for the purpose of producing a particular kind of output. If nothing is foregone no economic cost has been incurred.

Broadly speaking, as in the case of other transport forms, the long-run costs of the shipping firm may be classified into :

a) Land use.
b) Capital costs.
c) Fuel and other necessary supplies.
d) Labour costs.

II. Land use

Shipping firms owning passenger vessels or cargo liners rent or purchase land for the purpose of constructing suitable loading and discharging berths at various ports for the use of their tonnage or for the use of tonnage which has been chartered by them. Similarly, oil companies have purchased land near by their refineries for the purpose of building suitable berths to be used either by their own tonnage or by tankers that are chartered by these companies. Also, shipbuilding and ship-repairing firms rent or purchase land near by ports in order to install their factories, yards, dry docks, etc.

The land acquired permanently or temporarily by firms connected

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with merchant shipping could be of some value for purposes other than those for which it is used by such firms. The same land might be used, for instance, for open spaces, cultivation, hospitals, houses, sanatoriums, hotels, warehouses, railway stations, fishing ports, factories, yacht clubs, and so on. Once rented or purchased and adapted the sums for which such land or property could at any time be let, sold or leased to others for the use of such purposes as the ones indicated above are a measure of the economic cost to the shipping firm for retaining or using the land in question.

In the case of independent shipping firms owing tramps, bulk carriers and tankers land or space use is a current cost. Due to the fact that the area of trading of these productive units is worldwide and the time period that the same space (which is of value for alternative uses) is made use of by them is small, independent shipping firms pay mostly port dues (which are a form of rent) to the government or authority of the port at which their vessels are to call or have called. Thus, tramp shipping firms assume the role of landlord or tenant only temporarily. Consequently, as we shall shortly see such payments as port dues, dry-docking dues, and so on are considered in the shipping world as part of the «operating» or current costs of the shipping firm.

It must be pointed out that space is made use of by shipping firms which does not have any value for alternative uses. Sailing on the high seas (but not through canals) or carrying out of emergency repairs with the assistance of crew at relatively safe anchorages outside ports may be considered as two important examples in this connection.

In Table No. 9 of the Appendix, we give the average monthly expenses of a laid up vessel. It will be noted that the usual cost of port dues is not included in the table. This is so because the vessel under consideration was laid up at an uninhabitable area at Taranto, Italy, which was unwanted at the time. With the exception of the mooring posts which were purchased and installed at the firms' expense, nothing else was foregone because of this temporary use of space and, therefore, no other economic cost was involved.

III. Capital Cost

Production of tramp shipping services presupposes the use of capital structures and equipment such as, for instance, the ships, their engines, their auxiliary machinery and electronic equipment, canals, lighthouses, cranes, tugboats, and so on. Such assets differ amongst themselves for they are specialized in relation to the output which they can produce but what they have in common is the need for physical and periodic replacement.

Shipping firms do not need to own all the above mentioned assets. So far as they are concerned payments of such items as canal dues, light dues, payments for the use of cranes, towage and so on are short-run costs.

However, one way or the other, shipping firms, in order to function as such must pay for their use and in the long-run for their maintenance and replacement.

A distinction must be made at this point so far as capital structures and equipment are concerned. It is necessary to distinguish between the situation existing prior to their construction and the situation created after their construction.

The sums to be paid by a shipping firm for the utilization of the resources necessary to construct and equip a ship will indicate the alternative value of these resources. The sums spent by the firm in order to purchase the ship constitute the original cost which once built and bought features no longer in the economic costs of producing the service for which the ship was constructed (interest on money funds that may have been borrowed by the firm for the purpose of purchasing a ship is an obligation but not a cost). Thus, once a ship has been delivered to its owners its purchase must be taken as a matter of fact. What represents a cost after a vessel has been delivered to its new owners is the interest lost on its saleable value, the cost of «hanging on» to the ship.

If we take a look at the various assets that are indispensable for the normal functioning of a shipping firm, it will come to our notice that some of them are short-lived whilst others are characterized by their longevity.

Such assets as various parts of the engine room (rings, springs, packings, valves etc.); various parts of the deck and the bridge (lifeboat's equipment, insulating material for pipes etc.); various parts of the officers' and crew accommodation (curtains, bed-sheets, crockery etc.) and various parts of the office's equipment are short lived and therefore their replacement becomes necessary. Such replacement costs of relatively short-lived assets — like maintenance costs — depend primarily upon the different conditions under which vessels are trading. For instance, if we assume that during the course of a heavy winter period two tramp ships of the same age and specification belonging to the same firm were trading continually, the first one at the route U.K. (Canada) U.K. and the second U.K. (West African Coast) U.K. we could safely state that the maintenance and replacement costs of the first vessel for the same period would — other factors being equal — have proved to be considerably higher (see par. IV). The cost of replacement of short-lived assets is not an overhead or a fixed cost to the shipping firm but it is a short run cost highly variable and allocatable to the provision of various stores, spare parts etc. which may be required.

As we pointed out some of the assets of the shipping firm are characterized by their longevity. Looking at a well maintained dry-cargo ship as a whole, we may say with some degree of certainty that its economic and physical life may last as long as twenty five years or even more. However, apart from the short-run maintenance expenses, and depending on the kind of use of the ship, on the maintenance policy followed by the firm, on the efficiency of its officers and crew, as well as on time, in the mid-run, that is to say, normally after the second special survey (each special survey is carried out every four years) it will be noted that even some of the assets of the ship that are characterized by their longevity (such as plates, pipes, valves and so on) will be in need of replacement. It is vitally necessary therefore for the firm. that provision should be made for these rather heavy and variable mid-run costs. It will be seen shortly that such expensive replacements are included in the «operating costs» of some firms under the heading of maintenance and repairs. Just what items of expenditure should be referred to as maintenance repairs or replacement is ultimately a matter of convention, of choice or opinion.

In the long-run, if a firm is going to continue in existence even such assets that are characterized by their longevity such as the hulls and engines of ships, that is to say, the ships themselves depreciate and therefore, must be replaced. Thus, in the long-run it is vitally necessary for the shipping firm that provision should be made for these expensive replacements. Under the circumstances, it is we think advisable to make a few comments on the depreciation of ships as a cost.

IV. Depreciation

In order to be able to discuss depreciation as a cost we must assume that, as a rule, entrepreneurs want to keep their firms in existence for time periods that are longer than the average life of ships. «Depreciation as a cost cannot be measured in terms of money apart from some defined objective»[1].

Depreciation of tramp ships is caused by the following different and distinct factors:

a) Wear and tear resulting from use and the way of use.

b) Wear and tear due to exposure to the elements

c) Changes in future demand.

a) Wear and tear resulting from use and the way of use : In order to appreciate the importance of this factor we may take, in the first place, as an example the main engine of a ship.

If we assume that a ship right after delivery to its owners proceeded to the lay up berth — on account of the existing state of the market — and remained there over a long period of time; and if we further assume that the necessary measures for protecting the main engine from exposure to the elements had been perfectly applied, then on the basis of existing information, we could safely state that the degree of wear and tear of this engine would be practically zero on termination of the lay up period. The excellent condition of the machinery of various T2 tankers after prolonged lay up periods may be a case in point.

However, if another ship of the same age and specification was trading whilst the first remained laid up there would have been symptoms of wear and tear on its machinery. The degree of wear and tear of the hull and machinery of a ship is fully noted during the course of special surveys.

The gradual wear and tear of a ship is due to use, but it also depends on the *way of use*, that is to say, the different conditions under which the ship is producing its output.

In order to demonstrate this significant point we think that it will be advisable to elaborate further on our previous example of the two ships of the same age and specification under the same management with the two different itineraries during a period of heavy winter. It will be recalled that vessel A was supposed to be trading continually at the route U.K. (Canada) U.K., and vessel B at the route U.K. (West African Coast) U.K.

1. See G. J. Ponsonby, «Depreciation with Special Reference to Transport» Economic Journal March 1956. It should also be pointed out that most of the concepts applied in this chapter are developed in the above as well as in the following articles: G. J. Ponsonby, «Freight Charges by Road in Competition» Economic Journal March 1938. G. J. Ponsonby, «Earnings on Railway Capital» Economic Journal December 1960.

Under the circumstances, it may be safely assumed that vessel A would have been exposed for the greatest part of the winter period to heavy or stormy seas and winds with a force of form 6 9 (Beaufort scale). Such heavy weather conditions would have caused heavy labour of its hull and engine over relatively prolonged periods of time. Engine and hull would have vibrated violently and racing of enfine would have occurred more than once. Furthermore, officers and other members of crew would have inevitably neglected their maintenance work both on deck and in the engine room.

As the deck-log extracts of any tramp ship performing continually voyages under heavy weather conditions will show, the wear and tear — as well as the damages — caused on vessel A as a result of its employment would have been far greater than those of vessel B which most probably would have encountered heavy weather only during the crossing of the Bay of Biscay.

Some of the rivets would have become loose, leakages in the double bottom tanks and bilges would have occurred, plates would have become rusty, the wear and tear on some of the bearings and white metals of the main engine would have become noticeable, and so on.

In addition, part of such short-lived assets as the various protective covers on deck, life safety equipment, catering department equipment, etc. would have been wasted and, therefore, in need of immediate replacement (see par. III).

We may therefore, safely conclude that one of the factors that causes useful life of ships to be taken out of them is use and the way of use. In the short-run user depreciation is merging into maintenance.

b) Wear and tear due to exposure to the elements : Which is essentially a function of time and thus, a time cost. We may mention in this connection the wear and tear of various parts of the hull, the deck and the bridge structure of vessels. Exposure to the elements causes corrosion, wastage and gradual decay of the plates, the winches, the pipes, the electrical equipment on deck, and so on. Needless to say that wear and tear due to exposure to the elements occurs even when ships are laid up.

Renewal of some certificates such as the life safety equipment certificate or the boilers' survey certificate and so on which necessitate the carrying out of a relative survey is a mid-run cost resulting from the increasing age of vessels.

c) Changes on Future Demand : One of the factors which affect the value of ships and the length of their economic lives is the future level of demand for their services.

If the demand for tramp shipping facilities, the level of ships' prices, the level of freight rates and the level of productive techniques remained static in the long run, depreciation (including obsolescence) could have been easily estimated in terms of money by calculating the value of the services of the ship in the price of the service produced. Also, the ship could have been placed out of use at the moment its productive capacity was exhausted and replaced by another one of the same specification at a price eqaul to the original cost of the old vessel.

However, the economic realities of the industry are quite different. The demand for tramp shipping facilities is subject to big changes, the money values of ships and tramp freight rates tend to fluctuate sharply and productive techniques do not remain static.

The longevity of demand for the services offered by a particular type of ship is an unknown factor to the entrepreneur at the time he decides to purchase the ship. For instance, it would have been impossible to forecast during 1945–1947, when most of the Liberty tramps and T2 tankers were purchased by private entrepreneurs, that there will be a demand for the Liberty's services even as late as 1967 but that the T2 tanker would become obsolete in its own market by the end of the 1950's.

Changes in future demand for a particular type of ship may or may not cause the end of its economic life before its physical deterioration. Consequently, such changes constitute a factor which, in the case of the tramp shipping industry, makes the accurate estimate of depreciation as a cost practically impossible and at the same time substantiate the well-known argument to the effect that «tramp shipping business is a highly speculative profession» [1].

V. Fuel and other Necessary Supplies

In order to operate a ship the use of oil or coal and of such other raw materials and products as, for instance, water for boiler consumption, or drinking water, provisions and stores are indispensable.

Fuel and the raw materials and products necessary for the operation

1. For further analysis on the cost of depreciation in industry see : J. L. Meij, «Depreciation and Replacement Policy».

of a ship represent an economic cost which is characterized by its versatility. For instance, the oil burned and water or provisions used in a ship could be utilized for exactly the same purposes by trains. The payments that would have been made to obtain the fuel, raw materials and products necessary for the operation of a ship are a measure of the economic cost incurred by the shipping firm for their use.

VI. Labour Cost

The use of labour, whether as ships' crew or as members of the office staff or as dock workers, riggers, etc., is indispensable for the production of tramp shipping facilities.

Labour can also be regarded as a versatile resource. The estimated payments which would have to be made for securing the labour employed by a shipping firm for alternative uses are a broad measure of the economic cost to the tramp shipping firm for using this scarce resource.

However, in view of the nature of the nautical profession some additional real costs are incurred by the shipping firm with regard to the utilization of labour.

As we shall see shortly each shipping firm once in the business will endeavour to get as much interest, depreciation and profit as possible — all of which are the surplus earned after the short-run costs of operation have been deducted. However this would depend on market conditions.

VII. The Costs of Production of a Tramp Shipping Firm

The money prices of the scarce resources which a shipping firm employs in order to produce its services give us the general level of its costs of production in terms of money. The general level of money costs and its relation to freights determine whether or not these services will be produced and at what quantity will be produced. Let us therefore, examine the position with regard to costs by taking as an example a hypothetical tramp shipping firm.

a) The «Operating Costs» [1]. For the sake of simplicity let us suppose that one or more entrepreneurs decided early in 1955 «to get into the shipping business» and that, as a result of this decision, a new

1. The term operating costs as used in the shipping world means all short-run and mid-run costs but not depreciation and interest.

shipping firm — Firm A — was established during the same year. The management employed by the entrepreneurs under consideration was just as efficient as the ones of older tramp shipping firms with long experience in the industry. During the course of the same year a new tramp ship, to be called X, was ordered by Firm A to be built by a Glasgow Shipyard.

The new shipowners and their management agreed that vessel X should be of the representative type of tramps at the time. Thus, the main features of the specification agreed with the shipyard were the following: G.R.T. 9722, N.R.T. 5477, D.W. 12,500. Diesel Engines. Consumption 17 tons fuel oil per day. Average working speed 15 knots.

Vessel X was delivered to Firm A without undue delay, i.e. during Summer 1957, and its original or building cost amounted totally to £ 1,000,000.

Vessel X was fixed during trials to take a full cargo of grain from Montreal to London. Subsequently, several fixtures for Atlantic voyages were concluded. On termination of one year of service the average daily running expenses of vessel X, which was registered under the British flag, were estimated as hereunder:

TABLE I

Daily Running Expenses of Vessel X for Voyage No. 1.

Crew Expenses :		
Wages	£ 75. 0. 0	
Sunday and leave pay, national health insurance and merchant navy Officer's pension fund	12.18. 0	
Bonus	5.10. 0	
Overtime	4. 0. 0	
Allowance for stand-by wages and sick pay whilst in the U.K.	1.10. 0	
Repatriations	1.10. 0	
Victualling	18. 0. 0	£ 118. 8. 0
Stores :		
Deck, Engine and Cabin		21. 0. 0
Insurance :		
Marine insurance on hull and machinery, etc.	35.15. 0	
Club calls and unrecoverables	7. 0. 0	42.15. 0

Management :		
Office	1.15. 0	
Superintendent Engineers and/or port captains, etc.	3. 0. 0	4.15. 0
Maintenance and Repairs :		
Including allowance for spare parts and for annual and special survey ...		25. 0. 0
Incidentals :		1. 0. 0
Total Running Expenses per day		£ 212.18. 0

Needless to say that the daily running expenses were not the only expenses incurred by Firm A for the performance of voyage No. 1 Glasgow (Montreal) London of vessel X, part of which had to be done in ballast. The following additional payments were made by Firm A in respect of Voyage 1 of vessel X :

Bunkers	£ 1,325. 0. 0
Loading Expenses	4,000. 0. 0
Discharging Expenses	4,000. 0. 0
Shifting boards	250. 0. 0
	£ 10,075. 0. 0
Total of «running expenses» for Voy. No. 1 : 22 days per £ 212. 18. 0 per day	4,683.16. 0
Operating costs re : Voy. No. 1 *	£ 14,758.16. 0

As it appears rather clearly from the above simple calculations, we have assumed that Voy. No. 1 was a «good and safe» one — not unduly affected by any «unforeseeable factors».

Thus it lasted for 22 days and vessel X — having not experienced any trouble in the engine room or elsewhere — was proved to be a «sound ship» in every respect.

The figures mentioned in respect of expences incurred at the loading and discharging ports represent actual payments for disbursements made by Firm A. The figure of £ 1,325. 0. 0. represents the cost of bunkers consumed during the round voyage. The £ 250 is an average of the

* For simplicity's sake commissions on freight are not included. We assume that these were deducted from freight prior to its payment.

total expenses incurred for the purchase, erection and dismantling of shifting boards (less the sale price of wood) which were used for four voyages continuously. In other words, we estimate that the total cost of the shifting boards to Firm A was about £ 1,000, a figure that may be thought to be rather conservative. This is so, for it is assumed that most of the work for the erection and dismantling of the shifting borads was done with the assistance of the crew.

The various daily running expenses are averages based upon the first year of the economic life of vessel X. The average for maintenance and repairs is also based on the past experience of the management of Firm A and it may be considered a representative one.

All the above mentioned costs amounting to £ 14,758.16.0 constitute *the operating costs*, or working expenses of vessel X for Voy. No. 1.

b) The Cost of Depreciation : The decision of the entrepreneurs who founded Firm A to order a new ship and not to purchase one or two units from the second hand market may be taken to mean that it was not their intention to enter the tramp freight market temporarily.

In the circumstances, it could be safely stated that the long-run objective of Firm A would have been to replace vessel X in due course. It is highly unlikely that the records of Firm A in respect of the cost of depreciation of vessel X, which would have been made in accordance with existing legal provisions, could serve our purpose which is to estimate the cost of depreciation of vessel X during the short run period of Voy. No. 1.

In order to attempt such an estimate the following assumptions become necessary :

a) That the total cost of replacement of vessel X will be equal to its original cost.
b) That the life of vessel X (both economic and physical) was going to be equal to the one of many other well constructed tramp ships, that is, in the neighbourhood of thirty years. Consequently, it could be further assumed that vessel X was sold during 1987 to a yard for scrapping. The net revenue realised by Firm A from this transaction was £ 100,000.
c) Out of the thirty years of its economic life vessel X was part of available supply over various intervals of time amounting totally to five years. During this period of time vessel X was not trading, either because of the depressed state of the freight market or because of repairs, etc.

On the basis of the above assumptions, Firm A had actually a period of 25 years to recover the original cost of its investment or the cost of replacement of vessel X. Thus, the cost of depreciation during the course of Voyage No. 1 could be estimated as follows :

Total original cost	£ 1,000,000	
Less estimated scrap iron value	100,000	£ 900,000

£ 900,000 : 25 years of trading = £ 36,000 per annum or £ 98.12.0 per day
£ 98.12.0 × 22 days, i.e. duration of Voy. No. 1 = £ 2,169.

Therefore, the total cost of Voy. No. 1 of vessel X would have been :

Operating costs	£ 14,758.16. 0	
Depreciation	2,169. 4. 0	£ 16,938

Needless to say that, in the shipping world, costs are viewed in a somewhat different way. If the freight collected from Voy. 1 was higher that the operating costs for that voyage, let us say £ 18,000, the difference or surplus i.e. £ 3,214. 4. 0. would have been considered as the profit made by firm A. Most probably the owners of vessel X would not have remained satisfied from such voyage results. This would have been so because, in view of the highly speculative natire of the profession, shipowners want to recover the original cost of their investment at the earliest possible stage of the economic life of the ship. It is not our purpose to comment extensively in this study on the attitude of entrepreneurs towards costs and profits. However, it must be stated at this point, that the figures given in this paragraph reflect rather closely the true position so far as the costs of the British and Continental tramp ships in the late fifties are concerned (see Appendix). Thus, they form a good basis for making an estimate of the approximate cost per ton mile for the carriage of bulk commodities by relatively modern tramp ships at the time.

c) The Cost per Ton-Mile : We assume that, as is usually the case, vessel X took a full cargo of grain (equal to its cargo-carrying capacity, see Chapter I, par. II) i.e. 11,900 tons. The distance of the round voyage Glasgow (Montreal) London is 6,000 miles. Thus, the cost per ton mile to Firm A (during the loaded passage) was :

$$\text{Cost per ton mile} = \frac{\text{Total cost}}{\text{tons} \times \text{miles}} = \frac{\pounds\ 16{,}928}{11{,}900 \times 3{,}000}$$

$$\frac{16{,}928 \times 240}{11{,}900 \times 3{,}000} = \frac{4{,}050{,}000 \text{ pennies}}{35{,}700{,}000 \text{ ton miles}} =$$

0,144 d/ton mile i.e. about $\frac{1d}{9}$ per ton mile.

We feel that this figure may be of some interest to economists who may wish to study the cost of transport of goods by sea and air.

d) Is Tramp Shipping a Remunerative Transport Service? It has been pointed out at the beginning of this study that some relatively small costs, mainly the cost of insurance on the cargo transported, are not paid by the shipping firms but by the cargo shippers. Moreover, as it appears from our hypothetical example of Firm A, the various shipping firms estimate their operating costs on the basis of actual payments made by them. Properly, Firm A, as well as all other shipping firms, should also include in their costs not only the payments made by them for goods and services, but also the imputed value or opportunity price of the productive factors which they use but do not directly pay for. Such costs would include the imputed but unpaid salary of a director of a young shipbroking firm, the imputed but unpaid salary of an owner-manager, the unpaid fees of a director who, because of his educational background and/or training, may be in a position to act occasionally or regularly — in addition to his managerial duties — as a port captain, or a superintendent engineer, or as a claims except or as a translator; the unpaid cost of repatriation of an officer or member of crew of vessel X by another vessel belonging or managed by the same company; the unpaid freight for spare parts, stores and/or provisions brought over to vessel X — which may be trading at great distances from the home port — by another vessel belonging to or managed by the same company, and so on.

In order to be able to determine whether the transport services offered by a shipping firm are remunerative or unremunerative the accounding costs of the shipping firm should be considered as appropriately rectified to register the full opportunity prices of all productive factors employed plus those small costs that are paid by the shipper for the purpose of carrying a bulk commodity from loading to discharging port.

If the resulting revenues are known or definitely expected to be sufficient to cover all these costs, it may then be concluded that the services offered by the shipping firm are remunerative :

> «It is suggested that... an unremunerative service can be defined as follows : A service, or part of a service, the resulting revenues from which are known (or definitely expected) to be

insufficient to cover those costs which, but for its provision would not have been incurred, either directly or indirectly, in the short — or long-run»[1].

It may be stated at this point that as the figure with regard to the cost per ton mile suggests, tramp shipping as a whole has in the long-run been a remunerative transport service.

VIII. The Fixed, Variable and Marginal Costs of Shipping Firm

The short period relation of cost to output is a kind of operational period of such length that the hull and machinery of a tramp ship and the office building, or the part of the office building that the owning shipping firm occupies, remain invariant in quantity but the materials and labour used may be variable in quantity. As in the case of other transport industries — and industries in general — it is not advisable to endeavour to determine precisely the time limits of the short-run period, but it can be assumed that it may last for some months. The longer the time period we contemplate, the more factors are potentially variable and the fewer are fixed. The long-run period during the course of which all production factors used vary in quantity may last as long as the average life of a tramp ship.

In the short-run period the shipping firm has certain fixed factors and certain variable factors that it uses. Correspondingly, the shipping firm in the short-run finds that its costs fall into two general categories - fixed costs and variable costs.

On the basis of the above one could feel tempted to classify all the operating costs of a tramp shipping firm into the short-run category of variable costs. Nevertheless, the actuel position is somewhat different and in view of the fact that, for reasons that may become shortly obvious, the distinction between the short-run fixed and variable costs must be made as accurately as possible, some further comments become necessary :

Fixed costs are those which in the short-run are absolutely invariant to changes in output, in other words, they are the total amount of costs that our hypothetical Firm A, or any other shipping firm, would incur when her output measured in ton-miles is zero. The variable costs in the short-run are those costs which vary with output or in effect any costs added as a result of any increase of output above zero.

1. See : G. J. Ponsonby, «What is an Unremunerative Transport Service?» Pre-print from the Institute of Transport Journal.

Thus, fixed costs for any given short period of time will include:

a) Costs that are incurred as a result of commercial transactions carried out in the past, that is to say before the short-run period under consideration, and allocated to the period.

b) Outlays made during the same period which will, in any event, be made at zero output.

It should be noted that fixed costs that can be classified under (*b*), though fixed for the short-run period, are made in anticipation of operations in a future period.

From our example of Firm A we remember that the depreciation cost of vessel X — allocated on a daily basis — was £ 98.12. 0. If we assume that vessel X remained laid up for short a period at a small U.K. port and that its lay-up expenses during this period (port expenses, management, port risks insurance, watchmen, basic maintenance, etc.) averaged £ 30 daily, then we can say that the fixed costs of Firm A which owned and managed only vessel X were averaging (£ 98.12. 0 + £ 30) £ 128.12. 0 daily.

If we now suppose that when vessel X was eventually re-commissioned it performed the same voyage, i.e. U.K. (Montreal) U.K., then we can conclude that its variable costs during this voyage were averaging £ 230 per day (i.e. £ 212 running expenses, plus £ 48 being daily average re cost of bunkers, loading and discharging expenses necessary for the performance of the voyage *less* £ 30 being average daily payments if vessel remained laid up) or £ 5,060 for the whole voyage which lasted for 22 days.

As we know, the marginal cost is the cost per additional unit of output. In the case of the tramp shipping industry production of one additional unit of output, that is to say the transport of a bulk cargo from loading to discharging ports presupposes the performance of one voyage. Therefore, all costs that are incurred because of the performance of the voyage including its in ballast part — or all those costs that would not have been incurred if the voyage was not performed — constitute the marginal cost. It follows that in the case of vessel X the marginal cost in respect of the voyage U.K. (Montreal) U.K. was £ 5,060.

Having defined the fixed and variable costs of the tramp shipping firm as well as the cost per additional unit of output, i.e. the marginal cost, we may now proceed to make a few comments with regard to the entrepreneurs' behaviour in respect of costs and prices.

It has already been mentioned that a shipowner or a group of shipowners owning a shipping firm in combining productive factors in various ways are seeking in the long-run and under competitive conditions to obtain, if possible revenues which are greater than costs.

On the other hand, due to the fact that the demand for tramp shipping facilities is subject to big changes and, therefore, varies in magnitude over different periods of times, there are short periods during the course of which average freight rates tend to yield a higher or lower revenue than the one required to cover average total costs.

More specifically the position is as follows : Given the existence of changes in the magnitude of demand there will be forthcoming at any level of freight rates different volumes of bulk cargoes. The existence of tonnage idleness leads shipping firms which are functioning under competitive conditions to accept in the short-run freights which yield revenues that are lower than average total costs. Thus, emerges a level of freight rates on a world-wide scale which is lower, during the stages of recession and depression, than the level of freight rates prevailing during the stages of revival and prosperity.

During the course of short-run periods, when total supply does not expand or contract, the degree to which the level of freights will vary depends upon the degree to which the demand varies in magnitude [1].

It has been, and still remains, the general practice of shipowners and their managements to conclude, during periods of low freight, rates fixtures which yield freights which are substantially below that which must be earned to cover the average total costs during the same periods. So long as freight rates are estimated as being sufficient to cover the variable costs of a vessel no experienced shipowner will miss such opportunities as the market offers to conclude fixtures and avoid idleness by laying up his vessel. In view of this policy, which is widely applied during periods of low freight rates, shipping firms have imposed upon them the necessity of earning more in future when freight rates will tend to yield average revenues which are higher than costs.

IX. Costs and the Size of Tramps and other Cargo Ships

So far, by referring to the «representative tramp ship» for each different period of time (and indeed there is such a ship as regards size, speed and cargo-carrying capacity), we have implicity assumed

1. Broadly speaking there is a close similarity in this respect between the tramp freight market and those local or national markets for the road haulage industry that are functioning under competitive conditions. See : G. J. Ponsonby, «Freight Charges by Road in Competition» in the Economic Journal. Vol. XLVIII. pp. 56–59.

that during the course of different periods of time all existing tramp ships had about the same average total costs and, consequently, given the competitive structure of the tramp freight market, they were, on the average, expected to earn similar amounts. We propose to drop the above assumption with a view to examining the size of tramps and other cargo ships in relation to costs and revenues.

Unlike productive units that belong to other transport industries such as the passenger liners, the cargo liners or the road haulage industries, tramp ships, bulk carriers, etc. — as has already been indicated — take as a rule full cargoes, that is to say they usually load to capacity. This makes it easier to discuss the effects of their growing size on their costs, for it can be assumed that they always load to capacity.

With the operation of larger vessels virtually all costs rise but at a smaller rate than that at which their cargo carrying capacity rises. Consequently, we get average costs falling as the size of ships increases. However, the rate of reduction of costs becomes progressively smaller as the size of ships increases. These very important points can be demonstrated by the following two examples:

a) From Tables 4 and 6 of the Appendix we can see that the average daily running expenses of a tramp ship of 8,200 t.d.w. are £ 180.0.4d. and the average daily running expenses of a tramp ship which is 2.000 tons larger, i.e. 10,200 t.d.w., are £ 221.7.0d. If we assume that both ships have the same speed and they are loaded «full cargoes» of the same kind for the same voyage (i.e. that the first ship has taken 7.800 metric tons and the second ship about 9,700 metric tons) we will see that the average running expenses per ton per 24 hours of the first ship were $5\,^3/_4$ d. approximately and the average running expenses per ton per 24 hours of the second ship were $5\,^1/_2$ d. approximately.

b) Table II is based on the data contained in par. XI of this study with regard to building and operating costs of bulk carriers of different sizes. This table and particularly the two columns which show the differences in building and daily operating costs as the size of the bulk carrier increases offer a clear indication to the effect that as the size of vessels increases costs are reduced but such reductions become progressively smaller [1].

1. For the same point with regard to tankers see: Hitachi Zosen's, «Economical Mammoth Tanker» (150,000, 200,000, 250,000, 300,000 t.d.w.) published by Hitachi Shipbuilding and Engineering Co. Ltd. Japan.

TABLE II

Costs and the Size of Cargo Ships

Total Deadweight Capacity	Building cost per ton d.w.	Difference in Building cost per ton d.w.	Cost of operation per day	Difference in daily operating costs
15,000	65		290	
30,000	50	15	375	85
50,000	45	5	500	125
80,000	42	3	600	100

X. Costs in Relation to the Speed and Size of Ships

We think that, before discussing the benefits of larger and faster ships, it will be advisable to make a few comments with regard to the speed of tramps and other cargo ships [1].

It may be recalled that in Chapters I and III we have given details with regard to increases in the average size and speed of ships. From the data contained in these Chapters as well as from the relative information that is freely circulating in the shipping world we can conclude that the speed of tramps and other cargo ships has increased within reasonable limits but not in proportion to their size. For example, the average speed of Liberty ships (which have a d.w. tonnage of about 10,000) is 11 knots but the average speed of bulk carriers with a d.w. tonnage in the neighbourhood of 20,000 or more is not 22 knots.

In order to discuss this point it will be necessary to abstract for the moment from fuel consumption costs as well as costs in respect of repairs, maintenance and spare parts.

To increase the speed of a ship its power must also increase. However, power and speed fo not increase in the same proportion. The H.P. power required increases per cube of speed. For example, if we had a tramp ship with a speed of 10 knots for which, let us say, 2000 horsepower was needed, in order to double its speed, i e. to make it 20 knots, we will be needing horsepower 23 $= 2 \times 2 \times 2 = 8$ of the horsepower which corresponds to the 10 knots, i.e. $8 \times 2000 = 16{,}000$ horsepower. Needless to say that this example has no practical value. No entrepreneur would see any purpose in considering such a costly conversion.

1. For simplicity's sake throughout this paragraph we will assume a static technological level.

Let us now assume that we wanted to increase the speed of a relatively small tramp of 10 knots (with horsepower 20000) by 10 per cent, i.e. from 10 knots to 11 knots. In such case we would be needing an increase in horsepower of 33 per cent, that is to say, horsepower would have to be increased to 2660.

Briefly speaking, the power required increases in much greater proportion than speed. This is one of the basic reasons why small tramp ships have engines which produce smaller speeds. Apart from the higher building costs involved more powerful engines are heavier and, also, they require more space which otherwise can be used for the stowage of cargo [1].

Consequently, costs per ton mile increase sharply. Thus, in the case of the relatively small tramps speeds which are higher than the average are not an economic proposition.

It should be stated at this point that from the information available it appears that building costs of engines do not increase in proportion with the power of the engine provided the type of the engine is not changed.

The building cost of a more powerful engine per horsepower is smaller than the cost of a less powerful engine per horsepower of the same type.

Having stated that an increase in the speed of a tramp above the average would result in high costs of operation per ton mile, we may now discuss the question of the increase in the speed of tramps and other cargo ships in relation to the increase in their size.

The increase in the size of a vessel (that is to say the increase of its displacement and, thus, of its deadweight) does not have such «negative» effects regarding horsepower and costs as the increase in speed. It is for this reason that, as stated at the beginning of this paragraph, the increase in the speed of cargo ships is not in proportion to the increase in their size. For example, the T2 type of tankers had a deadweight tonnage of 16,700 tons and a service speed of 15 knots with 6000 S.H.P. Larger tankers presently in existence with, roughly, the same type of engine and with a deadweight tonnage of 34,000, have a service speed of about 16 knots with 15,000 S.H.P. [2].

1. The problem of the space occupied by the engines is a real one in the case of passenger liners where high speeds are required.

2. All vessels compared have steam turbined engines. The tankers we have in mind so far as the above comparison is concerned are «ROKOS V», steam turbines, Liberian, built 1956. GRT 21,028 NRT 13,060, and «SAVINA», steam turbines, built 1956, GRT 21,081 NRT 12,842.

Let us now give another specific example which demonstrates quite clearly how costly is the increase of speed in the case of relatively small ships. For the s.t. «APOLLONIA» a passenger ship, whith a dispalacement of 5,500 tons S.H.P. 12,000 is required in order to develop a speed of 22 knots. In order words, the horsepower needed in the case of the s.t. «APOLLONIA» in order to develop 22 knots is approximately the same which is needed for tankers with a displacement of about 43,000. This in spite of the fact that the s.t. «APOLLONIA» has been much better designed than the tankers under consideration for developing high speeds.

On the basis of the foregoing we may state that large speeds are not an economic proposition in the case of relatively small ships and that for this reason the speed of cargo ships increases within «reasonable» limits as their size increases.

> «a better economic proposition is the fact that the larger a ship of a given economical shape the faster the ship can travel. For all practical purposes it is an established fact that the smaller ships cannot go as fast» [1].

Let us now give a bird's eye view on consumption, labour, and spare part costs in relation to the increase in the size and speed (within reasonable limits) of tramps and other cargo vessels.

The data contained in the Appendix and, more specifically in Tables 14, 1 and 4 shows that labour, repair, maintenance and spare part costs increase as the size and speed of cargo vessels increase but at a smaller rate than that at which their cargo carrying capacity rises. Consequently, up to a certain point we get average costs falling as the size and speed of vessels increase. For example, Table 14 (Appendix) shows that the number of engine room personnel employed by shipping firms operating cargo ships under the Greek Flag rises as their cargo carrying capacity and speed [2] rise but that such rises become progressively

1. The source of this quotation is a television script written by Mr. G. Prys-Williams of the L.S.E.

2. In discussing the data contained in this table the following points should be borne in mind :

a) The figures under consideration are realistic so far as steam reciprocating and steam turbine engines are concerned and, therefore, they may be used as a rough guide for our purpose.

b) On the basis of the information given in Chapters I and III it may be safely assumed that as the size of vessels increases their speed also increases within reasonable limits. Thus, it were be assumed that the larger vessels of Table 14 are of higher speed.

smaller. Tables 1 and 4 (Appendix) show the running expenses of two vessels under the Greek Flag with steam reciprocating engines. As can be seen from the tables, the deadweight tonnage of the first tramp is 6,400 and its average service speed 7 knots. The d.w. tonnage of the second tramp is 8.200 and its average service speed is 10 knots approx. The cost of repairs and maintenance of the first ship average £ 16 per day and for the second £ 17 per day. The cost of stores and spare parts for the first tramp average £ 15 per day and for the the second £ 19 per day.

Inasmuch as we can judge from the example given below the position in respect of fuel consumption costs is not the same.

Two vessels with similar technical characteristics have been compared. Vessel A has a d.w. tonnage 9,400, average service speed 10.5 knots with a fuel consumption 10 tons per 24 hours. Vessel B has a d.w. tonnage 11,200, average service speed 14 knots with a fuel consumption 16 tons.

Under the circumstances, the cost of fuel consumption per ton mile for vessels A and B will be as hereunder :

$$\frac{\text{Consumption per 24 hours}}{\text{tons (d.w.)} \times \text{miles per 24 hours}} = \frac{10.0}{9400 \times 10,5 \times 24}$$

or in pounds :

$$= \frac{10 \times 2240}{9400 \times 252} = \frac{22400}{9400 \times 252} = \text{about } 0,0094 \text{ lbs fuel}$$

per ton mile.

Vessel B consumption per ton mile =

$$= \frac{16 \times 2240}{11200 \times 14 \times 24} = \frac{35840}{3,763,200} = 0,0095 \text{ lbs fuel per ton mile.}$$

Tramps A and B are comparable because they have the same type of engines (i.e. diesel engines. In fact, the engines of both ships that we have in mind were built by Doxford and Sons Ltd., U.K.). If two tramps with different types of engines were compared, or in other words, if we were assuming that vessel A had steam reciprocating engines, then our calculations would have shown that fuel consumption costs per ton mile would have been more in the case of vessel A. However, such a comparison would have demonstrated the effects of technical progress and not the effects of the increasing size and speed of cargo ships with regard to the costs of fuel consumption [1].

It is risky to generalise on the basis of one example. However, if we also take into consideration the information available in this respect we can state that the pattern followed by fuel consumption costs as the size and speed of vessels increases is not the same with the one of building labour repair parts and maintenance costs. As the size and speed of vessels increases fuel consumption costs tend to become higher.

Having made these comments on the size and speed of vessels in relation to their costs we can now proceed to discuss the benefits of larger and faster ships.

XI. The Benefits of Larger and Faster Ships

We have already pointed out that up to a certain point as the cargo carrying capacity and speed of tramps and other cargo ships increase costs go up but not proportionately. This is due to the following:

a) Reduced building costs per ton deadweight (see Table 2).

b) The number of officers, engineers and crew increases slightly with the increase of the ships size and speed and certainly far less than in proportion (see Table 14 Appendix).

c) Costs of stores, provisions, spare parts, repairs and maintenance increase as the size and speed of vessels increase but far less than in proportion (see, for example, Tables 4 and 11, etc. Appendix).

d) Lower port expenses per G.R.T. or N.R.T. (see for example Table 12 Appendix).

e) Lower management and insurance costs (see Tables in Appendix).

Mr. C.F.H. Cufley, in his article on the «Trends in the Bulk Trades» is making an attempt to demonstrate the significance of the increase in the cargo carrying capacity of vessels so far as costs concerned [2]. We think that some of his points are of interest to the student of the economics of transport and, therefore, worthwhile mentioning at this stage.

The figures that follow (which are taken from the above article)

1. For a technical discussion regarding the relation of speed, horsepower and concumption see Reed's Practical Mathematics for Marine Engineers (eighth edition), particularly pp. 447 and 947.

2. See C.F.H. Cufley, «Tends in the Bulk Trades, Their Effect on Ships, Ports and Location of Industry» in the «Syren and Shipping» July 3, 1963.

illustrate the extent to which sea transport costs can be reduced by increasing the deadweight tonnage of ships. In each case the example chosen are motor vessels of 14-14 $^1/_2$ knots average working speed. The building costs represent a rough average of current prices «leaving aside the extremes of £ 160 per ton d.w. recently paid for a 100-ton dry-cargo ship and a reported price of less than £ 38 a ton for a 130,000-ton tanker». It is assumed, quite realistically, that the operational costs would show little variation between tankers and dry-cargo bulk-carriers. In addition to crew expenses, stores, spare parts, provisions and insurance the figures below which are «based on operation under traditional European maritime flags» include an adequate allowance for management and proper reserves for maintenance and repairs including classification surveys:

Total Deadweight Capacity	Building Cost per ton d.w.	Operational Cost per day
15,000	£ 65	£ 290
30,000	50	375
50,000	45	500
80,000	42	600

As the author of the article points out, the benefits that accrue from the lower capital and operational costs of larger vessels can be most easily shown by time-charter comparisons which eliminate the complications arising from voyage expenses (i·e. loading and discharging expenses, bunkers, time spent in port, etc.). The break-even hire rate, indicated below, per ton of total d.w. per month allows fully for operational expenses and for each vessel to be «off hire» for repairs, survey, etc. for a rather «generous» average period of 30 days in the year.

Deadweight tonnage	Hire rates Break-even	Required to provide for: + 3 % p.a.	+ 10 % p.a.
15,000	12s.10d.	18s. 9d.	24s. 8d.
30,000	8s.3$^1/_2$d.	12s.10d.	17s. 4$^1/_2$d.
50,000	6s.8d.	10s. 9d.	14s.10d.
80,000	5s.0d.	8s.10d.	12s. 8d.

It goes without saying that no shipping firm owning units below 14,000 t.d.w. that follows the policy of maintaining its tonnage in good condition, can possibly agree to conclude time-charter agreements even at the maximum break-even rate indicated below.

It would have been gathered that the cost of fuel is not included in the above figures. The reason for this, according to Mr. Cufley, is that unlike the advantages which derive from lower capital and running costs, the reduction in fuel bills which accompanies increased ship tonnage only applies while the vessel is at sea. Maximum benefit from this factor can only be obtained if loading and discharging facilities are speeded up proportionately to the growth in the ships' size. The figures below assume this to be the case [1]. Allowance is made for 65 days per annum in port loading and discharging, 270 days at sea and 30 days out of service. Diesel propulsion is again chosen (steam turbine fuel costs would have been 80–100 per cent higher) and an optimum speed of 14 knots. It is further assumed that the motors burn ordinary heavy fuel oil which is priced at an average of £ 5 per ton. Each ship carries nine full cargoes yearly and allowance has been made for carrying capacity lost by reason of the weight of bunkers and extra weights :

Ship Tonnage (Total d.w.)	Daily fuel Consumption	Annual Lifting	Fuel cost per ton cargo
15,000	23 tons	120,000 tons	5s.5d.
30,000	41 tons	242,000 tons	4s.8d.
50,000	55 tons	412,000 tons	3s.8d.
80,000	75 tons	663,000 tons	3s.1d.

Needless to say that had Mr. Cufley assumed that the gradual increase of the cargo carrying capacity of the ships was also accompanied by a gradual increase in their speed within reasonable limits the economies indicated above would have been further increased.

In order to be able to understand fully the benefits resulting from the operation of larger and faster ships, we will assume momentarily that, the services offered by the tramp shipping industry are highly substitutable.

Such benefits are not basically different from those that are derived from the construction of more and better roads [2]. More and better

1. The assumption that an 80,000 t.d.w. bulk carrier can be turned round in the same time as 15,000 t.d.w. tramp is not realistic, at least so far as the present is concerned. It is quite safe to assume that the 15,000 t.d.w. tramp can be turned round at 65 days per annum and that the length of time in port for the 80,000 tonner will be greater but not in proportion to its size. Thus, in our view Mr. Cufley's figures in this respect should be accepted only as a rough guide.

2. See : G. J. Ponsonby : «Pinpointing the benefits of more and better Roads», in «Road International». Winter 1956–1957.

roads lead to cheaper and faster transport of goods by road. Larger and faster ships lead to cheaper and faster transport by sea.

Due to the fact that modern, larger and faster cargo ships produce their service at a lower cost, such ships are able to carry bulk commodities at lower freight rates. As a result of lower freight costs the price of bulk commodities in the countries of consumption is lowered and all buyers benefit accordingly. In addition, as a consequence of the fall in price at the importing countries more of the bulk commodity is bought in the long-run. Not only will previous buyers at the importing countries buy more but in the long-run new buyers at the same or different geographical locations, who previously did not buy the commodity at all owing to its high price or unavailability, will now come to enjoy its purchase and consumption. Thus, assuming that no other factor interferes to offset the effects of the reduction of sea transport cost in the long-run, the foundations are laid for the opening up of new markets and for the extension of the world tramp freight market.

Another important consequence of reduced sea transport costs is to stimulate and encourage production, possibly at a lower cost (if intensive agriculture is not involved) at the country of export. Thus, larger and faster ships reduce the real cost of production of bulk commodities and, through prices, the cost of living too.

The chain of events does not end at the exporting country. As we know, tramp ships and bulk carriers transport mostly raw materials. The factory or group of factories at the importing country that may use the raw materials in question, whether pre, coal or grain, will produce more — up to the point of diminishing returns — and the manufacturer will be able to realise more fully the benefits of large-scale production. Thus, the cost of production of the various finished products for which the commodity in bulk is used as well as their ultimate price to the consumer will stand to fall. At the end even the location of factories and ports may be questioned. This secondary benefit in the case of larger ships is, we think, well demonstrated by the following hypothetical example given in Mr. C.F.H. Cufley's article [1].

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1. See : C.F.H. Cufley, «Trends in the Bulk Trade» in «System and Shipping» July 3, 1963, p. 57. Again it should be stated that the figures under consideration should be taken as a rough guide. Needless to say that for any detailed study regarding this important point the extra costs on shore and/or transhipment costs in the case of larger cargoes must be taken into account.

«Assuming that a country has an annual import programme for a particular commodity, e.g. grain or ore, to the order of 10 m. tons and that the average length of voyage is 10,000 miles, of which one-half is ballast steaming, the net carrying costs, allowing for 5 per cent depreciation per annum, bunkers (diesel) and despatch at the rates presently given to such cargoes in major ports, will work out to something like the following overall amounts :

Shipment in cargoes of 10,000 tons ... £ 20 m.
Shipment in cargoes of 30,000 tons ... £ $11^1/_2$ m.
Shipment by cargoes of 80,000 tons ... $7^1/_2$ m.»

It would seem that the economies made possible by the advent of the medium and large sized bulk carrier are of a considerable magnitude and that the sums involved are large enough to warrant the construction of new cry-cargo bulk terminals and a rationalisation of distribution methods similar to that carried out by the petroleum industry in recent years.

Furthermore, it can be maintained that the bigger and faster ship, if used effectively, may even call for the re-siting of industrial plants, on the seaboard, to the detriment of established enterprises in the hinterland. This point is brought out very well by the French shipping financier Monsieur André Verneuil [1].

Monsieur Verneuil takes as his illustration the steel industry tracing its origin from the ironmasters who set up their forges in forests where they could obtain charcoal and water power for their hammers, as in the «Devil» country of Surrey. After explaining how they were driven out of business after the eighteenth century by the use of coke in the furnace charge and the discovery of ore deposits close to the coalfields he suggets that the next step is, so far as Europe is concerned, the abandonment of those steelworks in favour of new plants adjacent to deep water. Monsieur Verneuil rightly stresses how the advantages of the big bulk carrier can be dissipated by excessive cargo handling and inland transport charges, points to the cheap freights at which high-grade foreign ores can be imported and suggests that in many cases it is cheaper to use foreign coals rather than pay high haulage costs involved in bringing domestic fuel to the seaboard. His article, which calls for serious attention by the student of the economics of transport, concludes with an imposing list of new steelworks designed to operate on imported

1. See : André Verneuil, «Seaboard Steel Industry and Shipping» in «Journal de la Marine Marchande et de la Navigation Aerienne» 1963.

raw materials in France, Holland, Germany and Italy, and also singles out for praise the Richard Thomas and Baldwins projetc in the Bristol Channel. Needless to say that in the event of such serious economic changes many other factors will have to be taken into consideration, one of them being the cost of inland transport of the finished product from the seaboard to the market.

It will be recalled that throughout this discussion we have assumed that the services offered by the tramp ship are highly substitutable and also that no other factors interfere in the long-run to offset the effects of the reduction of transoceanic transport costs.

As we know the actual position is somewhat different. Tramp shipping services are moderately substitutable and it will therefore be erroneous to assume that the modern large-sized bulk-carrier can replace the average tramp on all trading routes. Furthermore, we have seen that the demand for tramp shipping facilities is capable of varying sharply in a given point of time whilst supply cannot expand or contract in the short-run. Thus, there are relatively short periods during the course of which the average level of freight rates tends to be high. As a result, freights on some of the trading routes tend to become «prohibitive» and, thus, the world tramp freight market tends to narrow over relatively short periods of time.

However, irrespective of these short and mid-run developments the present picture of the world tramp freight market mechanism offers many examples which prove beyond any doubt that in the long-run on many trading routes where the tramp is substitutable by larger and faster ships the chain of events that were described above is well under way.

In view of the competitive structure of the tramp freight market as costs tend to decrease in the long-run average freight rates also tend to become lower.

Thus, where the flow of traffic justifies the use of larger and faster tramps and bulk carriers costs and freights per ton-mile tend to be lower than where the flow of traffic is only adequate to justify the use of tramps of smaller dimensions. Looking at the present picture of the world tramp freight market mechanism we may mention for instance the Vancouver (Far East (grains), South Africa (Japan (grains or ore) and Australia (Japan or China (ore and grains) trading routes where freights are, as a rule, on a remunerative level only so far as large tramps and bulk carriers are concerned, and on the other hand, the Mediterranean (U.K.) North Sea route where freights are on a relatively higher level and, therefore, remunerative so far as the small tramps are concerned. As is known in the latter route the flow of traffic is inadequate to justify the use of larger units. As a matter of fact, on such routes tramps which are smaller but faster than the average 10,000 t.d.w. 11 knots are preferred.

We may therefore safely conclude that wherever the flow of traffic justifies the use of larger and faster ships we get, in the long-run, costs falling.

XII. General Remarks

In closing it must be emphasized that the level of the operating costs of cargo vessels is also affected by the following two factors :

1. The «Flag», that is to say the country of registration of the vessel.
2. The age of the vessel.

As is well known, factor I is connected with the thorny question of Flags convenience. Indeed a thorough discussion of the question would pre-suppose the writing of another article. Thus all that can be mentioned at this stage is that, as a rule, labour costs tend to be higher in the case of maritime nations with advanced industrial economics than in the case of those with underdeveloped economies.

The position with regard to Factor 2 is not different from the one in respect of units of inland transport industries. As the age of the vessel advances its running costs become higher.

The various tables contained in Appendix A aim at giving an accurate idea with regard to the actual position of the operating costs of tramp ships. These Tables are based upon data collected from several shipping firms in London, Athens and Piraeus, with a relatively long history in the industry. Inasmuch as we could judge, all the firms under consideration were following the policy of maintaining well their fleets.

Information in respect of costs is not circulating freely in the shipping world. Thus, whilst wefelt it to be our obligation to make the facts known to the academic world, on the other hand, in view of the above, we are morally bound not to disclose the firms under consideration.

APPENDIX

TRAMP SHIPPING COSTS

TABLE 1

Daily Running Expenses of a Tramp Ship (during 1955)
G.R.T. 3553, N.R.T. 2159, 6400 t.d.w. Built 1922. Greek Flag.

Crew Expenses :		
Wages	£ 45.10. 0	
Overtime	5. 0. 0	
Greek Seamen's Pension Fund	4.10. 0	
Victualling	10.17. 6	
Repatriation etc.	10. 0	£ 66. 7. 6
Stores and Spares :		
Deck, Engine and Cabin	15. 0. 0	15. 0. 0
Insurance :		
Hull, machinery, etc.	22. 0. 0	
Club : Calls, plus unrecoverable items	7. 4. 5	29. 4. 5
Repairs and Maintenance :	16. 0. 0	16. 0. 0
Management :		
Office, Superintendent Engineer and incicidentals	7. 0. 0	7. 0. 0
		£ 133.11.11

TABLE 2

Daily Running Expenses of a Tramp Ship (during 1959)
G.R.T. 5205, N.R.T. 3000, 9800 d.w.t. built 1939. British Flag.

Crew Eexpenses :		
Vages	£ 49. 4. 0	
Sundays at sea and leave	8.10. 0	
National Health Insurance	1.14. 0	
Merchant Navy Officer's Pension Fund	1. 0. 0	
Bonus	2.10. 0	
Overtime	5. 0. 0	
Allowance for stand by wages and sick pay whilst at U.K.	1.10. 0	
Repatriations etc.	1. 0. 0	
Victualling	£ 17.10. 0	£ 87.18. 0
Stores and Spares :		
Deck, Engine and Cabin	18. 0. 0	18. 0. 0
Insurance :		
Marine Insurance on hull and machinery, etc.	40. 5. 6	
P and I Club Calls and unrecoverable items	6. 0. 0	46. 5. 6
Management :		
Office Expenses	3. 0. 0	
Superintendent Engineer	3. 5. 0	6. 5. 0
Incidentals and Sundries :	2. 0. 0	2. 0. 0
		£ 160. 8. 6

TABLE 3

Daily Running Expenses of a Modern Tramp during 1960.
G.R.T. 7960, N.R.T. 5165, D.W. 11,500. Built 1957. British Flag.

Crew Expenses :		
Wages	£ 62.17. 6	
Sundays and leave pay	9.10. 0	
National Health Insurance	2. 8. 0	
Merchant Navy Officer's Pension Fund	1. 0. 0	
Bonus	5.10. 0	
Overtime	4. 0. 0	
Allowance for stand by wages and sick pay whilst at U.K.	1.10. 0	
Repatriation	1.10. 0	
Victualling	18. 0. 0	£ 106. 5. 6
Stores and Spares :		
Deck, Engine, Cabin	21. 0. 0	21. 0. 0
Insurance :		
Marine Insurance (Hull and Machinery)	35.15. 0	
Club Calls and unrecoverable items from Club	7. 0. 0	42.15. 0
Maintenance and Repairs :		
Allowance for maintenance and repairs including annual and special survey		25. 0. 0
Managemnt :		
Office expenses	3. 0. 0	
Superintendent Engineer	3. 5. 0	6. 5. 0
Incidentals and Sundries :		2. 0. 0
		£ 203. 5. 6

TABLE 4

Daily Running Expenses of a Tramp Ship (during 1952)
G.R.T. 5173, N.R.T. 3192, 8200 d.w.t. Built 1919. Greek Flag.

Crew Expenses :		
Wages, overtime and bonus for extra work	£ 74. 9. 4	
Greek Seamens' Pension Fund	6. 0. 0	
Repatriation Expenses	1. 0. 0	
Master's expenses in ports	16. 0	
Victualling 36 men per 10/- per person...	18. 0. 0	£ 100. 5. 4
Stores and Spares :		
Deck, Engine and Cabin	19. 0. 0	19. 0. 0
Maintenance and Repairs :	17. 0. 0	17. 0. 0
Insurance :		
Marine Insurance on hull and machinery, etc.	25.15. 0	25.15. 0
P and I Club : Calls, franchise, unrecoverable items, deserters, detainees, etc. .	11. 0. 0	11. 0. 0
Management :		
Management	3.10. 0	
Superintendent Engineer	2. 0. 0	5.10. 0
Incidentals :	1.10. 0	1.10. 0
		£ 180. 0. 4

TABLE 5

Daily Running Expenses of a Tramp Ship (during 1955)
G.R.T. 8251, N.R.T. 4639, 11,500 t.d.w. Built 1954. Liberian Flag.

Crew Expenses :		
Wages	£ 51. 0. 0	
Overtime	7. 0. 0	
Bonus for extra work	1. 0. 0	
Crew Repatriations etc.	1.10. 0	
Victualling	22.10. 0	£ 83. 0. 0
Stores and Spares and El. Equipment :		
Deck, Engine and Cabin	20. 0. 0	
Electronic Equipment	3.15. 0	23.15. 0
Insurance :		
Marine, hull, etc.	30.16. 0	
P and I Club: Calls and unrecoverable items	10. 0. 0	40.16. 0
Maintenance and Repairs :	20. 0. 0	20. 0. 0
Management :		
Office	3. 0. 0	
Superintendent Engineer	2. 0. 0	5. 0. 0
Incidentals	1. 0. 0	1. 0. 0
		£ 173.11. 0

TABLE 6

Daily Running Expenses of a Tramp Ship (during 1957 Liberty type) G.R.T. 7174, N.R.T. 4322, D.W. 10,200 Built 1943. Greek Flag.

Crew Expenses :		
Wages, including overtime and bonus for extra work	£ 75. 0. 0	
Greek Seamen's Pension Fund	5.10. 0	
Victualling	17.12. 0	£ 98. 2. 0
Stores and Spares Parts etc. :		
Deck, Engine and Cabin	25. 0. 0	
Electronic Equipment	3.15. 0	28.15. 0
Insurance :		
On hull, machinery, etc.	43.10. 0	
Club : Calls, plus unrecoverable items	18. 0. 0	61.10. 0
Maintenance and Repairs :	25. 0. 0	25. 0. 0
Management :		
Office	3.10. 0	
Superintendent	3.10. 0	
Incidentals and sundries	1. 0. 0	8. 0. 0
		£ 221. 7. 0

TABLE 7

Daily Running Expenses of a Tramp Ship (during 1959)
G.R.T. 7690, N.R.T. 5637 and about 10,200 t.d.w. built 1950.
British Flag.
(British officers Hong-Kong Chinese crew).

Creaw Expenses :		
Wages	£ 53. 0. 0	
Sundays at sea and leave	11. 0. 0	
National Health Insurance	2. 8. 0	
Merchant Navy Officer's Pension Fund	1. 0. 0	
Bonus	2.10. 0	
Overtime	5.12. 0	
Allowance for stand by wages and sick pay whilst at U.K.	1.10. 0	
Repatriations	1. 0. 0	
Victualling	21. 0. 0	£ 99. 0. 0
Stores and Spares :		
Deck, Engine and Cabin	18. 0. 0	18. 0. 0
Insurance :		
Marine Insurance on hull and machinery, etc.	28. 0. 0	
P and I Club : Calls and unrecoverable items	6. 7. 0	34. 7. 0
Maintenance and Repairs :	30. 0. 0	30. 0. 0
Management :		
Office Expenses	3. 0. 0	
Superintendent Engineer	3. 5. 0	
Incidentals and Sundries	2. 0. 0	8. 5. 0
		£ 189.12. 0

TABLE 8

Daily Running Expenses of a tanker ship (during temporary entry into the tramp freight market — 1960) G.R.T. 12,100, N.R.T. 7020,18.600 t.d.w. Built 1953. British Flag.

Crew Expenses :		
Wages	£ 69. 4. 0	
Additional crew or labour expenses for gas freeing and preparing vessel to load grain	5. 0. 0	
Sundays at sea and leave pay	18.11. 3	
Merchant Navy Officer's Pension Fund	1. 5. 0	
National Health Insurance	2. 8. 0	
Bonus	4. 0. 0	
Overtime	5.10. 0	
Allowance for stand by wages, sick pay, etc.	1.10. 0	
Crew Repatriations	1.10. 0	
Victualling	22.10. 0	£ 131. 8. 3
Stores and Spares :		
Deck, Engine and Cabin	25. 0. 0	25. 0. 0
Insurance :		
Insurance on hull and machinery, etc.	44. 0. 0	
P and I Club : Calls and unrecoverable items	10. 0. 0	54. 0. 0
Management :		
Office	2.10. 0	
Superintendent Engineer	3.10. 0	6. 0. 0
Maintenance and Repairs :	60. 0. 0	60. 0. 0
Incidentals and Sundries	2. 0. 0	2. 0. 0
		£ 278. 8. 3

TABLE 9

Monthly Expenses of a T2 tanker laid up (during 1958) G.R.T. 10,400, N.R.T. 6300, 16,500 t.d.w. Greek Flag.

Crew Wages, 5 men	£ 248. 0. 0	
Freek Seamen's Pension Fund	19.17. 0	
Victualling at 8/6 per man per day ...	63.15. 0	
Insurance :		
Port Risks and Club Calls	149. 3. 0	
Stores	45. 0. 0	
Nightwatchman, Agency and Sundries .	65. 0. 0	
Radio Maintenance and Radar Rental maintenance	35.12. 0	£ 626. 7. 0

i.e. £ 20.17.6 per day or £ 7,516.0.0. per annum.

TABLE 10

Approximate Daily Running Expenses of a Bulk Carrier 25.000 t.d.w. built 1964 under Greek Flag.

Crew Expenses :		
Wages, including bonus, overtime, etc...	£ 115. 0. 0	
Victualling 45 men per 10/- each	22.10. 0	
Greek Seamen's Pension Fund-Owners contribution	11. 0. 0	
Crew travelling expenses	3. 0. 0	
Master's expenses in port	7. 6	£ 151.17. 6
Insurance :		
Hull, Machinery and Freight	40. 0. 0	
P and I Club, plus allowance for franchise and unrecoverables and War Risks	20. 0. 0	60. 0. 0
Wireless :		
Rental/Maintenance, wireless and radio supplies		2. 5. 0
Stores and Spare Parts :		35. 0. 0
Maintenance and Repairs :		
Allowance for Special and annual surveys	30. 0. 0	
Other Repairs and drydockings	9. 0. 0	39. 0. 0
Management :		
Office	5. 0. 0	
Superintendent Engineer, etc.	4. 0. 0	9. 0. 0
Total ...		£ 297. 2. 6

TABLE 11

Daily Running Expenses of a 31.500 t.d.w. Modern Bulk Carrier (Diesel Sulzer Engines) under the Greek Flag, 1966.

Crew Expenses :		
Wages and Overtime	£ 117. 0. 0	
Pension Fund, etc.	14. 0. 0	
Repatriations and Substitutions	3. 0. 0	
Victualling	23. 0. 0	£ 157. 0. 0
Insurance :		
Hull Machinery and Freight	49. 0. 0	
War Risk, P and I Club and non-recoverable items	28. 0. 0	77. 0. 0
Maintenance and Repairs :		
Repairs	40. 0. 0	
Spares	24. 0. 0	
Stores	50. 0. 0	114. 0. 0
Management :		
Office expenses and Superintendence ...		11. 0. 0
Total ...		£ 359. 0. 0

TABLE 12

Port Charges and the Size of Vessels
re : Port of Genoa

Pilotage:

For the first 500 gross tons (minimum compulsory charge Lit. 2,100

From	501	to	1,000	gross tons ... »	2.60 per gross tons
»	1,001	»	3,000	» » ... »	1.85 » » »
»	3,001	»	5,000	» » ... »	1.70 » » »
»	5,001	»	7,000	» » ... »	1.25 » » »
»	7,001	»	9,000	» » ... »	1.05 » » »
»	9,001	»	10,000	» » ... »	0.55 » » »
over	10,000			» » ... »	0.15 » » »

Mooring and unmooring service :

	Vessel's G.r.t.				Mooring or unmooring		Shipp Shifting (2 operations) (unmooring and mooring)	
From	0	to	250	g.r.t.	Lit.	760	Lit.	1,370
»	251	»	500	»	»	3,020	»	4,620
»	501	»	1000	»	»	4,620	»	6,830
»	1001	»	2000	»	»	6,120	»	8,400
»	2001	»	3000	»	»	7,260	»	9,110
»	3001	»	5000	»	»	8,390	»	11,310
»	5001	»	7500	»	»	10,090	»	13,190
»	7501	»	10000	»	»	11,520	»	14,640
»	10001	»	15000	»	»	12,880	»	18,140
»	15001	»	20000	»	»	15,930	»	21,910
»	20001	»	30000	»	»	21,900	»	25,670
»	30001	and over			»	25,560	»	29,960

Towage:

From	0	up	to	500	gross	tons	...	Lit.	7,000
»	501	»	»	800	»	»	...	»	9,000
»	801	»	»	1,200	»	»	...	»	11,000
»	1.201	»	»	2,000	»	»	...	»	16,000
»	2,001	»	»	3,000	»	»	...	»	23,000
»	3,001	»	»	4,500	»	»	...	»	29,000
»	4,501	»	»	6,000	»	»	...	»	36,000
»	6,001	»	»	8,000	»	»	...	»	44,000
»	8,001	»	»	10,000	»	»	...	»	57,000
»	10,001	»	»	13,000	»	»	...	»	68,000
»	13,001	»	»	16,000	»	»	...	»	80,000
over	16,001				»	»	...	»	88,000

Source: «Italy: Port Expenses and Information» published by the Mediterranean and Overseas Shipping Agency S.p.A., Genoa. For more details in connection with port charges see: «Ports of the World» thirteenth edition, edited by Sir Archibald Hunt. «Shipping World» No. 1.

TABLE 13

Wages of an Able Seaman on vessels under British Flag.

National Standard Rates of Pay of an Able Seaman (monthly rates with free food applicable to crews signing on in the United Kingdom under Ministry of Transport Articles)

Rates effective from :

1 January	1938	£ 9.12. 6	
15 September	1939	12.12. 6	including £ 3 war bonus
1 March	1940	15.12. 6	» £ 5 » »
1 January	1941	17.12. 6	» £ 5 » » and £ 2 differential pay.
1 May	1942	22.12. 6	including £ 10 war bonus and £ 2 differential pay.
1 February	1943	24. 0. 0	including £ 10 war bonus but differential pay merged in basic pay.
1 April	1947	20. 0. 0	Plus «efficiant service pay» up to a maximum of £ 4 after four years' service.
1 March	1951	22. 0. 0	
28 January	1952	24. 0. 0	
25 January	1954	25.10. 0	
30 May	1955	27.10. 0	Plus 10/- for holding A.B.'s certificate; plus «efficient service pay» up to a maximum of £ 4 after 4 years' service.
14 May	1956	29.10. 0	
22 July	1957	31.10. 0	Plus 10/- for holding A.B.'s certificate; plus «efficient service pay» up to a maximum of £ 4. 5.0. after 4 years' service.
10 November	1958	33. 5. 0	
29 Auguste	1960	33.15. 0	
12 June	1961	35.15. 0	Plus £ 1.15. 0. Compounded compensation for Saturday afternoon at sea; plus £ 1 for holding A.B.'s certificate; plus «efficient service pay» up to a maximum of £ 4.10.0d. after 4 years' service.

Source: National Maritime Board Year Book.

TABLE 14

Size of Vessels and Number of Crew Employed

The Manning scale of well maintained tramp ships and bulk carriers belonging to Greek owners of 4501 tons d.w. and upwards is fixed as follows :

(A) Navigating Officers and Radio Officers :

Vessels Tons D.W.	Master	Chief Officer	Second Officer	Cadet	Radio Officer
4,501– 6,500	1	1	2	–	1
6,501– 9,000	1	1	2	–	1
9,001–13,000	1	1	2	1	1
13,001–17,000	1	1	2	1	1
17,001–30,000	1	1	2	1	1
30,001–40,000	1	1	2	1	1
40,001–	1	1	2	1	1

(B) Deck Ratings :

Vessels Tons D.W.	Boatswain	Carpenter	Sailors	Deck Boys
4.501– 6,500	1	–	7	–
6,501– 8,000	1	1	7	1
8,001–11,000	1	1	8	–
11,001–13,000	1	1	8	1
13,001–17,000	1	1	9	1
17,001–30,100	1	1	10	1
30,001–40,000	1	1	11	3
40,000–	1	1	12	4

(C) Engineers :

Vessels Tons D.W.	Chief Engineer	Second Engineer	Third Engineer	Elect-rician	Apprentice Engineer
4,501– 6,500	1	1	2	0	–
6,501– 8,000	1	1	2	0	–
8,001–11,000	1	1	2	1	1
11,001–13,000	1	1	3	1	2
12,001–17,000	1	1	3	1	2
17,001–30,000	1	1	3	1	3
30,000–40,000	1	1	3	2	4
40,000–	1	1	3	2	4

Engine Room Staff :

	Donkeygreaser.	Greasers	Firemen	Wipers
4.501– 6.500	1	1	3	0
6,501– 8,000	1	2	3	1
8,001–11,000	1	3	3	1
11,001–13,000	1	3	3	1
13,001–17,000	1	3	3	2
17,001–30,000	1	4	3	2
30,000–40,000	1	5	5	2
40,000	1	6	6	3

Catering Department :

	Chief Steward	Asst. Steward	Cook	Asst. Cook	Caterer
4,501– 6.500	1	1	1	1	–
6,501– 8,000	1	2	1	1	–
8,001–11,000	1	2	1	1	1
11,001–13,000	1	3	1	1	1
13,001–17,000	1	3	1	1	1
17,001–30,000	1	3	1	1	1
30,001–40,000	1	4	1	1	1
40,000–	1	4	1	2	1

Source: Greek Collective Agreements, and various Greek firms and officers.

TABLE 15

Wages and the Size of Vessels
(monthly wages of well maintained Greek Vessels 1962)

	10,000–13,999 t.d.w.		14,000–30,000 t.d.w.		30,000–40,000 t.d.w.	
	No.	Amount	No.	Amount	No.	Amount
Captain	1	£ 205	1	£ 220	1	£ 230
Chief Officer	1	100	1	110	1	110
Second Officer	2	150	2	160	2	160
Apprentice	1	20	1	25	1	25
Radio Officer	1	100	1	105	1	110
Chief Engineer	1	205	1	215	1	225
Second Engineer	1	100	1	105	1	110
Third Engineer	3	225	3	240	3	240
Electrician	1	90	1	100	2	150
Apprentice	2	70	3	105	4	140
Bosun	1	46	1	46	1	46
Carpenter	1	46	1	46	1	46
Sailor	8	336	9	378	11	462
Deck-boy	1	22	2	44	4	88
Donkeygreaser	1	48	1	48	1	48
Greaser	3	132	3	184	5	220
Wiper	2	70	2	70	3	105
Cook	1	60	1	75	1	90
Assistant Cook	1	30	1	30	2	60
Chief Steward	1	65	1	75	1	80
Assistant Cook	1	30	1	30	2	60
		£ 2,150		£ 2,411		£ 2,805

Source: Greek Collective Agreements and various Greek Firms and Officers.