THE STRUCTURE AND ECONOMIC IMPACTS OF MARITIME TRANSPORT IN KENYA

BY

G. M. MBAE MAETI

RESEARCH PAPER SUBMITTED TO THE DEPARTMENT OF ECONOMICS, UNIVERSITY OF NAIROBI, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN ECONOMICS.

JULY, 1985

This research paper is my original work and has not been presented for a degree in another University.

GILBERT M. M. MAETI

This research paper has been submitted for examination with our approval as University Supervisors.

PROFESSOR L. P. MUREITHI

DR. T. N. KIBUA

ACKNOWLEDGEMENTS

I am indebted to many people and institutions whose contributions either explicit or implicit enabled me to complete this study. They are indeed many and space would not allow me to mention them each by name.

My gratitude goes to the Kenya Ports Authority for giving me a generous study leave and taking care of my welfare in Nairobi. Then to my supervisors, Professor Mureithi and Dr. Kibua who gave me suggestions and comments and were patient to see me through. I am very grateful.

I must also record my gratitude to Mr. J. N. Mwanza of the Intergovernmental Standing Committee on Shipping (ISCOS) at Mombasa for the valuable information he provided to me and also the Kenya Customs and Excise Department for making available to me their documents.

Then there is of course my family, Margaret, Muthoni and Nyagah and all the rest in the extended family who could not readily get my company when the struggle was on.

Lastly, but not least my colleagues in the M.A. class with whom we shared the anxieties of approaching examinations and patiently had to bear with each other in Gandhi Memorial Library waiting for one's turn to read the recommended journal articles.

ABSTRACT

Title: The Structure and Economic Impacts of Maritime Transport in Kenya

Transport is one of the industries in the tertiary sector of the Kenyan economy. Maritime transport is a part of the transport industry and in Kenya it is the mode by which over 90 per cent of her international trade is conveyed.

This study is on manitime transport in Kenyan international trade. It examines the structure of the industry and attempts to find out the factors used in determining freight charges in the dry general cargo trade and their relative importance. Linear regression analysis results based on data collected over a period of six months suggest that value of cargo has the highest explanatory power among the other variables which are distance cargo is conveyed and its tonnage. Distance and tonnage are not significant in several trade zones.

It is also realized that the level of freight rates in the Kenyan trade is higher than in most parts of the world by comparisons with levels worked out by UNCTAD. This indicates some degree of overcharging and high possibilities of monopolistic behaviour by the shipping conferences operating here. It would result in Kenya incurring excessive costs on shipping her imports.

Finally estimates of excess costs paid by Kenya for her seaborne international trade are calculated and are found to be substantial. This implies that Kenya loses directly in the way of resource extraction by the amount of excess charges paid for the transport services. It also has negative effects because the prices of locally made products are higher in the local markets and also may not be competitive for export markets.

CONTENTS

TABLES

TABLES

CHAPTER ONE

INTRODUCTION

1.1 GENERAL

In many developing countries, there has been a tendency of placing considerable emphasis on industries which belong to the primary and secondary sectors of their economies in their development programmes. These industries include agriculture, mining and manufacturing among others. They are considered key industries because they lead to self sufficiency in food and industrial goods. The countries assume that their economic programmes are doing well if in successive years there are substantial growth rates recorded in these industries. They also assume that if they can exercise control on industries in the primary and secondary sectors by increasing local participation and applying appropriate measures on the foreign participation, they can maximise the benefits which accrue to fast growth and hence develop faster.

This notion has made some countries to place relatively less emphasis on tertiary sector industries such as transportation, banking, insurance and many aspects of general commerce.

The tertiary sector may be critical in determining who benefits most from the fast growth which may occur in the primary and secondary sectors of the economy depending on who runs it and how it is administered. In cases where a developing country abdicates its tertiary sector industries to foreign ownership and control, there is a likelihood

of considerable loss of benefits to the country inspite of increased output from the primary and secondary sectors when it has an open economy: In cases where inadequate attention is given to the tertiary sector industries such as transportation they pose serious bottlenecks if they are operated inefficiently even when participation is mainly local.

This paper is concerned with shipping which is part of the transportation industry. It is also referred to as maritime transport where carriage of goods is in the high seas. Maritime transport can be of a national or international character depending on whether the trade being conducted is of an inter-regional or international nature.

It has been established that maritime transport is the predominant mode of transport in international trade. According to O'Longhlin (1967),[1] 78 per cent of the worlds international trade in terms of weight, and 68 per cent in value terms, moves by sea. In the case of the African countries, according to Hilling (1970),[2] 94 per cent of the total external trade in value terms is conveyed through sea transport.

The fact that so much of international trade is conveyed through sea transport implies that maritime transport is crucial in its conduct and it is therefore important to study the manner in which this transport service is conducted.

This study focuses on international maritime transport in the Kenyan trade. Except for a small amount of coastal shipping among the coastal towns maritime transport in Kenya is international in character. Kenya is a typical developing country with very limited participation in maritime transport either in the ownership of vessels or in administration of its operations.

1.2 PROBLEM SPECIFICATION

Kenya depends quite heavily on external trade for sustaining her economy and also for her economic growth and development.

In 1978, the percentage of Kenya's imports to the Gross Domestic Product was 35.6 per cent. In the USA and Japan, the percentages were 10.6 and 19.8 respectively.[3] Kenya's ratio of imports to the GDP is therefore considerably high compared to the US which is a developed economy with some high level of self sufficiency. This high dependance on international trade implies that Kenya needs to be concerned about maritime transportation.

According to the East African Shipping Study[4] (1975), 97 per cent of the imports and 93 per cent of exports in East Africa are seaborne. Though there are no figures for Kenya separately the percentages may have risen since the closure of her common border with Tanzania in 1977 since a considerable proportion of her inter-African trade was lost.

The price of purchasing goods from one country to another includes among others the transport cost on conveying them from their source to destination. Assuming that the transport cost is not subsidized by any third party, its incidence will be shared by the supplier and the buyer according to the elasticity of demand on the buyer's side. If the elasticity of demand for the commodity transported is low the buyer will meet most of the transport cost while if it is high the seller will meet most of the transport cost. In cases of complete inelasticity or perfect elasticity, the buyer or seller respectively will meet the full transport cost.

Maritime transport in Kenya is almost solely conducted by foreign shipping companies which own ships and provide services worldwide. The market structure under which these shipping companies provide the transport services is of significant importance to her economy. If the market is monopolistic, it is possible for shipowners to overprice their services. This would have the effect of overpricing her imports reducing her exports earnings and thereby discouraging export.

Any type of imperfections in the market may also result in her losing the potential gains from trade since the demand for imports in Kenya is fairly inelastic while the overseas demand for her exports is fairly elastic. This is because her imports are essential goods such as machinery, spareparts and many industrial imports essential for basic consumption and also for economic development. On the other hand her exports are mainly agricultural products which have other substitutes or are easily available from other developing countries.

Since Kenya has no national shipping lines and has little control on the foreign owned shipping companies which provide maritime transport for her international trade, she could be at serious disadvantages from the point of view her import prices and earnings from her exports if the practices of these companies result in imperfect or monopolistic markets for transport services. This would constrain both the welfare of her people and also economic growth and development.

There has not been any serious study conducted on the subject of maritime transport in Kenya. This study attempts to do this and it is hoped that its findings will be of use to policy makers and also activate interest from other researchers who may wish to pursue the subject further.

1.3 OBJECTIVES OF THE STUDY

As indicated earlier, Kenya is heavily dependent on international trade which is mainly with countries where the predominant mode of carriage is maritime transport. Kenya possesses no national shipping lines and has no significant influence on the determination of freight rates paid for her imports and exports.

Because of the lack of any national shipping lines or any significant control over the conduct of foreign owned shipping lines which carry her trade, Kenya's external trade is likely to be significantly affected by the market behaviour of these foreign shipping companies to the extent that maximum benefits do not accrue to her nationals.

This study attempts to focus on the conduct of maritime transport in Kenya with the following objectives:

(i) Examine the structure of the shipping industry.

(ii) Identify the factors which determine freight rates charged in the Kenyan trade.

(iii) Examine whether there is overpricing of maritime transport services by making comparisons with other region

(iv) Assess some economic impacts which the existing structure of maritime transport imposes in the Kenyan economy.

1.4 ORGANIZATION OF THE STUDY

This paper is organized into six chapters. The first chapter is Introduction which sets out the general background, the statement of the problem to be studied and the objectives of the paper.

The second chapter is Description of the Shipping Industry. It explains the manner in which cargoes and ships are classified and defines some uncommon terminologies used in maritime transport. It also gives statistics on port traffic in Mombasa port classified by ship types and cargo types. This chapter also gives an account of some features of maritime transport in Eastern African and the levels of participation by governments and shippers in its conduct and administration.

Chapter Three is a review of available literature on shipping which covers organization, controversies, pricing and specific studies undertaken in the past which have some similarities of approach with this study. It also covers literature on the impacts of maritime transport on national economies and some measures which countries have taken to redress themselves from the negative impacts which their economies may have experienced.

Chapter Four outlines the hypotheses advanced and the methodology used to collect data and test these hypotheses. It also gives the data limitations experienced.

Chapter Five contains the analysis of data in the light of the hypotheses advanced. The hypotheses are accepted or rejected on the basis of the results.

Chapter six contains conclusions reached and recommendations put forward from the study.

Footnotes - Chapter 1

1. G. O'Longhin, The Economics of Sea Transport, Pergamon Press, London. 1967. pp 3-5

2. D. Hilling and B.S. Hoyle, Seaports and Development in Tropical Africa. McMillan and Co. Ltd., London. 1970 pp 1-9.

3. Europa Yearbook, 1981, Europa Publications, London 1981. pp 644-1619.

4. UNCTAD/UNDP: Eastern Africa Shipping Study, Geneva, 1975, p. 285.

CHAPTER TWO

DESCRIPTION OF THE SHIPPING INDUSTRY

2.1 TYPES OF CARGO

The shipping industry can be classified according to the types of cargo transported. There are three broad categories under which cargo is grouped. These are: dry general cargo, dry bulk cargo and liquid bulk cargo. These three categories of cargo have given rise to the evolution of three types of carrier ships respectively known as dry general cargo carriers, dry bulk carriers and liquid bulk carriers.

2.1.1 Dry General Cargo

Dry general cargo is solid cargo which can be packaged or unitized to make units that can be stowed in a ship and loaded and discharged as single units. It includes cargoes such as tea chests, coffee bags, canned goods, motor cars and units of machinery. Except where there is a possibility of damage due to smell or contamination, various types of dry general goods can be carried by the same vessel. Usually a dry general cargo carrier loads several types of consignments sent by different consignors to different consignees to different ports along its voyage. The size of cargo units may range from a fraction of a tonne to several hundred tonnes per consignment. Where a consignment is a large one

it may contain several packages. Freight charges are paid according to quantity of cargo, the distance it is transported and any other criteria that a shipowner may use for raising his charges.

The transport of dry general cargo is undertaken mainly by liner[1] ships which make regular sailings along a given route and calling on specified ports. Their sailing dates are made available to importers and exporters in advance just like scheduled trains or air services. There may be several shipping lines operating on a route at a particular period. Some of the shipping lines may combine through agreements to form shipping conferences which may regulate freight rates, number of sailing per line and conduct jointly other activities such as negotiations with shippers, port authorities and regulatory bodies in the areas they operate. The other carriers of dry general cargo are known as tramp carriers. The tramp ships do not however have pre determined voyage routes since they operate according to cargo availability. They tend to concentrate on routes where there is excess cargo to be carried. Excess cargo on a route may arise due to seasonal peaks especially for agricultural products or due to a sudden rise in the demand for shipping capacity due to major projects taking place in a region and requiring a lot of imported

components. They take advantage of these peak demands and challenge the liner ships. When the demand falls, the tramp ships are withdrawn to other routes or laid up to await high demand again.

2.1.2 Dry Bulk Cargo

Dry bulk cargo is solid but bulky homogeneous cargo such as grain, cement, iron ore, coal and soda ash. This type of cargo is usually loaded in bulk into a vessel. The dry bulk vessel normally carries a full shipload of a single commodity, from one port to another, without making any stops in intermediate ports on its route. Usually this cargo comes from a single consignor to a single consignee. The dry bulk vessels are usually chartered through various exchange[2] centres such as the Baltic Exchange in London and other exchanges in Tokyo, New York and Hong Kong. Some dry bulk vessels operate on owner carriage basis. This happens mainly with miring companies who use their own ships to transport raw materials from the mining regions to processing areas when the two are located in different parts and long sea transportation is necessary. It is quite common with iron ore and other extractive industries such as

rubber, where the raw material is purchased or produced by multinational companies in the developing countries and is sent for processing in the industrialized countries. This is a familiar practice with American Steel and tyre makers and for many European and Japanese companies.

When a dry bulk vessel is on a charter it charges its freight for the voyage if it is on voyage charter or charges per period if it is on time[3] charter. Effectively it is the cargo owner who pays for the transport service provided by the vessel. Handling of dry bulk vessels ranges from the use of highly automated systems such as those used in the grain and ore ports in the U.S.A. to labour intensive methods as those used for loading and discharging in Indian ports.

2.1.3 Bulk Liquid Cargo

Bulk liquid cargo is liquid cargo in large quantities which require special types of vessels. The popular bulk liquid cargoes include crude oil, refined petroleum oils, industrial acids, palm oil and liquified gases. Bulk liquid carriers carry full loads of cargo mainly between two ports without making any calls in intermediate ports on their route. They are also chartered or carry cargo on own carrier basis. The main own carriers are the oil companies. Chartering of

bulk liquid carriers is done from the various exchanges just like in dry bulk cargo carriers. The liquid bulk carriage is dominated by oil tankers owned either by the oil companies or by private chartering groups known as the "independents". The independents make the tankers available for use in carrying oil through voyage or time charters.

Liquid bulk cargoes are handled in ports through specialized terminals. The handling is usually highly automated with the liquids being pumped out or into ships through pipelines to or from their storage areas respectively.

The traffic throughputs in Mombasa port classified in ship types and cargo types are shown on Tables 2(a) and 2(b) respectively.

The number of ships and their types which called in Mombasa Port in 1980-1983 are shown on Table 2(a) below. It is clear that dry general cargo ships compose the highest percentage.

Table 2(a) Ship Arrivals in Mombasa Port for year 1980-1933

Year	Dry General Cargo Ships	Dry Bulk Cargo ships	Liquid Bulk Ships	Total No. of Ships	% of Dry General Cargo Ships
1980	1038	167	132	1337	77.6
1981	865	123	109	1097	78.9
1982	962	121	95	1178	81.7
1983	799	122	86	1007	79.3

SOURCE: Annual Bulletin of Port Statistics 1980-1983
Kenya Ports Authority, Mombasa.

The traffic handled through Mombasa port is shown on Table 2(b) below.

Table 2(b) Traffic Handled Through Mombasa Port in '000 Tonnes

Type / Year	Dry General Cargo	Dry Bulk Cargo	Liquid Bulk Cargo	Total Cargo
1978	2076	894	3101	6071
1979	1896	750	3296	5942
1980	2215	1231	4066	7512
1981	2129	1466	4841	8436
1982	2471	1075	3394	6561

SOURCE: Annual Bulletin of Port Statistics - 1982
Kenya Ports Authority Mombasa

2.2 SHIPPING CONFERENCES

As indicated in 2.1.1 above, the dry general cargo trade is dominated by regular shipping lines. In East Africa for example all trade with Europe, America and the Far East is carried by regular shipping lines[4]. In cases where there are several regular shipping lines, competition among them is bound to arise. Historically, this competition has brought serious price wars in form of freight rates cutting and consequently chaos in maritime transport. The shipping lines tend to team up together in order to protect their interests by forming conferences. A conference is set up by a number of lines in order to avoid self ruinuous competition among themselves and also to fight against any new entrants.

The strategy of fighting entry[4] by other lines is to use methods such as fighting ships or temporary freight rates cuts so that the new entrants lose cargo. When the new entrants are thrown out of the market the conference raises the freight rates again. In the case of a fighting ship method , a conference releases one or several ships to sail along the itenerary of a new entrant's ship charging considerably lower freight rates and hence denying it cargo.

Conferences originated in the British - Indian trade in the 19th Century in order to fight against the many marginal entrants (shipowners) who were venturing into the trade.

Shipping conferences may be closed or open. Where they are closed no new entrants are allowed in. The conference lines agree on sailing schedules, ports of call and sometimes pooling cargo, freight monies or net earnings[5]. They also agree on common strategies to deal with shippers, port authorities, governments and other regulatory bodies in their zones of operation.

There are possibilities of independent regular lines operating alongside conferences, but this is very rare. In the East Africa/Europe zone, the only regular independent line is the Soviet owned Besta Shipping Line, which serves the Soviet Union and East Africa and does not have sufficient capacity to challenge the East Africa/Europe Conference.

The list of conferences serving East Africa and the rest of the world is shown on Table 2(c).

Table 2(c) Shipping Conferences Operating in East African Ports

	Name of Conference	Number of Shipping Lines
1.	East Africa/Europe	16
2.	East Africa/Far East	5
3.	East Africa/USA	9
4.	East Africa/Canada	2
5.	East Africa/Australia	4
6.	East Africa/New Zealand	1
7.	East Africa/Persian Gulf	2
8.	East Africa/Coastwise	25

SOURCE: Eastern Africa Shipping Study
Geneva 1975

The number of lines in a conference may vary from time to time since some lines may withdraw their operations from the East African region. However if they reactivate their operations, they easily get admission in the conference system.

2.3 SHIPPING IN MOMBASA PORT

The port of Mombasa has facilities for handling all the above mentioned types of cargo. There are sixteen dry general cargo berths, while dry bulk cargoes are handled at the Mbaraki Wharves composed of the cement wharf and two other dry bulk handling wharves. Liquid bulk cargoes are handled through two specialized terminals, one for crude oils and the other for refined oils and other bulk liquids.

For the transportation of dry general cargo Kenya is connected to various trading zones such as Europe, North America, Indian Subcontinent, Far East and Australasia by regural liner services provided by various shipping lines. Most of the trade with South America is conducted by transhipment either through North American or European ports.

Dry bulk carriage is irregular in nature and depends on where dry bulk cargoes originate or are consigned to. Most of it is conducted through chartered vessels.

The liquid bulk cargoes are dominated by crude oil. Kenya's crude oil originates primarily from the Persian Gulf and is owner carried by major oil companies or by chartered vessels for the smaller ones. Other bulk oils and bulk liquids originate from various sources and are also transported on owner carriage basis or in chartered vessels.

2.4 SHIPPING IN EAST AFRICA

The East African countries use ports in Kenya and Tanzania for their maritime transport requirements. The shipping lines and the conferences operating in Mombasa are the same ones which operate in the Tanzanian ports of Dar-es-salaam, Mtwara and Tanga.

Tanzania owns some shipping lines where one is jointly owned with China. These shipping lines conduct international maritime transportation though their capacity is small. As said previously Kenya has no international maritime transport capacity. In an attempt to reduce the powers of conferences operating in the East African region, four countries namely: Kenya, Tanzania, Uganda and Zambia formed the East African National Shipping Line in 1966 and also the Intergovernmental Standing Committee on Shipping (ISCOS). The shipping line eventually wound up but ISCOS is still active in studying and documenting the pattern of freight rates in the Kenyan and Tanzanian ports. However, ISCOS does not have the machinery to control the conferences and therefore remains only as a monitoring body. The list of conferences and the number of shipping companies (lines) in them is shown on Table 2(c)

It is clear that there are shipping conferences on all the routes which connect East Africa to her major trading zones.

Chapter 2 - Footnotes

1. Liner ship is a ship that operates on a regular basis within a defined route. Each shipping line may have several ships operating on a given route.

2. Time charter is a charter agreement in which a charterer leases a ship for a given period and uses it as his own. The charterer meets all the operational costs of the ship and decides which routes he deploys it on.

3. An exchange in shipping such as the Baltic Exchange is a market controlled by brokers who provide information to shipowners and shippers for purposes of chartering vessels either on single voyages or time charters.

4. UNCTAD/UNDP, Eastern African Shipping Study
Geneva, 1975
pp220-235.

5. Marx Jr.D: International Shipping Cartels
Princeton University Press;
New Jersey. 1953, pp22-64.

CHPATER THREE

LITERATURE REVIEW

3.1 MARITIME TRANSPORT IN A BROAD CONTEXT

Maritime transport like other modes of transport involves the conveyance of goods from one place to another. The demand for transport of goods is a derived demand. It depends on the demand for goods being transported. According to the Norton (1971) transport creates utility of place and time. He says:-

> "Transport creates utility of place and to a lesser degree that of time. It is readily apparent that goods may have little or no usefulness in one location but may have great utility in another place at another time .....
> The creation of place utility can be seen in various relationships. Some goods are so common as to be present in almost every area and little or nothing would be gained by transporting them. Other goods may be so unique and so valuable that they can be transported for great distances."1

Maritime transport is of considerable importance in world trade especially for long distance carriage where it possesses a comparative advantage over other modes of transport for freight transportation. In international trade Anderson (1945)[2] estimated that about 80 per cent of world trade moved by sea around the forties. Hilling[3] (1971) estimated that 94 per cent of external trade in Africa continent moves by sea.

Maritime transport can be traced to thousands of years in past but the major thrusts into its expansion and sophistication occurred after the famous "voyages of discovery" undertaken by various European nations towards the end of the fifteenth century and finally the invention of the steam engine and its use in steamships in the nineteenth century. The voyages of discovery resulted in colonization and European settlements in the new lands and also in the expansion of trade through sea routes which were initially unknown. Larger ships were built and were used to transport commodities such as grain, spices, cotton jute, ores and other merchadise.

The invention of the steam engine enabled ships to run faster than before and also facilitated the construction of larger vessels.

The history of maritime transport has its own share of political and economic dimensions which have also contributed to its present day characteristics. After colonization of the so called "New World" the main colonizing powers in Europe such as Portugal, Spain and later Britain, France and Germany, shipping companies were often provided with charters giving them monopoly over the carriage of cargo on specific areas to the exclusion of others.

In the case of Britain, Sturmey (1962) says the following:-

> "The empire constituted a trading area from which Britain drew imports of raw materials and food and to which she supplied manufactured goods and emigrants.... The Navigation Acts which from the close of the 16th century to 1849 kept intra-imperial trade in the hands of the British ships or ships of the country of origin of the goods concerned led to the early diversion of British Shipping to the ocean trades which was a great contributary factor to its great expansion[4]".

Other colonial powers also did the same for their national companies in their empires. Even when Portugal and Spain did not have adequate ships capacity to carry their own cargo and passengers, they imposed heavy custom duties on goods carried by foreign shipping lines[5].

Many of the colonial powers were also important maritime nations owning considerable carrying capacities in excess of their intra-imperial trade requirements. They therefore had ships operating in cross trades among other countries. Portugal and Spain finally lost their importance in shipping when they were supplanted by Britain, France and Holland by being driven out from some of their major trading posts in Africa, America and the East.

With the deconolization and consequent emergence of new sovereign nations, challege has been posed to the traditional maritime nations such as Britain, France and Holland. The developing countries have objected to the domination of maritime transport by a few developed countries arguing that this has conferred them with monopoly powers in freight rates fixing and consequently economic and political leverage over the affairs of the developing countries.

3.2 CONTROVERSIES OVER MARKET STRUCTURE OF MARITIME TRANSPORT

There exists pronounced controversies among writers and also nations about the market structure and consequently the economic impacts which maritime transport imposes on countries whose trade it carries. Goss[6] (1976) a reputed British author on maritime transport argues that perfect competition prevails in shipping. He adds that since perfect competition exists, reduction in ships operating costs will benefit both the shipper and the shipower. He concludes that the main interests in the study of maritime transport should be in its costs to the shipowner and how to reduce them since freight rates would automatically go down. Goss argues that conferences are useful since they reduce wasteful competition. The traditional maritime nations in their negotiations with the developing countries in UNCTAD

take the views advanced by Goss to counter the attacks from the developing countries who argue that they provide the services in a monopolistic market form.

Marx[7] (1953) holds the view that there is no perfect competition in maritime transport and argues that conferences are cartels. He says:-

> "Shipping conferences are among the earliest cartels in international trade. Shipping conferences or rings as they are sometimes called are agreements by Shipping lines to restrict or eliminate competition, regulate and rationalize sailing schedules and ports of call and occassionally to arrange for pooling cargo freight monies or other net earnings".

The Merchant Marine Act of 1936 outlaws closed conferences operating in the US trades[8]. The US view seems to accept that there is a good degree of competition within a conference if it is an open one since all lines which wish can join it. Most developing countries on the other hand have viewed the shipping conferences as outright monopolists. This is because majority of the developing countries have little or no participation in the carriage of goods because many of them do not have any shipping lines.

The developing countries have expressed their dissatisfaction about conferences and other shipping arrangements through various forums and especially through UNCTAD. In an UNCTAD publication of 1967 about shipping in West Africa, it is stated:-

> "In recent years the conflict of interest between traditional maritime nations and developing countries has become progressively more evident. Thus at the trade conference in Genervа in 1964, a marked atmosphere of division between the interested parties prevailed ".[9]

Some of the earliest reactions to the dominance of the developed countries in maritime transport can be traced in Latin America. This was mainly through the Latin American Free Trade Association (LAFTA). The LAFTA countries advanced the following reasons justifying their wishes to increase their participation in maritime transportation by expanding their shipping capacity:

1. acquisition of leverage in the determination of freight rates which were fixed by ocean conferences composed of foreign-owned shipping interests;

2. aiding of balance of payments by conserving foreign exchange;

3. assurance of adequate and regular services,

4. promotion of exports in general;

5. National defense - This was to ensure uninterrupted shipping services in times of emergencies such as during hostilities when merchant ships of the traditional maritime nations are diverted for other uses. This occured most seriously during the last two world wards when merchant ships were deployed for war purposes.

The LAFTA countries first put their case within the Organization of American States (OAS) to express how they were negatively affected dur to shipping their goods within a system of maritime transport where freight rates were determined without their participation. They argued that among other things, this affected their national trades negatively.

Resolution XXI adopted by the Economic Conference of the OAS in 1957 states:-

> "The freight rates adopted in intra-American maritime routes the principal means of transportation in the region often tend to discourage diversified trade bcause such rates are higher than those for similar products originating from outside the area thus weakening the competitive position of Latin American products.... The Economic Conference resolves to recommend to interested parties that in view of the requirements of economic development of Latin America and the diversification of its trade they sponsor the adoption of freight rates for the maritime routes of the region on a level with those prevailing in the Maritime routes between Latin America and other regions for the same commodities taking into consideration factors that have a bearing on the costs of respective transportation"[10]

The developing countries have argued that there is freight rates discrimination for the goods originating or destined to them. According to an UNCTAD report on freight markets:-

> "The economic basis for discrimnation is that shippers have fewer alternative means of transport or ship products which are less sensitive to transportation charges than others".[11]

The above implies that the shippers demand for the shipping services is fairly inelastic so that when freight rates increase, there is little fall in the quantity of goods to be shipped. This is quite possible looking at the nature of exports and imports in the developing countries. Freight rates discrimination is possible in the case of imports because most of them may be essentials such as machinery and spareparts which are necessary for development or basic needs and have almost an inelastic demand. In that case a developing country has to import since there is no local source for the imported goods. In the case of exports, prices are determined in foreign markets and the developing countries have to export at almost whatever price is available in order to purchase their essential imported commodities. Since overseas buyers purchase at world market prices, shipowners can charge high freight rates and effectively lower the final earnings of producers in the developing countries.

The developed maritime nations have argued in UNCTAD forums that due to potential competition because of new entrants shipowners cannot practice freight rate discrimination in the long-run. However the possibility of discrimination exists especially since majority of the conference members of shipowners operating in developing countrie's routes also operate in other routes in most other regions of the world. The conference members can therefore effectively keep out new entrants by employing entry-limit pricing when the threat of entry is inevitable or use such methods as rate cutting or "fighting ships" drawn from other routes when new entry has actually taken place. This undercuts new entrants and drives them out of the market. Fighting ships are ships sailing beside a competitors ship all along its route and charging considerably lower freight rates than it in order to capture its cargo. Effectively fighting ships get most of the cargo and the ship being fought eventually loses cargo and has to withdraw from the route. The conferences then raise their freight rates to the levels existing before the new entry took place. A study carried out by the Indian[12] government on freight rates between Indian Ports and Port Said in Egypt and UK Ports and Port Said revealed that freight rates to and from UK to Port Said were consistently lower than those for India to Port Said

and Port Said to India even though the distances were almost the same. Counter arguments by developed maritime nations in UNCTAD asserted that freight rates were not only determined by distance but by other factors such as port costs.

However in the Indian Study some rate differences were exceedingly spectacular so that in one case the percentage of the UK rate to the Indian rate was only 29.2%. In the case of carriage of dry bulk cargoes, such as grain iron ore bauxite, cement and others, the developed maritime nations have asserted that the charter markets such as the Baltic Exchange have conditions nearing perfect competition. They argue that the charterers and the shipowners have full information on the charter markets and that there are large numbers of ships available for charter. However these assumptions have been challenged and the main challenges are based on the fact that a considerable proportion of dry bulk cargoes are transported by transnational corporations who control the products on both ends and also use their own ships for the transportation. It has been argued that many multinational corporations especially those in mining have subsidiaries which do the mining in one country and transport the ores to the mother company for processing.

A UNDP paper on the transportation of dry bulk cargoes by sea says as follows:-

> "International seaborne movements of iron ore, alumina/bauxite are controlled to a high degree by transnational corporations based in developed market economies which are engaged in vertically integrated activities extending from mining to the production of steel and alumina. Control over transport stems from the vertically integrated control exercised by these corporations over manufacturing facilities in developed market economies and mining activities in developing countries through full ownership equity participation or longterm contractual arrangements".[13]

It therefore remains controversial to say that the dry bulk market for sea transport is characterized by perfrect competition.

In the case of liquid bulk transportation where crude oil forms the largest proportion there is the same situation of vertical integration where oil companies which are some of the largest transnational corporations are involved . It has been argued especially by developing countries that a considerable amount of transfer pricing is practiced in both dry bulk and liquid bulk transportation because of the unique feature that the transnational corporations involved are very often vertically integrated.[14]

3.3 COSTS IN MARITIME TRANSPORT

In economic theory a distinction is made between short-run and long-run costs. In the shortrun capital and management are usually fixed but in the long-run all factors of production are variable.[15]. The cost structure in shipping may be studied using the traditional methods of cost analysis where costs are classified into fixed and variable ones and further considered per unit of output as average fixed costs or average variable costs. Marginal cost refers to the cost of an additional unit of output. Marx[16] classifies ship costs into three categories, i.e. operating expenses, overhead expenses and prime costs. The first two are fixed costs when a ship has committed itself on a voyage and the last are really the variable costs which depend on the amount of cargo loaded or offloaded from a ship.

Operating expenses include fuel, water food supplies, crew's wages, maintenance and repair, marine insurance on vessel protection and indemnity insurance. These expenses depend on the route to be taken, the speed, size and type of vessel, management and the ports the ship calls. Other charges such as port charges and canal tolls come under operating expenses.

Overhead expenses are composed of items such as management, interest on capital investment depreciation, and taxes. They also include shore staff, and freight solicitors. For freight solicitors the expenses may be variable if payment is made on the basis of the volume of cargo handled in a port.

Prime costs are made up of loading and discharging expenses which are usually paid to ports and are based on tonnage handled. The more cargo a ship loads or discharges the more it pays in stevedoring charges and also for the time it stays in port since many ports charge ships for staying alongside berths on a time basis. The prime costs are the actual variable costs according to Marx.

Sturmey[17] classifies the ship costs into voyage overheads, organizational overheads and variable costs. Voyage overheads are made up of the same items as operating expenses under Marx's classification while organizational overheads and variable costs are similar to overhead expenses and prime costs respectively. According to Sturmey, the proportion of each cost varies according to the type of trade a ship undertakes.

When a ship has committed itself to a voyage, most of its costs become fixed except the variable cost items which depend on the amount of cargo handled and the time it stays in port which

which is also influenced by the quantity of cargo to be discharged or loaded in that port.

The marginal cost of loading or discharging an additional unit of cargo is usually constant where stevendoring charges are fixed. Sturmey also argues that there exist increasing returns in ship's carriage due to fuller utilization. He says:-

> "Furthermore it is often characterized by increasing returns resulting from fuller utilization of carrying capacity and at time it can reduce average unit costs by expanding the scale of operations. In addition the mobility of its "plant" renders opportunity costs of greater significance than in the case of most manufacturing or other service industries".[18]

3.4 MARKET FORMS

In maritime transport, the commodity sold is the transport service. The sellers are the shipowners and the buyers are the shippers. The interaction of shipowners and shippers under various circumstances determines the type of market under which maritime transport services are provided. Under perfect competition it is assumed that there is a large number of buyers and sellers, products are homogeneous, there is free entry and exit of firms, firms objective is profit maximisation, no government interference, perfect mobility of factors of production and perfect knowledge about the market by all buyers and sellers. Few if any markets for shipping services in the world fulfil all the above conditions simulteneously.

Under pure monopoly there is a single seller and many buyers with no close substitutes for the commodity and complete barriers to new entry. There exists few if any situations in maritime transport where monopoly conditions are fulfilled.

Shipping markets may therefore fall between the two extremes where there exists imperfections in the market. Marx says the following about liner shipping:-

> "A pure monopoly condition is rarely found and then only in relatively unimportant trades or where government restrictions assist monopoly in avoiding the invigorating breath of some competition. In short the liner trades except for a few cases are basically oligopolistic structures....."[19]

In dry bulk and liquid bulk cargo trades Pace (1979)[20] argues that the market operates under conditions which are almost near to those of perfect competition because ships are chartered from the exchanges which are centralized so that information on freight charges is easily available from the brokers to the shippers and shipowners. However this may not be true, expecially in developing countries' trades where most of the dry bulk and liquid bulk carriage is undertaken on owner carrier basis mainly by multinational mining corporations and oil firms.

In the case of liquid bulk cargoes where crude oil and refined petroleum products are the major commodities, de Chazeau[21] says that oil companies control 72-90% of the worlds commercial tanker fleets through direct ownership and long term charters. The rest is controlled by independents who undertake voyage charters or very short time charters and manage their own tanker fleets.

The dry general cargo carriage is dominated by liner shipping where shipping conferences play a very large part.

3.5 FACTORS DETERMINING FREIGHT RATES

Many authors have written about freight rates and the manner in which they are determined in various modes of transport. Kindleberger[22] lists weight, bulk, value, physical characteristics of cargo, distance cargo is conveyed and speed of transport as the primary determinants of freight rates. He also argues that weight and value are among the most important factors.

Brown[23] lists value, character of cargo, packing, stowage, distance, competition with goods from other sources of supply, competition from other carriers, direct cost of operation cost of handling, port facilities, port regulations, canal tolls, port location and the possibility of securing return cargoes as the major determinants of freight rates.

Most tariffs in various modes of transport charge freight on the basis of the tonnage of cargo and the distance it is conveyed. The Kenya Railways tariff quotes their rates per tonne for a kilometer and the more tonnes one conveys the more he pays. There may be rebates for consignments exceeding a certain number

of tonnes but any additional tonne increases the total freight payable by the consignor. This is the same position with ship tariffs where rebates are given also when cargo consignments exceed a certain level of tonnage.

Among the factors given by Kindlerberger and Brown above as determinats of freight rates, most of them are qualitative in nature and are therefore not measurable. Several studies employing econometric models on the determination of freight rates have been undertaken. In most of them the authors have used distance and weight or volume as the quantitative explanatory variables and have used dummies for the unquantifiable characteristics (variables) which they have considered important to include in their model specifications.

Bates[24] carried out a regression analysis where he assumed that freight charges were determined by the quantity and the distance cargo is conveyed.
For the quantity of cargo be used the term volume which in shipping is known as harbour tonnage and is used as a bsis for charging freight. The harbour tonne is either in cubic measurements or in weight in tonnes depending on which one yields more units of measurement. He categorized his data on the basis of year, terms of carriage of cargo and routes and carrier out several regressions. His model took the form:-

$$R = \beta_0 + \beta_1 D + \beta_2 V + \varepsilon$$

where R = freight charged per long tonne

D = Distance in nautical mites.

V = Quantity of cargo in long tonne.

and β_0 β_1 and β_2 are the relevant coefficients to be estimated.

By classifying his data on basis of routes, years and terms of carriage be carried out ten regressions. These regressions single out classes of data or combined classes.

His coefficients in most cases were significantly different from zero. Distance had always a positive coefficient and volume except once had negative coefficients. This was because he had divided the total freight cost by volume to obtain R which was his dependent variable. This would occur because the freight cost per unit volume of cargo may fall as the volume of cargo increases.

The explanatory powers of the independent variables varied according to the classifications. The lowest case was one where R^2 was equal to 0.253 and the highest was where it was 0.776.

Below is a table of results - Table 3.1

Table 3.1 Regression Results for Bates' Study

Equation No.	Est. of β_o	Est. of β_1	Est. of β_2	No. of Observations	R^2
1	337(11.5)*	0.051(2.0)	0.008	101	0.672
2	1159(3.8)	0.032(5.5)	-0.043	105	0.253
3	1124(11.3)	0.075(5.6)	-0.071	84	0.643
4	518(14.0)	0.083(0.7)	-0.012	91	0.720
5	455(13.3)	0.053(1.47)	-0.008	185	0.768
6	1063(11.0)	0.057(7.4)	-0.049	196	0.538
7	614(17.0)	0.058(5.9)	-0.030	381	0.615
8.	465(13.0)	0.053(1.5)	-0.008	185	0.776
9	1167(11.4)	0.056(7.5)	-0.050	196	0.591
10	675(17.0)	0.057(6.1)	-0.026	381	0.638

* Figures in brackets are the values of t

Another study was conducted by Borger and Nonneman[25] in which they chose a model where freight cost was a function of five variables. The implicit function took the form:-

$$P = f(S, NM, D, E, C).$$

Where P = Freight Cost

S = Vessel size

NM = Voyage Length

D = Vector of other characteristics such as trade type, multiple calls, etc...

E = Excess supply at the time of Chartering

C = Capacity of Shipping in service

They had two variants of the explicit model. The first variant was a multiplicative one which was estimated using ordinary least squares after transformation by taking logarithms. The statistical quality of the regressions was fairly good. All the estimated coefficients had the expected signs and were highly significant except for the dummy variables in iron and coal trades.

Below are the results of the computations:

Table 3.2 Regression Results

	Iron Ore		Coal	
Variable	Estimate	Standard Error	Estimate	Standard Error
Constant	-19.320	6.184	-20.847	9.364
ln C	4.705	1.192	5.043	1.792
ln NM	0.420	0.037	0.414	0.053
ln S	0.406	0.058	0.511	0.102
ln E	0.512	0.108	0.353	0.184
ln D	0.087	0.064	0.101	0.067
R^2	0.746	-	0.700	-
No. of Observations	87		55	

The second variant of the basic model took the form:

$$P = a+b/s + (C+dNM^2 + es)\ NM + gE + hE^2 + jC + kD$$

where b, c, j and k were expected to be positive and d, and e were expected to be negative. The results obtained from this variant were better than the previous since the coefficients of multiple determination went up. All the coefficients had the expected signs except the coefficient of distance squared (Nm^2).

The results of the comuptations are as shown below.

Table 3.3 Regression Results for the Modified model

Variable	Estimate	Standard Error	Estimate	Standard Error
Constant	-23.020	(10.080)	-64.807	(16.717)
C	0.159	(0.072)	0.274	(0.103)
NM	1.454	(0.203)	0.982	(0.527)
NM^2	-0.035	(0.013)	0.029	(0.039)
$\frac{1}{S}$	132.495	(24.496)	350.496	(60.815)
E	0.202	(0.673)	3.314	(1.032)
E^2	0.019	(0.024)	-0.126	(0.036)
D	0.559	(0.536)	1.087	(0.586)
NMXS	-0.0025	(0.007)	-0.002	(0.0024)
R^2	0.778		0.879	

There was another study conducted by Heaver and reproduced in part by Evans[26] and used a multiple regression. The assumptions made for the model were that freight cost is a function of quantity of cargo and value. The equation was estimated for the US Eastbound and Westbound conferences and the results were found to be reasonable.

Below are the results:

Table 3.4 Regression Results for Evans Study

	Eastbound		Westbound	
Variable	Estimate of coefficient	t	Estimated coefficient	t
Constant	23.82	(2.5)	28.81	(5.2)
Tonnage	0.43	(3.06)	0.41	(7.9)
Value	0.91	(4.70)	0.42	(2.7)
R^2	0.66		0.73	
No of Observations	24		29	

It was not made clear which variable has the higher explanatory power between the two i.e. Tonnage and Value.

In total the literature is not very rich with quantitative analysis with conclusive results. In all the three studies cited, none used all the three variables i.e. distance, tonnage and value at once.

This study will adopt a model which includes all three factors as the explanatory variables.

3.6 FREIGHT DISCRIMINATION

Freight discrimination refers to a situation where similar cargoes - with same tonnage from one part going by the same ship or a group of ships owned by the same line to the same port are charged differently or where the general level of freight rates is higher in one region than in another region even though distances traversed are the same and the cargoes are also similar. Discrimination is a popular behaviour of monopolists where different buyers pay different prices for the same commodities.

Ocean freight rate discrimination according to a UNCTAD report may arise from the pursuit of deliberate policies to achieve such goals as profit maximization, commercial advatages and flag or national preferences[27]. Discrimination as a practice in maritime transport has been cited in various occassions and studies have been undertaken to examine its intensity.

Brown[28] discusses discrimination in Latin America where US and European Shipowners charge differently between Latin America and US and Europe and also between routes of the same distances in Latin America and other part of the world.

The Group of 77 has argued very strongly against freight rates discrimination practiced against developing countries[29]. They argued that it is intolerable to stand and watch the fixing of freight rates being left to the discretion of shipping companies from the developed countries even though they form an important element of the final price of their products. The group argues that freight rates are manipulated to the disadvantage of their foreign trade and therefore seek to participate in their determination since a substantial part of their national products depend upon the profit motive of a group of foreign enterprises who provide the maritime transport service.

3.7 ECONOMIC IMPACTS OF MARITIME TRANSPORT

The group of countries in Latin American Free Trade Association (LAFTA) was the first in the group of developing countries to undertake a detailed study on the impacts of maritime transport in their economies. In their situation, the transport services were provided primarily by ships from the developed countries.

Among the economic impacts diagnosed were the following:

(i) resource extraction through overcharging and transfer pricing.

(ii) balance of payments problems.

(iii) high prices of imports.

(iv) perpetuation of dependence on developed countries for the provision of shipping services.

(v) poor development records.

In the first case, resources are extracted from the developing countries to the developed ones through overcharging due to monopolistic or oligopolistic conditions in the various shipping services markets. Transfer pricing occurred through vertically integrated companies which had interest and control over the sources of imports or distinations of exports and also directly provided transport services.

The balance of payments problems arise for countries relying on foreign shipping companies to carry their trades because they pay more for their imports due to overpricing of the shipping services and earn less from their exports from the same problem since the prices of their exports are determined in world markets where they have little or no influence.

Dependence on the developed nations for shipping services persists for developing countries because of market entry difficultires, which arise due to competition arising from established interests from the developed countries, and also due to the large capital outlays required to launch private or national shipping lines.

In the Eastern Africa Shipping Study[31] (1975) one of the primary objectives was based on the fact that enhancement of international trade is considered an important factor in the growth and development of the region. In the case where such trade is conducted under some anomalies such as overcharging and transfer pricing through the shipping services a country's growth and development may be considerably impeded.

3.8 MEASURES TAKEN TO REDRESS THE ADVERSE ECONOMIC IMPACTS OF MARITIME TRANSPORT

Various measures have been taken to redress the disadvantages that countries in the developing world have suffered due to the order of maritime transport which they have faced in their own areas.

Establishment of national shipping lines has taken place in various countries after they became independent. In the British ex-colonies this was pioneered by India and presently national shipping lines exist in Ghana, Nigeria, Pakistan and Singapore among others. These countries had relied heavily on shipping services provided by Britain in the past and their trade was predominantly with Britain. Other former colonies of various colonial powers which have formed their own shipping lines are Brazil, Argentina, Angola and Indonesia and also had similar trade relations with their ex-colonial powers as the British ex-colonies. Some countries have formed regional shipping ventures such as existed among Kenya, Tanzania, Uganda and Zambia with their Eastern Africa National Shipping Line which is now defunct.

Another method used by the developing countries to counter the dominance of the developed countries in shipping services was the establishment of codes of conduct for ships operating in their regions. This was done mainly through the forum offered by UNCTAD. Currently the UNCTAD Liner code of conduct[32] has become mandatory after receiving the required number of sinatories from members of UNCTAD. The UNCTAD Liner Code of Conduct distributes cargo on the basis of the ships owned by the exporting country, the importing one and ones owned by other countries not participating in the trade in

the commodities being transported. The exporting and importing countries' ships are given each 40% of the cargo and the ships from other countries referred to as cross-traders are given 20% of the cargo. The code therefore distributes cargo on 40:40:20 percentage basis for exporting countries, importing countries and outsider countries' ships. The conferences have been controlled through legislation in some countries. The US through the Merchant Marine Act of 1936 and its later amendments outlaws all closed conferences from operating in the US trade. The Act confers the Federal Maritime Commission with powers to call for any information from a conference in order to examine and determine whether it is breaking the law.[33]

The formation of Shippers Councils has taken place in various regions in order to educate shippers and enable them to deal collectively with shipowners. Encouraged primarily by UNCTAD, Shippers Councils have been successful in India and Australia.[34]

In East Africa, maritime transport shares the same pattern in Kenya and Tanzania. The liner ships which operate in Mombasa are the same ones which operate in Tanzania Ports and belong to the same conferences where they are conference members. Since all countries in East Africa are heavily dependent on maritime transport for their foreign trade, they all emphasize the need for adequate and efficient services.

In the Kenyan situation the 1979-1983 Development Plan [35] emphasizes on this need. Kenya, Tanzania, Uganda and Zambia established a regional shipping line in 1966 through which they took part in international shipping but the line was dissolved in 1980 due to financial difficultites and lack of the will by the member countries to bail it out. Tanzania currently operates a shipping line jointly with China. Kenya has no international shipping capacity since it has no shipping line. According to the 1979-1983 Development Plan Kenya was supposed to start her own shipping line but this has not yet materialized. It is expected that the national shipping line will be formed in the current plan period.

The disadvantages of complete dependence on foreign Shipping companies have been discussed in some detail for Kenya in an article in the Weekly Review.[36] The article argues to great depths how the balance of payments problem for Kenya could be alleviated by dealing with the freight element in the cost of importing goods. The article argues that if only 50% of Kenya's exports could be carried in national carriers more than £35 million would have been saved in foreign exchange for the year 1975. The background to these calculations is however not shown in the article.

Chapter 3 - Footnotes

1. Norton, H.S.: Modern Transportation Economics, Charles E. Merrill Press, Ohio, 1971.p.3.

2. Anderson, R.E.: The Merchant Marine and World Frontiers, Cornell Maritime Press, New York, 1945, p.196.

3. Hilling, D. and Hoyle, B.S: Seaports and Development in Tropical Africa, Mc.Milland & Co.Ltd., London, 1970, pp.1-

4. Sturmey, S.G.: British Shipping and World Trade, The Athlone Press, London, 1962 p.12.

5. Ibid : pp.102-103.

6. Goss, R.O.: Studies in Maritime Economics, Cambridge University Press, London, 1976, p.1.

7. Marx Jr. D.: International Shipping Cartes, Princeton University Press, Princeton, 1953. p.3.

8. US Department of Commerce: The US Merchant Marine and the Internatio Conference System. Harbridge House Inc., New York, 1976 pp.1-9.

9. UNCTAD: Conference Plenipotentaries of a code of Conduct for Liner Shipping, TD/CODE/13, Geneva, 1967 pp.196-214.

10. Brown, R.T.: Transport and Economic Integration in South America, The Brookings Institution, Washington DC 1969, pp117-120

11. UNCTAD: Freight Markets and the Level and Structu of Freight Rates, New York 1969 p.89.

12. Ibid: pp. 89-90

13. UNDP: Control of Transnation Corporations over Dry Cargo Movements, TD/B/C4/203 Rev.1, New York, 1981 p;3.

14. UNCTAD: Establishment or Expansion of Merchant Marines in Developing Countries, New York, 1968, pp.14-16.

15. Kontsoyiannis,A.: Modern Microeconomics, Mc.Millan Press Ltd., London 1979, p,105.

61. Marx. D.: International Shipping Cartels Princeton University Press, Princeton, 1953, pp.11-14.

17. Sturmey, S.G.: Op,Cit.p 264.

18. Ibid: p.10

19. Marx Jr.D.: Op.Cit.pp.448-450

20. Pace, M.H.: Determination of Ocean Freight Rates, Institute of Shipping Economics, Bremen, 1979, p.3.

21. Chezeau, de. M.D.: Integration and Competition in Petroleum Industry, Yale University Press, New Haven, 1959, pp.341-346.

22. Kindleberger, C.P.: Foreign Trade and National Economy, Yale University Press, New Haven 1962 pp.1-125.

23. Brown, R.T.: Op.Cit. pp8-125.

24. Bates, T.H.: "A linear Regression Analysis of Ocean Tramp Rates", Transportation Research, Vol.3 No.3 1969, pp.377-395.

25. Borger, de, B. and Nonneman W.: "Statistical cost functions for Dry Bulk Carriers", Journal of Transport Economics and Policy Vol.XV. No.2 1981, Bath. pp,155-165.

26. Evans, J.J.: "Concerning the Level of Freight Rates", International Journal of Shipping and Po Research Vol.9 No.2 1982, London pp.103-113.

27. UNCTAD: Freight Markets and the Level and Structure of Freight Rates; Geneva 1970 pp,89-90.

28. Brown, R.T.: Op.Cit.pp,118-119.

29. Fasbender, K and Wagner, W.: Shipping Conferences, Rates Policy and Developing Countries, Hamburg Institute of International Economics, Hamburg,197 pp.24-40.

30. Brown, R.T.: Op.Cit.pp 88-107.

31. UNCTAD/UNDP: Eastern Africa Shipping Study Geneva, 1975, pp 2-5.

32. UNCTAD: Conference on Plenipotentiaries of a Code of Conduct for Liner Shipping, Geneva, 1967

33. US Department of Commerce: The US Merchant Marine and the International Conference System, Harbridge House Inc., New York, 1976, pp 1-9.

34. UNCTAD: Consultation on Shipping TD/B/C4/20/Rev 1, Geneva, 1966 pp 73-107.

35. Republic of Kenya: Development Plan 1979-1983, Government Printers, Nairobi, 1978, pp 424-427.

36. The Weekly Review: 30th June, 1975 Nairobi.

CHAPTER FOUR

HYPOTHESES, MODEL AND METHODOLOGY

4.1 HYPOTHESES

(a) Conceptual Framework

Several factors have been listed in the Literature Review chapter as being the determinants of freight charged for transport of cargo by sea and other modes. Except for distance, tonnage and value most of the others are state variables. Some of the state variables named by Kindleberger[1] and Brown[2] include physical characteristics of cargo, packing, stowage, competition, sources of supply, port facilities, port location and possibility of getting return cargoes. These state variables are not quantifiable.

Assuming that there is a functional relationship between freight charged and the factors determining it, it can take the following implicit form:

$$R = f(X_1, X_2, \ldots, X_n; Y_1, Y_2, \ldots, Y_m) \quad (1)$$

where R is the freight charged,

$X_1, X_2, \ldots, X_n$ are variable factors

and $Y_1, Y_2, \ldots, Y_m$ are state variables.

Then $X_1, X_2, \ldots, X_n$ affect the regression hyperplane throughout its path while $Y_1, Y_2, \ldots, Y_m$ are expected to affect only the intercept.

The influence of state variables can be eliminated if analysis is carried under identical conditions for all observations. In this paper, most of the state variables will be assumed to be uniform since cargo will be narrowed down to one class - dry general cargo - where it will be assumed that physical characteristics, stowage, packing and port facilities are uniform. Since there are five trade zones to be considered separately, it will be assumed that competition on each route and the possibility of getting return cargoes are uniform. It will also be assumed that only variable factors such as distance, tonnage and value are important.

It may then be assumed that the implicit functional relationship between freight charged and the explanatory variables will take the form:

$$R = g(X_1, X_2, \ldots, X_n) \qquad (2)$$

Where all the X_s are variable factors.

Bates and Nonemann considered only distance and tonnage while Evans considered only tonnage and value as the explanatory variables. This study considers the three i.e. distance tonnage and value as the only explanatory variables. The implicit functional relationship will take the form:

$$R = g\ (D, T, V) \qquad (3)$$

where R = freight charged,

D = distance cargo is transported,

T = tonnage of cargo,

V = value of cargo.

The factors R,D,T, and V are implicit so that we can allow for their transforms where desired, especially when their logarithms are employed.

It is expected that freight charges vary positively with distance since the longer a ship sails, the higher its costs. Distance is commonly used for charging both freight for cargo and passenger fares and normally, the longer the distance the higher will be the price.

It is expected that freight charges will vary positively with the tonnage since more cargo will occupy more space in a ship and the ship essentially sells space. Tonnage is also commonly used for charging in other modes of transport.

However, value should not be an important determinant since all cargo is expected to be stowed in the same spaces whether high value or low value. In case of damages or losses it is expected that claims are met by the insurance taken by the cargo owner and not by the shipowner.

It is also expected that shipowners operate in perfect markets where practices such as freight rates discrimination, and overpricing of their services do not occur, therefore monopolistic and oligopolistic market forms are not expected.

After investigating the freight charging structure, freights charged will be compared with freights charged in other parts of the world since many arguments have been raised that there exists

freight rates discrimination against the developing countries. In the presence of discrimination it implies that there exist some adverse economic impacts on those who face it.

(b) Hypotheses

In this paper, five hypotheses are advanced and tested using the same basic data. The first three are tested through a regression model and the other two are tested by making comparisons with results of studies carried out elsewhere.

(i) Hypothesis 1

The distance cargo is transported determines the freight charged and varies positively with it for dry general cargo in the Kenyan trade.

From the implicit equation in (3) this hypothesis implies that:

$$H_o : \frac{\partial R}{\partial D} > 0$$

$$H_1 : \frac{\partial R}{\partial D} \leq 0$$

If this hypothesis is rejected it would imply that shipowners do not charge for their transport services according to the distance cargo is transported. This would mean that sea transport in our region is unlike other modes of transport where distance is used as a factor in the pricing of transport services.

(ii) Hypothesis 2

The tonnage of cargo determines the freight charged and varies positively with it for dry general cargo in the Kenyan trade.

If this hypothesis is rejected it would imply that shipowners serving the Kenyan trade do not charge their transport services according to the quantity of cargo transported.

From the implicit equation in (3) hypothesis 2 implies that:

$$H_o : \frac{\partial R}{\partial T} > 0$$

$$H_1 : \frac{\partial R}{\partial T} \leq 0$$

(iii) Hypothesis 3

The value of cargo does not matter in the determination of freight charged in the Kenyan trade for the dry general cargo

This implies that:

$$H_o : \frac{\partial R}{\partial V} = 0$$

$$H_1 : \frac{\partial R}{\partial V} > 0$$

If rejected, it would imply that value is used by shipowners to determine freight charges. It would then mean that the value of consignments is given the most important consideration in determining freight charges if the first two hypotheses are not accepted.

(iv) Hypothesis 4

The ratio of freight charged to the value of cargo in Kenyan imports is considerably higher than the average for various parts of the world including the African region.

If this hypothesis is accepted it would imply that freight charges are considerably higher in the Kenyan sea trade than in many other parts of the world. This hypothesis will be tested by comparing the freight/value ratios for the Kenyan trade with those published by UNCTAD for the corresponding periods.

(v) Hypothesis 5

There is considerable monopoly power in the market for maritime transport services in the Kenyan trade.

If this hypothesis is accepted, then it would imply that Kenya loses considerably from the existing structure of the carriage of her trade which passes through the sea. This would also imply that there is a considerably departure from the conditions of perfect competition which some writers have assumed exist in the general cargo trades. If value is used as the determining factor for pricing of the transport service by sea, it would possibly be concluded that shipowners take advantage of the elasticity of demand for the goods being transported where if the elasticity was low, they would be sure that there would no significant reductions in the cargo available because the burden of high transport charges can be passed.

to consumers who eventually end up with the goods. Lerners[3] method of calculating monopoly power will be used here to test the hypothesis.

4.2 MODEL

The primary technique used in this paper is the linear regression analysis model. The objective of the analysis is to test whether the factors expected to influence the determination of freight charges are significant in the Kenyan situation. These factors which are distance, tonnage and value are used as the independent variables and freight charged is the dependent variable.

The implicit form of the model takes the following form:

$$Y = X\beta + \varepsilon$$

where Y is a vector of observations of the dependent variable, X is a matrix of the observations of the independent variables, β is a vector of the coefficients of the independent variables and ε is a vector of the disturbance term. The Ordinary least Squares (OLS) method is adopted because, it yields unbiased and efficient estimators.

On minimising the sum of squares and solving for the values of β, the following results are obtained.

$\hat{\beta} = (X'X)X'Y$ where $\hat{\beta}$ is the vector of estimated coefficients.

For $\hat{\beta}$ to be an unbiased estimator of β, then ε is supposed to have an expected value of zero. For purposes of prediction ε is also supposed to be independently normally distributed and homoscedastic with variance σ^2.

i.e. $\varepsilon \sim N(0,\sigma^2 I)$ where I is the Identity matrix.

In our case, the explicit explanatory variables will be distance, tonnage and value while the dependent variable is the freight charged. Two variants of the model are used. The first variant is the additive variant and the second is the multiplicative form which is linearized by taking logarithms of the variables.

The adoption of the two variants has been done because no explicit functional relationship exists which has been universally accepted. The purpose of the two variants will therefore be exploratory. The variant which will yield the acceptable results will be utilized. For purposes of distinguishing between the regression variables in the two variants of the model, explicit model specifications with clear notation will be provided.

The additive variant takes the following functional form:

$$FERI = \alpha_0 + \alpha_1 DIST + \alpha_2 TONE + \alpha_3 VALE + \varepsilon$$

where FERI = Freight Charged

DIST = Distance

TONE = Tonnage

VALE = Value.

ε = Error Term

and α_0, α_1, α_2 and α_3 are the coefficients to be estimated. In the regression α_1 and α_2 are expected to be positive. The coefficients α_1, α_2 and α_3 can be interpreted as the marginal effects of changes in distance, tonnage and value respectively.

This variant of the model has been used by Bates but he considered only distance and tonnage as the explanatory variables.

The second variant is the multiplicative one which is linearized by taking logarithms. It has the following functional form:

$FERI = A.DIST^{\beta_1} TONE^{\beta_2} VALE^{\beta_3} e^{u}$. When transformed by taking logarithms it has the following form:

$$AFER = \beta_0 + \beta_1 ADIS + \beta_2 ATON + \beta_3 AVAL + u$$

where AFER = $\log_e$ FERI

ADIS = $\log_e$ DIST

ATON = $\log_e$ TONE

AVAL = $\log_e$ VALE

u = Error Term

and $\beta_0 = \log_e A$

The coefficients β_1, β_2 and β_3 are the elasticities of freight with respect to distance, tonnage and value respectively.

The multiplicative model was attempted by Nonemann and Borger as indicated in the Literature Review but they considered only distance and tonnage. They however included a list of other characteristics many of which were not directly measurable. It is assumed in the two variants that ε and u are random disturbances with independent normal distributions and expected values equal to zero and fixed variances- i.e.

$$\varepsilon \sim N(0, \sigma_\varepsilon^2)$$

$$U \sim N(0, \sigma_u^2)$$

Following the regression analysis, computation of freight cost as a proportion of value of imports will be undertaken. Comparisons will be made with those from UNCTAD to determine whether Kenya pays more for a unit of import than other countries. If she pays considerably more, than others then an overpricing problem may be prevalent..

4.3 METHODOLOGY

(i) Choice of Data and Period

The data used in this study comes from individual consignments of cargo carried by dry general cargo ships which called in Mombasa port in the period January to June, 1982. Information is obtained on ships from port records and Customs entries where shippers declare their consignments. These are used to extract any particulars for each consignment. The information includes tonnage value, freight paid and the port of loading.

From the port of loading, distances to Mombasa port are then obtained in nautical miles. Tonnage is given in metric tonnes and value and freight paid are obtained in Kenya pounds.

It is not possible to obtain in complete form the same details in the case of imports of dry bulk and liquid bulk because shippers provide the information on the basis of consolidated cost insurance and freight (c.i.f.) and therefore do not break down the various components as in dry general cargoes. This may be because most of the shippers in the dry bulk and liquid bulk cargoes are own carriers - they transport their own cargoes. These include mainly local processing multinationals and oil companies who use their own ships or charter ships and may therefore wish to conceal how much they pay under each item. They may therefore wish to

withold their figures on value, cost of insurance

and freight possibly for purposes of transfer pricing. There will be no bias in omitting the bulk cargoes since this study focuses on the dry general cargo trades.

Exports have also been excluded because it is not also possible to obtain the requisite data in complete form because of their documentation system.

The quantitive work undertaken in this study therefore uses dry general cargo imports data. The period from which the data is taken covers only six months. It is a short period for a transport environment and is quite recent for the purposes of this study.

Not many changes took place in the local or international shipping scene over this period. There were also no major global changes in the economic sphere in the price levels. This means that information regarding prices of imports and directions of trade did not shift significantly within the period.

There were also no changes in freight rates in the form of general freight increases for all the five major trade zones. In view of this, the data has been taken as cross-sectional data in the regression analysis.

(iii) Sampling Techniques

This study uses data obtained from ships which called in Mombasa port for the period specified above. The data is obtained from five major trade zones where each zone is made up of a group of countries. Each zone forms a stratum and the subsample size for each stratum was intended to depend on the proportion of trade it accounted for in Kenyas external trade in value terms for the year 1982. The proportions of trade in the five zones were calculated from figures of Kenyas external trade in 1982 and the selection of the number of ships was on this basis but with some adjustment for the European zone which will be explained later.

From the list of ship arrivals, in Mombasa, the ships are grouped by the five zones depending on the port where their voyages commenced. This information is provided by the ships master and is compulsory for all ships. There were 423 ships of the dry general cargo category for the period. The number of ships selected for the sample was 100. Each ship has a unique rotation number. The rotation numbers commence from unity for the first ship to arrive in the new year and ran sequentially until the last ship in the year.

Ships were selected from each zone by a random selection method using random numbers. The selection procedure was random sampling without replacement. For each ship six observations where possible were selected in a systematic procedure since each ship had many consignments. For each consignment selected, tonnage and value of cargo and port of loading were extracted. The distances from the port of loading to Mombasa were then obtained in nautical miles. All values and freight paid were converted into Kenya pounds so that data on all the four variables required for the regression analysis and other computations was obtained.

Below is the breakdown of the zones and numbers of ships which called in the port, number selected and number of observations extracted.

Table 4.1 Distribution of Ships and Observations Selected

Zone	Total No. of Ships	No. of Ships in sample	No. of Observations in sample
1. Europe	263	51	321
2. Far East	78	20	162
3. Indian Subcontinent	49	10	70
4. America	28	14	36
5. Australasia	5	5	11
All Regions	423	100	600

(iv) Adjustments made due to Empirical and Other Considerations

Although the primary underlying considerations on the selection of the number of ships and observations for each zones was the proportion of external trade the zones had with Kenya some adjustments on the number of ships and observations per zone were made in order to deal with the special circumstances which arose. These adjustments in the number of ships and observations do not affect the precision of the results since they affected mainly the European zone whose proportion of total external trade was 64% which is quite high.

In the case of Europe, the number of ships were reduced to 51 and each of the other four zones had more ships added. In case of Australasia there were only five ships and all were only five ships and all were taken though this zone accounted for less than 1% of the external trade with Kenya. But the position remains that Europe had still the highest number of ships and also the highest number of observations.

In the case of Australaia and America the observaitons are on average less than six per ship.

This was because the consignments were few and complete enumeration was done for each ship and the target number of observations per ship and for the zone could not be reached. To reach the target of 600 observations which was intended, observations from other zones were increased thereby giving the other three zones an average of more than six observations per ship.

Footnotes:

1. Kindleberger,C.P.: Foreign Trade and National Economy, Yale University Press, New Haven, 1962. pp 1-25

2. Brown, R.T. : Transport and Economic Integration in South America The Brookings Institution, Washington, 1969, pp 117-120.

3. Lerner, A.P. : "The Concept of Monopoly and Measurement of Monopoky Power". Readings in Microeconomics Edited by Breit, W.and Hochman, H.M Nolt, Reinhart and Winston, Inc. New York 1968, pp 239-255

Lerner's measure of monopoly power was by an index of monopoly power $MP = \frac{P-A}{P}$ where

MP = Index of Monopoly Power

A = Average Price

P = Price

CHAPTER FIVE

ANALYSIS

5.1 SEQUENCE OF ANALYSIS

This chapter is subdivided into the following four parts:

(a) Regression Analysis.

(b) Freight Cost as a Ratio of Imports Value

(c) Monopoly Power

(d) Analysis of Excess Costs.

The analysis proceeds part by part with the assumptions made and possible constraints being highlighted.

5.2 REGRESSION ANALYSIS

5.2.1 Assumptions and Notation

It is assumed in the analysis that dry general cargo is an homogeneous type of cargo so that it can be carried in any dry general cargo ship. Handling and stowing it in the ships holds is uniform and the only variations in any two consignments of cargo are their tonnages, values and the distances they are conveyed. In the regression model, it is assumed that the three variables i.e. distance, tonnage and value have an important role in the determination of freight charges and that they are independent of one another. The quantity of cargo which is given in tonnage is an important factor since handling of cargo at ports is charged to

ships on the basis of tonnage. The quantity of cargo also to a large extent determines how much space a consignment occupies in a ship.

Distance will also affect the running costs of a ship because the longer the ship sails, the higher will be the fuel costs, crew costs and depreciation. It may also have to pay more due to canal tolls.

The value of cargo seems not to have serious effects on ship costs except in as far as cargo must be kept safe so that it does not get damaged through breakage or constamination when it is in the ship. However, this study assumes that goods are well stowed and free of contamination whilst in the ship since this can be ensured when loading. It is also accepted that all shippers take insurance cover on their goods and if damaged without the ships negligence they are compensated by their insurers. Shipowners also take insurance cover in case claims arise due to damage or loss of cargo due to their own errors.

Data is partitioned into five parts according to the five zones being analysed for this study. Regression analysis is performed for each zone separately and then a sixth one using the data from all the five zones.

Each zone has both the additive and multiplicative variants of the regression carried out. The five zones are designated as: Europe, Far East, Indian Subcontinent, North America and Australasia and the combined one is referred to as "All Regions".

The notation adopted in the equations for the computer pvintouts for the dependent and independent variables is as follows:-

FERI	=	Freight charged	(dependent)
DIST	=	Distance	(independent)
TONE	=	Tonnage	(independent)
VALE	=	Value	(independent)
AFER	=	$\log_e$FERI	(dependent)
ADIS	=	$\log_e$DIST	(independent)
ATON	=	$\log_e$TONE	(independent)
AVAL	=	$\log_e$VALE	(independent)

The additive variant of the model has the following functional form:-

$$FERI = \alpha_o + \alpha_1 DIST + \alpha_2 TONE + \alpha_3 VALE + \varepsilon$$

While the multiplicative variant takes the functional form:

$$FERI = \beta_o + \beta_1 ADIS + \beta_2 ATON + \beta_3 AVAL + u$$

The usual assumptions of Ordinary Least Squares are made as explained in chapter 4 on model specification section. In the additive variant α_o is the constant term while α_1, α_2 and α_3 represent the coefficients for distance, tonnage and value respectively. In the multiplicative model β_o is the constant while β_1, β_2 and β_3 represent the coefficients to the transformed variable for distance, tonnage and value respectively. The terms ε and u represent the error terms in the two variants and are subject to the Ordinary Least Squares assumptions mentioned above.

The same notation is used in all the regions. The following parts of this section are the results of the regression analysis for the twelve equations estimated. Decisions to accept or reject hypotheses are made at 95% level of confidence. The two values of the coefficient of determination R^2 are given in the results.

5.2.2 Europe

The number of observations for Europe was 321.

(a) Additive Variant

In this variant the highest coefficient of correlation between any two explanatory variables was 0.189 for tonnage and value. The regression results are shown on Table 5.2.2 (a) below.

Table 5.2.2 (a) Regression Results for Europe (Additive Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	-1995,7650	0.48	0.67	0.64
DIST	0.3005	0.46	0.67	0.64
TONE	12.7209	3.11	0.67	0.64
VALE	0.1133	22.82	0.13	0.08

R^2 = 0.67 0.64

Degrees of Freedom = 317

Critical t Value = 1.645

Interpretation:

(i) The constant term is not significantly different from zero.

(ii) $\hat{\alpha}_1$ which is the coefficient of distance is not significantly different from zero.

(iii) $\hat{\alpha}_2$ which is the coefficient of tonnage is significantly different from zero and has the positive sign.

(iv) $\hat{\alpha}_3$ which is the coefficient of value is significantly different from zero, and has the positive sign. The value variable has the highest explanatory power among the others.

(b) Multiplicative Variant

The highest coefficient of correlation between any two variables was 0.631 for tonnage and value transforms. The regression results are shown on Table 5.2.2 (b) below.

Table 5.2.2 (b) Regression Results for Europe (Multiplicative Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	4.9989	1.03	0.98	0.74
ADIS	-0.4938	0.89	0.98	0.74
ATON	0.3287	11.87	0.98	0.69
AVAL	0.6068	17.12	0.96	0.58

R^2 = 0.98 0.74

Degrees of Freedom = 317.

Critical Value of t = 1.645

Interpretation

(i) The constant is not significant.

(ii) $\hat{\beta}_1$ which is the coefficient for ADIS is not significantly different from zero. It has a negative sign.

(iii) $\hat{\beta}_2$ which is the coefficient of ATON is significant and has the positive sign. This implies that tonnage elasticity with freight charged, is positive and significantly different from zero.

(iv) $\hat{\beta}_3$ which is the coefficient for AVAL is significantly different from zero and AVAL has the highest explanatory power.

(v) This variant of the model gives the impression that the elasticity of freight charged with respect to distance is not significantly different from zero while the elasticities with respect to tonnage and value are positive and significantly different from zero.

5.2.3 Far East

The number of observations for this zone was 162.

(a) Additive Variant

The highest coefficient or correlation between any two explanatory variables was 0.651 for tonnage and value. The regression results are shown on Table 5.2.3(a) below:

Table 5.2.3 (a) Regression Results for Far East (Additive Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	489.6766	0.38	0.85	0.79
DIST	-0.0648	0.33	0.85	0.79
TONE	15.8471	7.55	0.79	0.72
VALE	0.1081	13.11	0.67	0.58

R^2 = 0.85 0.79

Degrees of Freedom = 158

Critical Values of t = 1.645

Interpretation

(i) The constant is not significant

(ii) $\hat{\alpha}_1$ is not significantly different from zero though it has a negative sign. This implies that distance is not an explanatory variable. Its omission does not reduce the value of the coefficient of multiple determination.

(iii) $\hat{\alpha}_2$ which is the coefficient of tonnage is significantly different from zero and has a positive sign. This implies that tonnage is an explanatory variable.

(iv) $\hat{\alpha}_3$ which is the coefficient of value is significantly different from zero and carried the positive sign. It also shows that value has the highest explanatory power among the independent variables.

(b) Multiplicative Variant

The highest coefficient of correlation between any two explanatory variables was 0.762 for tonnage and value. The regression results are shown on Table 5.2.3 (b) below.

Table 5.2.3 (b) Regression Results for Far East (Multiplicative Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	-6.2469	0.70	0.98	0.72
ADIS	1.0103	1.00	0.98	0.72
ATON	0.3677	7.58	0.96	0.61
AVAL	0.3890	6.04	0.98	0.66

R^2 = 0.98 0.72

Degrees of Freedom = 158

Critical Values of t = 1.645

Interpretation

(i) The constant is not significant.

(ii) $\hat{\beta}_1$ which is the coefficient to ADIS is not significant. This implies that distance is not an explanatory variable.

(iii) $\hat{\beta}_2$ which is the coefficient of ATON is significantly different from zero and has the expected sign. Since the lowest R^2 occurs when ATON is excluded, it implies that tonnage has the highest explanatory power among the independent variables.

(iv) $\hat{\beta}_3$ which is the coefficient of AVAL is significantly different from zero and has the positive sign. It implies that value is an explanatory variable though it does not have the highest explanatory power.

(v) There seems to be a significant problem of multicollinearity.

5.2.4 Indian Subcontinent

The number of observations for the Indian subcontinent was 70.

(a) Additive Variant

The highest coefficient of correlation between any two explanatory variables was 0.236 for distance and tonnage . The regression results are shown on Table 5.2.4(a) below.

Table 5.2.4(a) Regression Results for the Indian Subcontinent (Additive Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	755.6223	1.06	0.36	0.27
DIST	-0.2670	0.96	0.36	0.28
TONE	69.5583	4.83	0.15	0.04
VALE	0.0049	0.48	0.14	0.28
R^2 = 0.37			0.29	

Degrees of Freedom = 66

Critical Values of t = 1.671

Interpretation

(i) The constant is not significant

(ii) $\hat{\alpha}_1$ which is the coefficient for DIST is not significantly different from zero though it does not have the expected sign.

(iii) $\hat{\alpha}_1$ which is the coefficient for TONE is significantly different from zero and has the expected sign. It also shows that tonnage has the highest explanatory power among the independent variables since R^2 has the lowest value when tonnage is excluded.

(iv) $\hat{\alpha}_3$ which is the coefficient for VALE is not significantly different from zero though it carries the positive sign. It therefore implies that value is not an explanatory variable in the determination of freight charged for cargoes from the Indian Subcontinent.

(b) Multiplicative Variant

The highest coefficient of correlation between any two explanatory variables is 0.688 for tonnage and value. The regression results are shown on Table 5.2.4 (b) below:

TABLE 5.2.4 (b) Regression Results for Indian Sub-continent (Multiplicative Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	-0.5789	0.12	0.98	0.77
ADIS	0.3149	0.50	0.98	0.77
ATON	0.5283	6.92	0.98	0.61
AVAL	0.3599	4.70	0.96	0.71

R^2 = 0.98 0.77

Degrees of Freedom = 66

Critical Value of t = 1.671

Interpretation

(i) The constant is not significant

(ii) $\hat{\beta}_1$ which is the coefficient for ADIS is not significantly different from zero though it has the expected sign. It therefore implies that distance is not an explanatory variable in the determination of freight charges.

(iii) $\hat{\beta}_2$ is significantly different from zero and has the expected sign. It therefore implies that tonnage is an explanatory variable in the determination of freight charged. Tonnage has also got the highest explanatory power.

(iv) $\hat{\beta}_3$ is significantly different from zero and has the positive sign. It implies that value is an explanatory variable in the determination of freight charged though it has a lower explanatory power than tonnage.

5.2.5 North America

The number of observations for North America was 36.

(a) Additive Variant

The highest coefficient of correlation between any two explanatory variables was 0.562 for tonnage and value. Regression results are shown on Table 5.2.5(a) below.

Table 5.2.5 (a) Regression Results for North America (Additive Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
CONSTANT	3506.6767	0.82	0.90	0.86
DIST	-0.3597	0.79	0.90	0.86
TONE	86.4130	7.05	0.77	0.67
VALE	0.0541	6.57	0.79	0.69

R^2 = 0.90 0.86

Degrees of Freedom = 32

Critical Value of t = 1.697

Interpretation

(ii) The constant is not significant

(ii) $\hat{\alpha}_2$ which is the coefficient for DIST is not significantly different from zero though it has a negative sign.

(iii) $\hat{\alpha}_2$ which is the coefficient for TONE has the expected sign and is significantly different from zero. It has the highest explanatory power among the independent variables.

(iv) $\hat{\alpha}_3$ which is the coefficient for VALE is significantly different from zero and has the positive sign.

The coefficient of determination is quite high and is would seem that the additive model explains the relationship fairly well.

(b) Multiplicative Variant

The highest coefficient of correlation between any two explanatory variables was 0.499 between tonnage and value. The regression results are shown on Table 5.2.5 (b) below.

Table 5.2.5 (b) Regression Results for North America (Multiplicative Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	63.6539	0.95	0.98	0.71
ADIS	-6.9046	0.92	0.98	0.71
ATON	0.3304	3.39	0.98	0.61
AVAL	0.6704	5.29	0.98	0.46

R^2 = 0.98 0.72

Degrees of Freedom = 32

Critical Value of t = 1.697

Interpretation

(i) Constant is not significant.

(ii) $\hat{\beta}_1$ which is the coefficient of ADIS has the negative sign but is not significantly different from zero. It therefore implies that distance is not an explanatory factor in freight charges determination for the North American Zone.

(iii) $\hat{\beta}_2$ which is the coefficient of ATON is significantly different from zero and has the expected sign. It therefore implies that tonnage has role in the determination of freight charges in the North American zone.

(iv) $\hat{\beta}_3$ which is the coefficient of AVAL is significantly different from zero and has the positive sign. Also AVAL has the highest explanatory power among the other independent variables.

(v) There may be some significant problem of multicollinearity.

5.2.6 Australasia

The number of observations for Australasia region was 11. There was no information on which to increase the number of observations.

(a) Additive Variant

The highest coefficient of correlation between any two explanatory variables was 0.642 between distance and value. The regression results are shown on Table 5.2.6(b) below.

Table 5.2.6 (b) Regression Results for Australasia (Additive Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
CONSTANT	-1472.0571	0.08	0.96	0.96
DIST	0.2630	0.09	0.96	0.96
TONE	13.3541	1.17	0.96	0.96
VALE	0.0318	8.91	0.55	0.52

R^2 = 0.96 0.96

Degrees of Freedom = 7

Critical Value of t = 1.895

Interpretation

(i) The constant is not significant

(ii) Distance is not an important factor in freight charging since $\hat{\alpha}_1$ which is the coefficient for DIST is not significantly different from zero. $\hat{\alpha}_1$ has the positive sign.

(iii) $\hat{\alpha}_2$ which is the coefficient of TONE is not significantly different from zero and has the positive sign. This implies that tonnage has no explanatory role in the determination of freight charged.

(iv) $\hat{\alpha}_3$ which is the coefficient of VALE is significantly different from zero and has the positive sign. Value has the highest explanatory power among the independent variables since R^2 is lowest when VALE is excluded from the equation.

(b) Multiplicative Variant

The highest coefficient of correlation between any two explanatory variables was 0.590 for tonnage and value. The regression results are shown on Table 5.2.6 (b) below.

Table 5.2.6 (b) Regression Results for Australasia (Multiplicative Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	-125.5758	0.97	0.98	0.83
ADIS	14.6675	0.99	0.98	0.83
ATON	0.2078	1.65	0.98	0.77
AVAL	0.4409	3.52	0.98	0.58

R^2 = 0.98 0.85

Degrees of Freedom = 7

Critical Value of t = 1.895

Interpretation

(i) Constant is not significant.

(ii) $\hat{\beta}_1$ which is the coefficient of ADIS is not significantly different from zero. This implies that distance is not an explanatory factor used in the determination of freight charged.

(iii) $\hat{\beta}_2$ which is the coefficient of ATON is not significantly different from zero. It has the positive sign. This implies that tonnage is also not an explanatory factor in the determination of freight charged in

(iv) $\hat{\beta}_3$ which is the coefficient of AVAL has the positive sign and is significantly different from zero. It is also clear that AVAL has the highest explanatory power among all the independent variables. This implies that value is an explanatory factor in the determination of freight charged.

(v) There seems to be a multicollinearity problem in the multiplicative variant.

5.2.7 All Regions

The number of observations here was 600 which is the sum of all the observations in the five regions covered.

(a) Additive Variant

The highest coefficient of correlation between any two variables was 0.221 for tonnage and value. The regression results are shown on Table 5.2.7(a) below.

Table 5.2.7(a) Regression Results for All Regions (Additive Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	-320.6641	0.47	0.66	0.64
DIST	0.423	0.39	0.66	0.64
TONE	13.9758	5.10	0.64	0.62
VALE	0.1087	30.06	0.15	0.09

R^2 = 0.66 0.64

Degrees of Freedom = 596

Critical Value of t = 1.645

Interpretation

(i) The constant is not significantly different from zero.

(ii) $\hat{\alpha}_1$ which is the coefficient for DIST is not significantly different from zero though it has the expected sign.

(iii) $\hat{\alpha}_2$ which is the coefficient of TONE has the expected sign and is significantly different from zero.

(iv) $\hat{\alpha}_3$ which is the coefficient for VALE has the positive sign and is significantly different from zero. Value has the highest explanatory power among the other explanatory variables.

None of the factors which were consistently insignificant in each zone have become significant in the combined regions. Value still has the highest explanatory power among the other variables followed by tonnage.

(b) Multiplicative Variant

The highest coefficient of correlation between any two explanatory variables was 0.678 for ATON and AVAL. The regression results are shown on Table 5.2.7(b).

Table 5.2.7 (b) Regression Results for All Regions (Multiplicative Variant)

Variable Name	Regression Coefficient	t Statistic	R^2 when Variable is excluded	
Constant	-4.7239	5.01	0.98	0.76
ADIS	0.7059	6.38	0.98	0.76
ATON	0.3390	15.41	0.98	0.67
AVAL	0.5205	18.70	0.96	0.64

R^2 = 0.98 0.76

Degrees of Freedom = 596

Critical Value of t = 1.645

Interpretation

(i) The constant is significantly different from zero.

(ii) $\hat{\beta}_2$ which is the coefficient of ADIS is significantly different from zero and has the expected sign.

(iii) $\hat{\beta}_2$ which is the coefficient of ATON is also significantly different from zero and has the expected sign.

(iv) $\hat{\beta}_3$ which is the coefficient of AVAL is significantly different from zero and has the positive sign. It also indicated that AVAL has the highest explanatory power among the other independent variables. There also seems to be a significant multicollinearity problem since the coefficient of correlation between ATON and AVAL is 0.67.

In this variant of the model the coefficient for distance has become significant though it was not significant in any of the individual regions separately. The main reason may be because since the distances within ports in each zone were not large, their corresponding distances from Mombasa may have transformed to nearly same logarithmic values, and hence the ADIS values may have been nearly the same for each region.

However ADIS did not have a high explanatory power compared with the rest of the factors even in this case.

5.3 FREIGHT COST AS A RATIO OF IMPORTS VALUE

This section calculates the ratio of freight paid to the total value of imports. The objective is to make comparisons with the same calculations done on global basis and published annually by UNCTAD[1]. The UNCTAD gives information on the level of freight rates in various parts of the world. The calculations are done on a zonal basis[2]. The formula for calculations is given in the footnote number 2. A simple Fortran programme was written to calculate the ratios and the results are given below in percentages on Table 5.3 (a) below. The arithmetic mean of the ratios in the observations per zone is used.

Table 5.3 (a) The Ratio of Freight Cost to Import Value for Kenyan Imports on Regional Basis

Zone	Freight Cost as a % Import Value
Europe	12.002
Far East	16.099
Indian Subcontinental	9.690
North America	11.663
Australasia	10.565
All Regions	12.404

Source; Own Computations

The All Regions percentage is obtained by calculating the arithmetic mean for all the six hundred observations for the five zones

The global comparisons include insurance in value so that the value quoted is cost insurance and freight. Therefore in order to match the definitions, insurance has been estimated at 2 per cent of free on board (f.o.b.) value. This is also the figure used by the Customs and Excise Department for their c.i.f valuation when insurance is not indicated in the declarations.

The estimates of freight as a percentage of cargo value are calculated annually by the Shipping Division of UNCTAD and the following were the results for the year 1982 shown on Table 5.3(b) below:

Table 5.3 (b) The Ratio of Freight Cost to Import Value for the World on Group of Countries Basis

Country Group	Freight Costs as % of Import Value
Developed Market Economies	5.32
Developing Countries	10.69
Africa	10.82
America-Developing	9.40
Asia - Developing	11.17

Source: Review of Maritime Transport, Table 26

5.4 MONOPOLY POWER

The calculation of monopoly power as indicated in the chapter on methodology is based on the method used by Lerner[3]. In this method, monopoly power is calculated by dividing the difference between price and average cost by the price. In notation form

$$MP = \frac{P - AC}{P}$$

Where P = Price
AC = Average cost
MP = Monopoly Power Index

In this study, freight paid is taken as the price the shipowner charges the shipper for the transport service. The average cost of transporting cargo to the shipowner is calculated indirectly from emperical results obtained from operating general cargo ships. The method used for estimating average cost takes advantage of known components of the ships cost items and uses it to work backwards to find the total cost of each consignment to the ship.

Sturmey[4] gives a breakdown of the cost items of a dry general cargo ship by classifying the ship costs into seven headings and showing the percentage of each cost item. Below are the cost

items and their percentages:-

(i) Crew Costs - 30%

(ii) Fuel Costs - 12%

(iii) Repairs costs - 6%

(iv) Insurance Costs- 8%

(v) Port Expenses - 10%

(vi) Cargo Handling Costs - 25%

(vii) Other Expenses - 9%

Cargo handling costs (item vi) above can be obtained by finding out the stevedoring charges from ports tariffs.

From studies undertaken by the Intergovernmental Standing Committee on Shipping (ISCOS)[5] in Mombasa, the cargo handling costs for the ships operating in the East Africa/Europe Conference in 1982. accounted for 28 per cent of total ships costs. In order to calculate the total cost incurred by a ship in transporting a consignment of cargo, one needs to know its tonnage so that handling and discharge can be worked out. When the handling costs are obtained then the total cost to a ship can be estimated since handling costs comprise a given proportion of total costs. It is assumed that all the ship costs - both fixed and variable will be distributed to the cargo on the basis of its

It is also assumed that ships are fully loaded with cargo. The handling costs are obtained from port tariffs. In the case of Mombasa port the tariff rate had a mean of Shs. 75/= per tonne for the period covered in this study. Tariff rates from most of the ports covered were not available but from those that were available such as Felixstowe and London the differences in the handling items were not very significant. It has therefore been assumed that handling costs are not significantly different among ports and therefore Mombasa rates have been assumed for other ports. Therefore total handling costs have been obtained by doubling the Mombasa rate since every import cargo is handled twice i.e. at the loading port and the discharging port. This assumption is not terribly unreasonable.

By adopting Lerner's method of calculating monopoly power the limiting values will be fixed between zero and unity if a carrier seeks to maximize profit and no loss for any individual consignment of cargo. Symbolically, $0 \leq MP \leq 1$. Monopoly power index will be equal to zero when the shipowner charges a freight rate equal to the total cost of transporting the consignments and will be equal to unity when the profit is so high that the cost is insignificant.

Symbolically, $MP = \frac{F - C}{F}$ where MP = Monopoly Power Index,
F = Freight paid
C = Consignment cost to the shipowner.

Since C is fixed for consignments of equal tonnage

then MP $\longrightarrow$ 1 as F $\longrightarrow \infty$

and MP $\longrightarrow$ 0 as F $\longrightarrow$ C

There is a possibility of MP=0 where the shipowner is willing to incurr loss on the transportation of a consignment. This could occur when there is cut-throat competition as in the case of "fighting" ships referred to in the literature review, where ship operators may be prepared to incur losses in order to drive out marginal competitors and eventually raise their freight charges and act like monopolists. In our case Sturmey's value of 25% of total costs being the cargo handling costs has been used to calculate monopoly power.

Since the cargo handling costs are known from the stevedoring charges in ports, and are paid for by the shipowner, then his total costs can be calculated. Assuming that the ship's total costs are distributed evenly to cargo, then the cost per consignment can be calculated and this will represent the Average Cost as used by Lerner. The value of monopoly power index is the arithmetic mean of the monopoly power per observation[6]. The formula for monopoly power index will have the form:

$$MP = \frac{I}{N} \sum_{i=1}^{N} \frac{F_i - C_i}{F_i}$$

where F_i = Freight paid for consignment i

C_i = Consignment i cost to shipowner

N = Number of observations.

The monopoly power index is calculated on regional basis and then for all the regions. The results showing the monopoly power indices on zonal basis are shown on Table 5.4

Table 5.4 - Monopoly Power on Zonal Basis in Kenya's Maritime Transport

Zone	Monopoly Power Index
Europe	0.64758
Far East	0.68386
Indian Subcontinent	0.40899
North America	0.87345
Australasia	0.57487
All Regions	0.66388

Source: Own Computations

From the above results it is clear that there is significant monopoly power since in most of the regions freight charged exceeds the estimated average cost of cargo to the shipowner by more than 50 percent.

5:5 ANALYSIS OF EXCESS COSTS

This section analyses the possible excess costs which Kenya incurs for the transportation of her imports by sea under the existing pattern of maritime transport. If there are substantial excess costs, then they may have serious impacts on Kenya's foreign exchange resources, internal prices, and also the prices of her exports since many imports are used as inputs into industries which produce for the local demand and also exports.

The results obtained in the previous sections of this chapter will be used to calculate estimates of excess costs for the period 1980-1983. It will also be assumed that monopoly power is the same for all cargo types. It will also be assumed that the ratio and monopoly power have been constant for the period under consideration. The assumption of same freight cost to value of imports and monopoly power for all types of cargo may understate them in the dry bulk and liquid bulk cargoes since there is a high likelihood of own carriers overcharging on freight rates in order to practice transfer pricing.

Kenya's total value of imports for the period 1980-1983 is shown on Table 5.5(a) below.

Table 5:5(a) Kenya Total Imports for the Period 1980-1983

Year	Value of Imports in K£ 000
1980	959,030
1981	932,406
1982	900,305
1983	905,220

Source: Statistical Abstract 1984
Central Bureau of Statistics

The ratio of freight cost to value for imports was found to be 0.12404 in section 5.3 above while monopoly power was found to be 0.6639 in section 5.4 above. The product of the ratio and monopoly power gives the excess cost per unit of import assuming perfect competition in the pricing of maritime transport services. Assuming that 97 per cent of Kenyan imports are seaborne, the excess costs incurred for payment of transport charges for the period 1980 - 1983 are shown on Table 5:5(b) below. The ratio of freight cost to value of import is taken as 0.12404 while monopoly power is 0.6639. The product of the two is therefore 0.08235.

Table 5.5(b) Excess Freight Costs Incurred on Kenyan Imports (K£ 000)

Year	Total Imports Value	Estimated Value of Seaborne Imports	Excess Freight Costs*
1980	959,030	930,259.1	76,607.0
1981	932,406	904,433.8	74,480.3
1982	900,305	873,295.9	71,916.1
1983	902,220	875,153.4	72,069.0

* Excess Freight Cost = Estimated Value of Seaborne Imports X Ratio of Freight cost to Value of Import X Monopoly Power Index.

Table 5.5(c) below shows the excess costs incurred on the imports allowing for a 10 per cent profit above the normal profit. The freight cost to value of imports ratio remains constant and monopoly power becomes 0.5639. The product of the two will be o.06995.

Table 5.5(c) Excess Freight Costs Incurred on Kenyan Imports Assuming a 10 per cent Profit Above Normal Profit (in K £ 000)

Year	Total Imports Value	Estimated Value of Seaborne Imports	Excess Freight Costs
1980	959,030	930,259.1	65,068.1
1981	932,406	904,433.8	63,261.7
1982	900,305	873,295.9	61,083.7
1983	905,220	875,153.4	61,213.6

From Tables 5.5(b) and 5.5(c) it is clear that there are significant excess costs incurred on the transportation of Kenya's imports by sea. On the higher scale the annual average for the four years was slightly over K£ 73 million while on the lower scale it was over K£ 62 million. All this is paid to foreign based shipping companies and therefore constitutes a foreign exchange loss.

5.6 SUMMARY OF FINDINGS

The summary of regression results is shown on Tables 5.6(a) and Table 5.6(b) attached.

On the basis of the results, Hypothesis 1 is rejected in all the individual zones and All Regions in the additive variant of the model. It therefore implies that the marginal effects of changes in distance were not positive. They were also not significantly different from zero. In the multiplicative variant, Hypothesis 1 was rejected in all the individual zones but was accepted in the "All Regions". The possible reason for rejection in the individual zones but acceptance in them combined may be because of the effect of the transoformation of distance by taking logarithms. In each zone the differences in distances of ports to Mombasa may not be considerable and when these distances are transformed into their logarithms, the differences in them become very small so that each zone's ports will tend to have the same distances from Mombasa.

Hypothesis 2 is accepted in all the zones in both variants except Australasia. This implies that tonnage is used as a factor in charging freight for most of the zones.

Hypothesis 3 is rejected in all the zones in both variants of the regression model except the additive variant for the Indian Subcontinent. It is therefore clear that value is an explanatory factor in the determination of freight charges and has turned out to have the highest explanatory power among the other explanatory variables considered.

From the results of the analysis it is implied that the marginal effects of changes in tonnage and value of consignments are positive with respect to freight charged for their conveyance by sea in most of the trade zones.

Hypothesis 4 is accepted since the ratio of freight cost to value of imports is higher in the Kenyan trade than in most other parts of the world. It is even higher than that of the African region.

Hypothesis 5 is accepted since monopoly power index was significantly high. It was over 50 per cent which means that the average cost of the transport service to the shipowner is less than half of the freight he charges.

The regression results show that both variants of the regression model have their constraints in explaining the relationship between freight charges and the factors considered as the explanatory variables. The additive model has been more consistent though it has had lower coefficients of determination

than the multiplicative one. It has however had lower correlation coefficients among the independent variables and its R^2 has consistently improved with the every addition of an extra explanatory variable. This makes the additive model less prone to the problem of multicollinearity.

The multiplicative variant on the other hand has had high correlation coefficients among the explanatory variables. Its R^2 has also tended not to improve appreciably with the introduction of an extra explanatory variable. Therefore inspite of its higher values of R^2, the multiplicative variant may have suffered from the problem of multicollinearity.

Table 5.6 (a): Summary of Results for the Additive Model*

Coefficient / Region	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\alpha}_2$	$\hat{\alpha}_3$	R^2	Degrees of Freedom	Critical Value of t
Europe	-1995.7650 (0.48)	o.3005 (0.46)	12.7209 (3.11)	0.1133 (22.82)	0.64	317	1.645
Far East	489.6766 (0.38)	-0.0648 (0.33)	15.8471 (7.55)	0.1081 (13.11)	0.79	158	1.645
Indian Sub-Continent	755.6223 (1.06)	-0.2670 (0.96)	69.583 (4.82)	0.0049 (0.48)	0.29	66	1.671
North America	3506.6767 (0.82)	-0.3597 (0.79)	86.4130 (7.05)	0.0541 (6.57)	0.86	32	1.697
Australasia	-125.5758 (0.97)	14.6675 (0.99)	0.2078 (1.65)	0.4409 (3.52)	0.96	7	1.895
All Regions	-4.7239 (5.01)	0.7059 (6.38)	0.3390 (15.41)	0.5205 (18.70)	0.64	596	1.645

* The bracketed figures are the t statistics for the corresponding estimated coefficients.

The R^2 values are the squares of the smaller values of R.

Table 5.6(b): Summary of Results for the Multiplicative Model*

Coefficient / Region	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	R^2	Degrees of Freedom	Critical Value of t
Europe	4.9989 (1.03)	-0.4938 (0.89)	0.3287 (11.87)	0.6068 (17.12)	0.74	317	1.645
Far East	-6.2469 (0.70)	1.0103 (1.00)	0.3677 (7.58)	0.3890 (6.04)	0.72	158	1.645
Indian Sub-continent	-0.5789 (0.12)	0.3149 (0.50)	0.5283 (6.92)	0.3599 (4.70)	0.77	66	1.671
North America	63.6539 (0.95)	-6.9046 (0.92)	0.3304 (3.39)	0.6704 (5.29)	0.72	32	1.697
Australisia	-125.5758 (0.97)	14.6675 (0.99)	0.2078 (1.65)	0.4409 (3.52)	0.85	7	1.895
All Regions	-4.7239 (5.01)	0.7059 (6.38)	0.3390 (15.41)	0.5205 (18.70)	0.76	596	1.645

*The bracketed figures are the t statistics for the corresponding estimated coefficients. The R^2 values are the squares of the smaller values of R.

Chapter 5 - Footnotes

1. UNCTAD : Review of Maritime Transport, TD/B/C4/182/Rev 1 New York, 1983, pp. 3- 59

2. The ratio of freight cost to value of cargo is given as

$$R = \frac{1}{N} \sum_{i-1} F_i/(1.02V_i + .F_i)$$

where f_i = Freight charged for consignment i,

V_i = Value of consignment i,

N = Number of observations

3. Lerner; A. P. : "The Concept of Monopoly and Measurement of Monopoly Power", Readings in Microeconomics Eds. Breit, W. and Hochman, H. M.: New York, 1968, pp. 239-255.

4. Sturmey, S. G. : British Shipping and World Competition, The Athlone Press London, 1962, p. 264

5. This information was obtained from unpublished working papers at the ISCOS Secretariat in Mombasa. ISCOS undertakes frequent studies on the ship costs which are used when discussions with conferences are being undertaken.

6. Monopoly Power Index is given by the following formula

$$MP = \frac{1}{N} \sum_{i-1}^{N} (F_i - C_i)/F_i$$

where C_i = cost of consignment i to the shipowner

F_i = Freight paid for consignment i,

N = Number of observations

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The conclusions reached from this study will be made according to the sequence of the analysis chapter.

(i) Regression Model

It was noted from the results of the regression analysis in chapter five that the value of cargo was the factor with the highest explanatory power in both the additive and multiplicative variants except for the Indian subcontinent and North America. In the case of the Indian subcontinent where tonnage had the highest explanatory power among the other factors the main reason may be because it is a captive region. This would imply that if freight rates were significantly high, ships originating from the zones such as Far East and Australia could call through there on their way to East Africa. This could pose competition to the Indian, Pakistan and Sri Lankan shipping lines which commence their voyages from ports in the Indian Subcontinent region.

In the case of North America it is likely that American shipping lines use the same methods of charging as they do on European trades where there is considerable competition from European lines.

If the freight rates are high on the North American East African route, it may be possible for European lines operating between America and Europe to tranship cargo in Europe and carry it to East Africa using their vessels which operate the European East African routes. The American lines are also subject to the strict anti-conference laws which are administered by the Federal Maritime Commission which outlaw closed conferences.

Tonnage was an important factor ranking second to value in all the routes except the Indian Subcontinent and the North American zones. It had the highest explanatory power in the last two zones. It was significant in all the zones except Australasia.

Distance did not seem to have any significant role in the determination of freight charged in all the zones. It was significant only in the multiplicative variant of All Regions zone but it has the lowest explanatory power among the other explanatory variables.

This is quite contrary to charging in other modes of transport such as rail and road where distance is an important factor in determination of freight charges. It is also contrary to what researchers such as Bates have found out.

(ii) Ratio of Freight Cost to Value of Imports and Monopoly Power

It was found out that the ratio of freight cost to value of imports was higher in the Kenyan trade than for most other regions in the world. This could be a sign of overcharging on freight rates charged by the shipping companies which provide transport services for Kenyan imports. This was reinforced by the fact that monopoly power index was over 0.5 which implies that freight charges are well over 50 per cent of the actual cost of what shipowners incur to carry the cargo. It is therefore indicated that serious overcharging exists in freights charged for the Kenyan seaborne trade under the current pattern of maritime transport.

(iii) Economic Impacts

The economic impacts arising from the overpricing as analysed on the section on excess costs indicate that Kenya loses considerable foreign exchange resources. In the case of the period considered, the average losses ranged from K£62 - 73 millions per year. The position is definately the same todate since nothing has changed on the pattern of shipping. It also implies that as Kenya's trade expands, more resources will be lost as the overpricing of freight charges will continue if the present pattern is retained.

High transport costs on imports result in even higher prices for the imported products in the local markets. This is because importers add markups on the c.i.f. values of goods in order to realize profits and therefore the local consumers of imported goods meet the incidence of both the excess costs due to transport and also the markups as most imports are sold to consumers whose price elasticity of demand is very low. Imports are also used as inputs in many local industries. This implies that the prices of locally produced commodities become higher in the domestic markets. In cases where the locally made products are meant for export, they are likely to fail to be competitive in the export market without export compensation schemes. This reduces our potential to export even in nearby markets in our neighbouring countries where it might be possible even at marginal reductions in prices.

6.2 RECOMMENDATIONS

This study has come up with findings which indicate that there is overcharging in the pricing of maritime transport services in Kenyan Seaborne trade. Consequently some adverse impacts in the economy have been examined. It is therefore necessary to take some remedial measures to eliminate the existing state of affairs.

The following measures if taken can reduce the adverse impacts both in the short term and in the long term:

(i) Establishment of a national shipping line or lines to operate on routes linking Kenya to her major trading zones. This would be a long term solution since it would ensure that the national lines could set a low benchmark on freight charges and shippers would have an alternative instead of depending on foreign shipping companies. It would also enable Kenya to take advantage of the UNCTAD Liner Code of conduct where her ships can carry at least 40 per cent of her seaborne international trade.

(ii) Contractual arrangements with selected shipping lines where freight charges are mutually agreed upon and cargoes destined to or originating from Kenya would be carried exclusively by these lines. The lines would undertake to provide regular services and Kenya would agree to provide cargo. This would enable the ships to achieve full capacity utilization and therefore provide services at lower unit costs. This could be a short term solution before the establishment of a national shipping line and a long term one for routes which are uneconomical for the national shipping line to operate.

(iii) Tighter control of shipping conferences by outlawing closed conferences and requesting all of them to provide data on their costs before any freight rate increases to ensure that they require the increases because of increased operating costs. These methods are used in the United States to deal with conferences.

(iv) Strengthing the intergovernmental committee on shipping (ISCOS) or any national consultative body in order to carry out research on shipping in Kenya and worldwide in order to understand and monitor the practices of conferences and their impacts on Kenyan trade. This would be a long term solution.

(v) Educate shippers so that they understand the maritime transport characteristics. This would enable them to negotiate better with shipping companies on matters of freight charges and other conditions of carriage such as compensation for losses of cargo, damage and also ships delays. Shippers can then be encouraged to form shippers councils which have more bargaining powers when negotiating with conferences. This would be a longterm solution.

6.3 SCOPE FOR FURTHER RESEARCH

There is a wide scope for research in the subject of maritime transport in Kenya and also on a regional basis such as the P.T.A.

Research could concentrate on some specific areas and carry out deeper studies or examine a number of aspects and assess their total impacts either on a national or a group of nations basis.

The following are some of the topics that may be studied and would give insights on how maritime transport affects Kenya and other countries in her position:

(i) The impact of maritime freight charges on the manufacturing sector where significant proportions of inputs are imported.

(ii) Constraints which may exist on Kenyan exports because of existing pattern of maritime transport.

(iii) Examination of whether the present supply of shipping capacity is the cause or the result of Kenya's choice of trading partners.

(iv) Containerization in Kenya: It may reduce transport and handling costs but who benefits?.

(v) Technological changes in ports' handling methods: Can they be controlled to prevent premature obsoleteness in working equipments?.

Bibliography

Anderson, R. E.: The Merchant Marine and World Frontiers, Cornell Maritime Press, New York, 1945.

Bains, J. S.: "Pricing in Monopoly and Oligopoly" American Economic Review Vol.39, 1949.

Bates, T. H.: A Linear Regression Analysis of Tramp Ocean Rates", Transportation Research, Vol.3 No.3, 1969.

Borger, de, B. and Nonemann, W.: "Statistical Cost Functions for Dry Bulk Carriers", Journal of Transport Economics and Policy, Vol.XV, No.2, 1981.

Brown, R. T.: Transport and Economic Integration in South America, The Brookings Institution, Washington, 1969.

Chezeau, de, M. G.: Integration and Competition in Petroleum Industry, Yale University Press, New Haven, 1959.

Europa Publications: Europa Yearbook 1981 Europa Publications, London, 1981.

Evans, J. J.: "Concerning the Level of Freight Rates", Intenrnational Journal of Shipping and Port Research, Vol.9, No.2, London, 1982.

Fasbender, K. and Wagner, W.: Shipping Conferences Rates Policy and Developing, Hamburg Institute of International Economics Hamburg, 1973.

Goss, R. O.: Studies in Maritime Economics, Cambridge University Press London, 1976.

Hilling, D. and Hoyle, B. S.: Seaports and Development in Tropical Africa, McMillan & Co.Ltd. London, 1970.

Johnston, J.: Econometric Methods, McGraw-Hill, New York, 1963.

Kenya, Republic of: Development Plan 1979-1984 Government Printers, Nairobi, 1978.

Kindleberger, C. P.: Foreign Trade and National Economy, Yale University Press, New Haven, 1962.

Kish, L.: Survey Sampling, J. Wiley, New York, 1965.

Koutsoyiannis, A.: Modern Microeconomics, McMillan Press Ltd. London, 1979.

Koutsoyiannis, A.: Theory of Econometrics McMillan Press Ltd., London, 1977.

Lerner, A. P.: "The Concept of Monopoly and Measurement of Monopoly Power" Readings in Microeconomics Edited by Breit, W. and Hochman, H. M., Holt, Reinhart and Winston, INC. New York, 1968.

Marx, Jr.D.: International Shipping Cartels A Case Study of Industrial Self Regulation by Shipping Conferences Princeton University Press, New Jersey, 1953.

Norton, H. S.: Modern Transportation Economics, Charles Merrill Press, Ohio, 1971.

Moser, C. A. and Kalton, G.: Survey Methods in Social Investigation, Heinemann, London, 1971.

O'Loughlin, C.: The Economics of Sea Transport Pergamon Press, London, 1967.

Starmey, S. G.: British Shipping and World Competition, Athlone Press, London, 1962.

Theil, H.: Principles of Econometrics, North-Holland Press, Amsterdam, 1971.

UNCTAD: Conference on Plenipotentiaries of a code of conduct in Liner Shipping, TD/CODE/13 Geneva, 1967.

UNCTAD: Consultation on Shipping, TD/B/C4/20 Rev.1, Geneva, 1966.

UNCTAD: Establishment or Expansion of Merchant Marines in Developing Countries, New York, 1968.

UNCTAD: Freight Markets and the Level and Structure of Freight Rates, New York, 1969.

UNCTAD/UNDP: Eastern Africa Shipping Study, Geneva, 1975.

UNDP: Control of Transnational Corporations over Dry Cargo Movements, TB/BC3/203 Rev.1., New York, 1968.

U.S. Department of Commerce: The US Merchant Marine and the International Conference System, Harbridge House INC.1976.

The Weekly Review: June 30th, 1975.

APPENDICES

Appendix 1 - Data

Europe

TONNAGE	VALUE	DISTANCE	FREIGHT
15.900	11247.0	6284.	593.3
39.200	7273.3	6284.	1211.8
128.400	20499.0	6284.	3306.3
146.500	24532.0	6284.	4528.9
30.000	1287.0	6284.	1344.2
15.900	11247.0	6284.	592.8
0.750	1798.4	6284.	13.4
0.130	3635.2	6284.	62.4
0.300	5247.7	6284.	54.1
0.100	1369.4	6284.	18.0
0.780	502.3	6284.	91.5
0.150	887.3	6284.	22.4
10.000	64975.0	6284.	6900.0
1.000	363.4	6284.	340.4
25.000	12132.5	6284.	1092.5
293.600	66806.8	6284.	10584.3
98.700	27148.7	6284.	2338.6
115.200	25257.0	6284.	4156.1
126.800	27762.1	6284.	4573.7
99.400	19259.9	6284.	4254.4
291.700	124405.9	6284.	19711.1
196.900	47206.4	6284.	7099.3
0.720	3107.3	6284.	723.8
1.300	8008.5	6284.	965.0
390.000	64573.2	6284.	13542.4
2.700	1816.9	6284.	1151.0
14.700	33592.4	6284.	853.5
30.300	36398.7	6284.	3357.8
490.000	78180.5	6284.	10854.6
1.300	998.1	6284.	174.1
0.250	1007.0	6284.	55.0
4.000	693.5	6284.	56.5
32.000	4861.6	6284.	1087.7
10.000	8448.4	6284.	690.0
0.350	165.8	6950.	43.8
195.700	31503.6	6284.	5763.4
0.090	1595.3	6284.	18.7
1.000	1427.1	6284.	28.1
7.600	9343.6	6284.	1037.7
5.600	4817.8	6284.	321.4
0.900	291.4	6284.	40.6
202.500	30772.3	6284.	6884.5
5.010	1610.0	6284.	575.0

Europe cont.

2.300	20784.0	6533.	484.4
0.930	2070.0	6533.	165.6
[illegible].000	4830.0	6533.	4600.0
[illegible].170	2916.4	6533.	179.4
1.200	3450.0	6533.	287.5
5.000	9487.5	6533.	775.1
1.400	5749.3	6533.	212.3
0.850	2707.6	6533.	97.8
4.200	13813.8	6533.	446.2
0.360	4854.2	6533.	82.8
9.900	28219.4	6533.	1710.1
50.100	20407.4	6533.	2841.3
11.000	13925.8	6533.	1029.7
15.200	16496.5	6533.	1403.9
[illegible]	31425.1	6533.	2613.0
79.600	49664.1	6533.	3670.1
1.400	1064.9	6533.	98.9
29.800	26534.3	6533.	3076.1
100.000	51750.0	6533.	4600.0
100.000	48300.0	6533.	4600.0
[illegible]	2916.4	6533.	179.4
14.700	10939.6	6533.	987.3

1.300	2801.9	6533.	229.1
41.500	33121.7	6533.	2776.4
50.000	23000.0	6533.	2300.0
10.300	5060.0	6533.	460.6
3.100	7455.8	6533.	2119.3
1.200	3450.0	6533.	287.5
5.000	9487.5	6533.	775.1
0.820	2707.6	6533.	97.7
1.400	5749.3	6533.	212.3
1.100	2566.8	6533.	529.0
0.021	1388.2	6533.	49.5
200.000	64169.0	6533.	7931.0
0.030	920.9	6533.	41.4
0.430	3772.0	6533.	375.6
0.020	20484.1	6533.	666.9
0.830	298.1	6533.	47.6
4.300	7440.5	6533.	978.7
2.300	903.9	6533.	72.0
29.400	55534.7	6533.	4487.5
1.000	1366.2	6533.	78.2
41.400	13521.3	6533.	18723.8
1.000	2166.6	6533.	66.7

Europe cont.

7.800	4706.6	6533.	400.7
0.350	583.9	6533.	36.3
0.400	460.0	6533.	36.3
0.200	130065.0	6533.	5060.0
0.200	971.8	6533.	171.6
20.700	12826.1	6533.	146.7
1.000	8855.0	6533.	805.0
0.980	1587.0	6533.	59.8
0.050	448.0	6533.	33.8
0.900	2101.8	6533.	113.9
0.500	805.0	6533.	40.3
0.500	1033.2	6533.	260.4
0.300	1731.9	6533.	80.5
0.150	879.0	6533.	52.9
0.200	8245.5	6533.	770.5
0.100	218.3	6533.	11.5
3.300	10619.1	6533.	1317.2
0.150	879.0	6533.	52.9
1.710	4005.3	6300.	314.9
2.500	1949.0	6300.	262.0
0.730	4613.7	6300.	179.4
0.710	4004.3	6300.	314.9
4.800	7140.9	6300.	889.2
1.800	5263.1	6300.	2107.0
11.800	182.3	6300.	1235.3
0.470	837.5	6300.	38.0
0.210	1425.5	6300.	76.1
2.000	4210.1	6300.	339.3
0.460	788.8	6300.	80.9
8.500	8674.6	6300.	3217.5
2.400	3022.5	6300.	197.0
2.000	3550.9	6300.	622.1
5.400	2914.3	6300.	882.4
4.700	9979.1	6300.	1267.5
0.413	37789.1	6300.	43.9
10.300	49725.0	6300.	4485.0
0.600	1551.2	6300.	162.8
0.390	1988.1	6300.	211.6
1.000	2211.3	6300.	89.7
73.700	70572.5	6300.	20735.3
0.230	1020.8	6300.	49.7
1.000	1247.0	6300.	179.4
5.400	2914.2	6300.	882.4
0.074	364.7	6300.	58.5

Europe cont.

0.500	2066.1	6300.	161.3
0.430	902.0	6300.	79.0
1.000	2730.0	6300.	80.0
1.100	3886.4	6300.	351.0
0.220	2772.0	6548.	281.8
0.530	2024.0	6548.	57.0
1.100	2331.3	6548.	256.5
-5.000	1936.6	6548.	75.9
5.100	1936.6	6548.	287.5
0.220	2772.0	6548.	281.0
0.830	224.0	6548.	57.0
0.500	1012.0	6545.	65.8
1.800	2242.5	6548.	215.1
98.700	195678.5	6548.	24674.9
0.390	14576.9	6548.	511.8
0.360	658125.0	6548.	141579.8
39.800	41865.5	6548.	3481.1
39.900	41954.1	6548.	3488.4
14.800	16101.4	6548.	1372.4
9.800	12601.0	6548.	919.8
25.000	14437.1	6548.	1458.2
4.800	9265.1	6548.	1034.5
1.200	5270.1	6548.	634.8
39.900	45680.5	6548.	3492.8
19.800	29355.4	6548.	1737.4
24.900	13057.6	6548.	953.1
30.000	13800.0	6548.	1380.0
0.600	2305.6	6548.	635.0
19.900	29460.2	6548.	1743.6
37.900	45691.8	6548.	3495.1
64.400	16584.2	6548.	4300.7
64.500	16604.8	6543.	4306.1
19.600	10774.3	6548.	606.7
64.900	16700.0	6545.	4150.0
23.300	12325.0	6548.	1605.8
64.500	16618.8	6548.	4309.7
47.400	19148.0	6548.	4965.6
55.000	57180.0	6548.	4807.0
20.000	507.4	6548.	1334.0
6.100	12966.2	6548.	1202.7
50.000	11586.4	6548.	2066.2
0.900	2399.4	6548.	193.5
6.800	13338.1	6548.	1655.7
98.200	16439.3	6548.	3034.9

Europe cont.

64.800	16674.2	6548.	4324.1
64.400	16602.2	6548.	4305.4
19.200	4955.8	6548.	1282.7
19.300	4986.0	6548.	1293.0
30.300	31663.7	6548.	3614.3
0.280	5748.0	6548.	106.2
0.328	1770.7	6548.	114.8
200.000	46951.2	6548.	13344.0
4.900	5806.4	6548.	466.7
3.600	7335.9	6548.	460.0
0.450	1884.6	6548.	41.5
20.000	19003.5	6548.	2587.9
6.800	13838.1	6548.	1655.7
19.300	4986.0	6548.	1293.0
74.200	19014.1	6548.	4954.2
0.720	2654.0	6548.	270.0
993.300	107936.8	6548.	25404.4
64.800	16692.2	6548.	4328.8
0.224	2212.6	6548.	169.1
29.900	11863.2	6548.	1375.4
2.700	4818.5	6350.	2430.8
0.930	1875.9	6350.	73.1
0.920	1875.9	6350.	72.2
2.700	4818.5	6350.	243.8
1.100	2744.6	6350.	68.3
0.020	87.8	6350.	90.7
0.030	173.6	6350.	31.2
2.200	7784.4	6350.	151.1
6.600	9837.8	6350.	488.5
49.500	19858.4	6350.	2855.2
30.000	10502.9	6350.	2243.3
0.320	947.7	6350.	33.2
0.660	4293.0	6350.	112.1
0.560	918.5	6350.	84.8
5.300	19990.4	6350.	964.3
30.000	10502.9	6350.	2243.3
2.000	469.0	6350.	500.2
7.500	5211.4	6350.	631.8
0.880	3768.4	6350.	139.4
1.500	4890.6	6400.	477.8
0.720	1931.9	6400.	151.5
3.300	2904.9	6400.	165.2
0.120	828.9	6400.	83.0
0.930	3036.5	6400.	239.3

Europe cont.

0.740	5336.5	6400.	365.7
0.220	777.8	6400.	153.4
51.100	51561.9	6400.	5249.6
7.500	2484.9	6400.	868.5
1.600	961.1	6400.	320.4
3.400	20386.6	6400.	542.3
54.000	24371.1	6400.	3025.3
18.000	12700.4	6400.	7295.4
6.000	5095.2	6400.	752.7
2.000	2547.6	6400.	276.0
1.200	14783.8	6400.	378.3
6.000	5095.2	6400.	704.5
1.500	3814.6	6400.	645.6
1.300	3794.4	6400.	337.8
0.340	14.5	6400.	60.8
0.300	12242.6	6400.	274.0
1.100	1737.0	6400.	231.6
3.700	1684.5	6408.	209.8
80.100	2660.9	6408.	3345.6
12.000	4305.6	6408.	634.8
0.820	6891.5	6408.	550.0
1.700	40645.1	6408.	2843.7
1.200	981.4	6408.	67.6
5.000	637.6	6408.	440.5
3.000	2097.1	6408.	345.0
5.900	6494.4	6408.	527.2
5.600	3035.8	6408.	3277.3
24.600	15574.6	6408.	1692.9
74.600	72385.6	6400.	4688.1
25.300	16053.4	6408.	1744.9
2.500	8926.3	6000.	2058.3
0.100	8655.1	6000.	482.5
0.300	399.5	6000.	39.6
0.300	354.2	6000.	86.9
0.200	61459.9	6000.	2875.7
0.400	533.6	6000.	106.2
0.300	3241.4	6000.	399.5
1.600	5653.9	6000.	160.2
1.290	3343.7	6000.	484.4
1.200	2995.4	6000.	260.8
0.070	834.3	4436.	61.8
0.500	2294.3	4436.	584.5
3.600	9693.8	4436.	362.2
0.010	7784.7	4436.	1030.0

Europe cont.

0.200	6050.0	6284.	660.0
2.000	542.1	6284.	147.6
0.500	79970.1	6284.	1015.7
38.000	6173.7	6284.	996.7
48.000	31425.3	6284.	506.8
5.000	2438.0	6284.	345.0
4.900	2898.0	6284.	303.6
25.800	31614.4	6284.	2095.3
43.000	492960.0	6284.	44720.0
2.890	576576.0	6284.	9776.0
0.100	13358.8	6284.	182.0
0.780	11356.8	6284.	2069.6
0.150	20061.6	6284.	509.6
0.300	52936.0	6284.	546.0
15.000	163514.0	6284.	16546.4
73.700	367770.0	6284.	33930.0
5.000	55120.0	6284.	7800.0
1.000	8216.0	6284.	7696.0
51.100	10695.0	6284.	2760.0
11.300	8397.1	6284.	461.4
0.530	440.0	6284.	30.8
3.600	1267.1	6284.	118.4
20.000	18216.0	6284.	874.0
4.800	6634.6	6284.	843.0
1.300	5253.3	6284.	74.1
0.170	88.8	6284.	12.3
1.540	6130.3	6284.	492.0
0.200	279.8	6284.	68.1
0.260	297.0	6284.	80.1
0.720	82.2	6284.	13.4
0.742	27.5	6284.	13.4
0.435	106.5	6284.	13.4
0.100	31.2	6284.	13.4
2.000	1748.5	6284.	56.9
0.348	1830.5	6284.	39.4
0.129	38.7	6284.	7.1
5.000	10196.0	6284.	569.1
5.000	653.2	6284.	316.3
2.000	1088.6	6284.	93.8
0.470	369.2	6284.	62.1
0.340	622.9	6284.	30.8
0.340	704.5	6284.	30.8
36.600	12457.2	6284.	1085.3
0.930	2070.0	6533.	165.6

Europe cont.

0.700	933.7	4436.	185.4
0.200	1763.9	4436.	65.0
1.600	8945.6	4516.	190.4
0.700	4181.7	4516.	81.8
2.000	391.2	4516.	93.6
0.580	1834.7	4516.	423.9
0.430	1551.3	4516.	31.9
2.500	9088.4	4516.	240.3
0.840	2452.5	4516.	357.8
100.000	43517.5	4516.	4120.0
2.400	589.5	4516.	350.0
0.950	5593.1	4516.	427.1
114.600	24005.9	4314.	5925.5
1.400	11303.8	4314.	1062.4

Far East

TONNAGE	VALUE	DISTANCE	FREIGHT
0.680	1110.3	5435.	64.9
0.602	11165.7	5435.	1194.3
0.680	1109.8	5435.	64.9
0.360	1333.3	5435.	35.5
4.070	1578.0	5435.	1764.4
0.250	1258.1	5435.	586.1
0.194	1134.0	5435.	258.0
2.890	5200.5	5435.	574.2
31.850	4994.0	5435.	411.0
0.600	2177.4	5435.	65.4
0.490	1331.8	5435.	58.7
1.700	5608.4	5435.	817.8
1.100	3055.0	5435.	109.2
0.500	7725.0	5435.	245.7
0.400	3502.0	5435.	55.6
0.280	4085.0	5435.	279.1
1.000	2008.9	5435.	100.4
1.000	1864.3	5435.	277.6
0.500	1489.9	5435.	328.6
0.900	9270.0	5435.	824.0
59.400	12799.8	6680.	2406.1
29.600	27463.5	6680.	5555.3
36.200	53428.5	6680.	4180.2
0.349	1716.5	6680.	64.0
0.193	1736.5	6680.	112.7
0.047	419.4	6680.	42.8
0.035	1062.4	6680.	64.0
100.300	18081.7	6680.	5130.4
45.100	6648.7	6680.	1720.1
59.400	12800.3	6680.	2405.6
29.600	27486.0	6680.	5555.3
1.600	998.6	6680.	148.5
216.900	60416.7	6680.	8747.8
60.000	4617.0	6680.	9776.8
9.900	17300.9	6680.	1537.0
34.900	45453.8	6680.	5689.4
9.800	17215.1	6680.	1594.5
15.000	10968.8	6680.	286.6
0.131	495.0	6680.	74.3
9.900	17349.0	6680.	1661.1
20.000	2235.1	6680.	1065.5
30.900	4799.3	6680.	1177.8
73.900	12584.0	6680.	2962.3
413.700	64242.6	6680.	15767.2
15.000	14986.5	6680.	1902.4
9.900	20322.4	6680.	2693.5
21.100	27529.0	6680.	3405.1
0.450	1419.9	6680.	62.3
29.900	39008.5	6680.	4765.8
0.588	3317.6	6680.	78.6
15.000	16098.8	6680.	758.1
1.000	3070.6	6680.	149.3
20.000	1485.0	6680.	1888.2
341.100	45206.3	6680.	7006.6
0.183	2114.1	6680.	64.4
2.700	4104.0	6680.	485.1
97.900	20008.3	6680.	3668.9
0.189	430.5	6680.	61.3
0.026	76.2	6680.	61.3
1.200	327.0	6680.	159.4
1.100	1961.0	6680.	130.8
3.000	2235.1	6680.	395.0
1.700	1039.8	6680.	185.4
1.700	4470.2	6680.	275.0

Far East Cont.

40.000	13142.8	6680.	1471.9
[illegible]	11549.1	6680.	283.7
0.019	254.4	6680.	62.8
1.200	6163.5	6680.	151.4
2.300	2148.3	6680.	577.9
1.200	4824.9	6680.	217.4
0.200	2280.4	6680.	467.6
0.120	188.3	6680.	2.6
0.140	1454.9	6680.	74.2
0.360	242.6	6680.	47.9
24.900	8496.5	6680.	1078.4
0.400	263.3	6680.	1051.9
30.700	6997.8	6680.	1263.3
4.700	4625.2	6680.	1048.5
8.300	11907.3	6680.	921.3
0.750	188.4	6680.	5.6
0.190	320.8	6680.	158.8
0.115	107.2	6680.	87.2
1.200	12102.5	6650.	910.0
0.370	1918.4	6680.	565.2
0.610	67937.1	6680.	11729.5
5.400	378.5	6680.	230.2
2.100	758.5	6680.	421.6
2.000	13410.0	6680.	1046.0
5.500	3542.2	6680.	172.6
0.600	649.7	6680.	105.3
0.300	828.6	6680.	69.5
0.814	11692.5	6680.	335.8
0.450	560.3	6680.	220.4
0.580	252.4	6680.	65.5
3.500	32991.7	6680.	163.6
3.500	11205.0	6680.	2010.7
4.000	5348.4	6680.	379.5
2.300	3984.0	6680.	531.5
2.8.0	3532.9	6680.	306.9
0.030	1975.3	6680.	326.7
2.400	2259.9	6680.	791.0
0.040	406.9	6680.	59.2
1.100	1984.3	6680.	74.7
0.100	8816.8	6680.	332.7
2.300	46562.7	6680.	1912.7
0.400	593.8	6680.	59.2
0.010	118.5	6680.	67.8
0.300	12.1	6680.	12.6
0.300	126.4	6680.	94.0
0.900	2580.2	6680.	373.4
0.400	1774.4	6680.	91.8
1.700	2385.0	6680.	325.2
0.300	1566.0	6680.	16.4
0.100	1184.0	6680.	59.2
0.183	944.5	5800.	67.0
0.790	772.5	5800.	98.4
3.800	2987.5	5800.	812.7
0.183	944.0	5800.	66.4
37.400	38999.0	5800.	9270.0
1.000	2322.7	5800.	432.1
0.547	2205.7	5800.	216.3
16.000	5956.3	6780.	1741.2
24.000	10573.9	6780.	2634.2
0.100	101.9	6780.	6.2
18.600	7257.9	6780.	1914.9
96.500	16[illegible].1	6780.	1321.5
182.000	42949.5	6780.	6719.7
1.600	10506.0	6780.	315.7
6.600	47209.0	6780.	7789.5

Far East

18.000	10688.3	6780.	1945.6
278.500	70863.0	6780.	10333.0
19.300	2848.5	6870.	737.0
115.200	16929.6	6870.	4380.1
0.032	117.6	6870.	6.2
0.020	121.8	6870.	67.0
0.051	127.7	6870.	70.2
0.042	128.0	6870.	70.4
0.050	126.9	6870.	69.8
0.049	130.5	6870.	71.8
0.044	121.2	6870.	66.6
0.216	1497.6	6870.	60.3
0.100	815.9	6870.	138.1
29.100	31616.9	6870.	2729.5
1.500	16366.2	6870.	1283.4
0.069	2451.4	6870.	61.8
11.000	12980.6	6870.	2278.9
0.266	1253.3	6870.	233.0
0.137	150.9	6870.	59.5
0.130	170.0	6870.	58.7
0.170	86.2	6870.	139.3
0.134	479.0	6870.	61.8
0.087	559.5	6870.	64.9
0.088	112.6	6870.	90.9
0.027	68.7	6870.	102.4
1.000	5439.6	6870.	253.5
0.450	3159.9	6870.	111.8
210.600	31028.2	6870.	8027.8
1.400	11057.0	6870.	10.4
3.400	522.2	6870.	390.3
1.300	13568.4	6870.	137.3

Indian Sub-continent

	VALUE	DISTANCE	FREIGHT
36	434.0	2400.	17.6
30	2207.1	2400.	95.6
00	131.6	2400.	16.3
20	125.0	2400.	16.3
00	8651.5	2400.	8651.5
68	552.6	2400.	19.5
00	166.7	2400.	16.9
100	5492.5	2400.	662.0
00	1217.1	2400.	53.5
530	2207.1	2400.	95.5
286	434.0	2400.	17.5
090	521.9	2400.	17.1
310	2275.8	2400.	55.6
350	798.8	2400.	25.7
168	1447.4	2400.	87.7
265	1254.4	2400.	32.2
774	821.7	2400.	41.6
031	128.5	2400.	16.8
832	710.0	2400.	53.8
700	16000.1	2400.	1880.0
100	4472.8	2400.	132.9
6.000	6047.2	2400.	182.3
1.800	12869.1	2400.	1736.1
3.600	14858.8	2400.	1884.3
0.811	842.8	2400.	69.1
2.600	10366.1	2400.	598.8
1.600	5559.3	2400.	83.4
0.260	1577.2	2400.	89.4
7.500	43859.6	2400.	273.2
19.500	1279.2	2400.	85.9
10.100	1703.0	2400.	238.5
14.900	15007.0	2400.	2079.4
10.800	3991.0	2400.	693.4
2.000	1656.0	2400.	298.0
1.100	2083.0	2400.	136.3
1.000	1703.0	2400.	238.5
33.400	1372.0	2400.	929.0
1.030	8950.7	2400.	45.1
0.604	896.6	2400.	59.7
0.600	171.1	2400.	17.2
0.410	2073.9	2400.	55.9
0.200	139.3	2400.	287.6
0.670	118.4	2400.	15.9

Indian Sub-continent

TONNAGE	VALUE	DISTANCE	FREIGHT
0.286	434.0	2400.	17.6
0.630	2207.1	2400.	95.6
2.000	131.6	2400.	16.3
0.120	125.0	2400.	16.3
15.400	8651.5	2400.	8651.5
0.168	552.6	2400.	19.5
0.100	166.7	2400.	16.9
9.100	5402.5	2400.	662.0
1.100	1217.1	2400.	53.5
0.630	2207.1	2400.	95.5
0.286	434.0	2400.	17.5
0.090	521.9	2400.	17.1
0.310	2275.8	2400.	55.6
0.350	798.8	2400.	25.7
0.168	1447.4	2400.	87.7
0.265	1254.4	2400.	32.2
0.774	821.7	2400.	41.6
0.031	128.5	2400.	16.8
0.832	710.0	2400.	53.8
14.700	16000.1	2400.	1880.0
1.100	4472.8	2400.	132.9
6.000	6047.2	2400.	182.3
11.800	12869.1	2400.	1736.1
13.600	14858.8	2400.	1884.3
0.811	842.8	2400.	69.1
12.600	10366.1	2400.	598.8
1.600	5559.3	2400.	83.4
0.260	1577.2	2400.	89.4
7.500	43859.6	2400.	273.2
19.500	1279.2	2400.	85.9
10.100	1703.0	2400.	238.5
14.900	15007.0	2400.	2079.4
10.800	3991.0	2400.	693.4
2.000	1656.0	2400.	298.0
1.100	2083.0	2400.	136.3
1.000	1703.0	2400.	238.5
33.400	1372.0	2400.	929.0
1.030	8950.7	2400.	45.1
0.604	896.6	2400.	59.7
0.600	171.1	2400.	17.2
0.410	2073.9	2400.	55.9
0.200	139.3	2400.	287.6
0.670	118.4	2400.	15.9

Indian Sub-continent

1.700	3144.1	2400.	103.0
2.000	1989.1	2400.	117.9
0.540	121.5	2400.	14.5
0.200	559.2	2400.	19.7
0.500	580.8	2400.	26.2
1.000	9517.5	2400.	345.2
0.300	158.7	2400.	16.8
1.000	1076.4	2400.	51.5
0.500	131.6	2400.	16.1
0.160	43.9	2400.	16.1
0.680	43.9	2400.	16.1
0.160	131.6	2400.	16.1
1.600	717.5	2400.	57.1
0.284	154.2	2400.	16.3
0.500	767.5	2400.	45.7
0.104	120.6	2400.	15.4
2.400	802.0	2400.	75.2
1.300	882.9	3699.	89.3
50.200	19466.4	3699.	2895.2
2.000	4040.7	3699.	201.9
0.675	5263.3	3699.	243.3
1.040	2763.2	3699.	43.9
23.000	3924.9	3699.	680.4
31.500	14740.9	3699.	1534.1
1.400	884.2	3699.	97.9
7.800	2336.0	3699.	418.3
0.100	175.4	3699.	18.5

North America

TONNAGE	VALUE	DISTANCE	FREIGHT
1.900	2730.5	9285.	824.0
0.940	2609.0	9285.	429.5
5.100	1240.1	9285.	820.4
0.130	588.6	9285.	38.1
0.940	2609.0	9285.	429.5
0.720	4019.0	9285.	421.3
0.770	215.3	9285.	47.4
0.300	51025.7	9585.	3120.9
1.000	1798.9	9580.	244.6
0.400	3048.9	9585.	95.8
0.120	1368.4	9285.	35.5
0.770	215.3	9285.	47.4
0.530	5511.5	9285.	755.5
21.300	42739.9	9320.	4715.9
2.500	8099.4	9320.	1959.6
0.720	4019.0	9320.	421.3
0.400	3848.9	9585.	95.8
1.200	3539.1	9835.	874.5
0.390	2293.3	9400.	42.2
0.100	852.3	9400.	108.2
0.800	4751.9	9400.	446.5
1.200	3539.1	9835.	874.5
39.900	27438.7	9835.	5349.8
0.960	6525.6	9600.	1223.6
0.200	5589.3	9600.	173.6
3.000	17804.1	9600.	678.8
0.150	431.6	9285.	79.4
11.330	5554.4	9285.	998.3
5.620	5511.7	9285.	755.7
0.100	1799.0	9285.	244.4
0.530	2609.0	9285.	429.5
0.520	957.3	9400.	228.4
0.720	9669.7	9600.	128.2
0.100	7326.4	9500.	635.0
16.120	28755.6	9685.	1442.5
1.200	2338.1	9700.	120.0

Copy

Australasia

TONNAGE	VALUE	DISTANCE	FREIGHT
1.600	4223.4	6000.	167.3
53.200	6959.8	6000.	542.2
1.300	648.6	6000.	154.7
1.200	1244.3	6000.	301.9
22.200	17051.6	6000.	2109.7
1.200	33988.3	6000.	372.6
0.200	1546.2	6000.	223.1
0.200	2409.3	6000.	190.9
1.060	1974.6	6000.	211.0
30.000	243682.1	6200.	8345.0
1.750	488.8	6200.	148.9

Appendix 2

Regional Shares in Kenya's External Trade in 1982

Region	Percentage Share
Europe	64.16
Far East	16.20
Indian Subcontinent	6.90
North America	12.10
Australasia	0.64

Source: Own computations using figures from 1983 Statistical Abstract.

Note (1) Crude petroleum oil is excluded in the computation of the shares.

Appendix 3 - CORRELATION MATRICES

(i) Europe

(a) Additive Variant

	DIST	TONE	VALE	FERI
DIST	1.000	0.044	0.043	0.053
TONE	0.044	1.000	0.189	0.253
VALE	0.043	0.189	1.000	0.797
FERI	0.053	0.253	0.797	1.000

(b) Multiplicative Variant

	ADIS	ATON	AVAL	AFER
ADIS	1.000	0.135	0.068	0.070
ATON	0.135	1.000	0.631	0.763
AVAL	0.068	0.631	1.000	0.829
AFER	0.070	0.763	0.829	1.000

(ii) Far East

(a) Additive Variant

	DIST	TONE	VALE	FERI
DIST	1.000	0.123	0.129	0.112
TONE	0.123	1.000	0.651	0.759
VALE	0.129	0.651	1.000	0.851
FERI	0.112	0.759	0.851	1.000

(b) Multiplicative Variant

	ADIS	ATON	AVAL	AFER
ADIS	1.000	0.065	-0.035	0.061
ATON	0.065	1.000	0.762	0.807
AVAL	-0.035	0.762	1.000	0.778
AFER	0.061	0.807	0.778	1.000

(iii) Indian Subcontinent

(a) Additive Variant

	DIST	TONE	VALE	FERI
DIST	1.000	0.326	0.019	0.073
TONE	0.326	1.000	0.226	0.523
VALE	0.019	0.226	1.000	0.173
FERI	0.073	0,523	0.173	1.000

(b) Multiplicative Variant

	ADIS	ATON	AVAL	AFER
ADIS	1.000	0.238	0.191	0.237
ATON	0.238	1.000	0.688	0.834
AVAL	0.191	0.688	1.000	0.775
AFER	0.237	0.834	0.775	1.000

(iv) North America

(a) Additive Variant

	DIST	TONE	VALE	FERI
DIST	1.000	0.280	0.306	0.271
TONE	0.280	1.000	0.562	0.830
VALE	0.306	0.562	1.000	0.814
FERI	0.271	0.830	0.814	1.000

(b) Multiplicative Variant

	ADIS	ATON	AVAL	AFER
ADIS	1.000	0.201	0.441	0.253
ATON	0.201	1.000	0.499	0.668
AVAL	0.441	0.499	1.000	0.777
AFER	0.253	0.668	0.777	1.000

(v) Australasia

(a) Additive Variant

	DIST	TONE	VALE	FERI
DIST	1.000	0.156	0.642	0.623
TONE	0.156	1.000	0.386	0.457
VALE	0.642	0.386	1.000	0.977
FERI	0.623	0.457	0.977	1.000

(b) Multiplicative Variant

	ADIS	ATON	AVAL	AFER
ADIS	1.000	0.306	0.242	0.404
ATON	0.306	1.000	0.590	0.736
AVAL	0.242	0.590	1.000	0.865
AFER	0.404	0.736	0.865	1.000

(vi) All Regions

(a) Additive Variant

	DIST	TONE	VALE	FERI
DIST	1.000	0.054	0.047	0.052
TONE	0.054	1.000	0.221	0.298
VALE	0.047	0.221	1.000	0.789
FERI	0.052	0.298	0.789	1.000

(b) Multiplicative Variant

	ADIS	ATON	AVAL	AFER
ADIS	1.000	0.085	0.195	0.263
ATON	0.085	1.000	0.675	0.771
AVAL	0.195	0.678	1.000	0.816
AFER	0.263	0.771	0.816	1.000

Appendix 4: Calculation of Consignment Cost to the Shiponwer

(i) Assume that handling charges at ports constitute 25% of the total ship costs. See page 98.

(ii) Let the tonnage of a consignement be T tonnes.

(iii) Handling charges per tonne at

Mombasa port = Sh.75/- = £3.75 (see page 99)

(iv) Doubling the handling charges at Mombasa will provide the total handling charges per tonne since charges are assumed to be the same for the port of loading and port of discharge (see page 99).

∴ Total handling charges per tonne = £(3.75 x 2) = £7.50

Total handling charges for a consignment of tonnage T equals £7.50T

(V) Since handling charges at ports constitute 25% of total ship costs and assuming that all the costs are distrbuted evenly on the basis of the quantity of cargo then consignment cost to the shipowner will be

£ $\frac{7.50T \times 100}{25}$ = £30T.