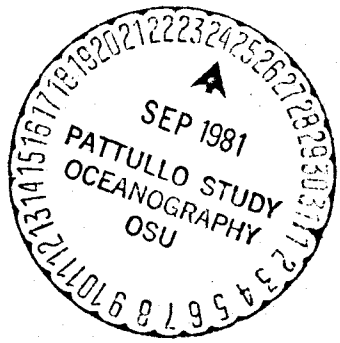

ALTERNATIVE WAYS TO INDUCE PORT DEMAND IN THE HONDURAN PORT SYSTEM

by

Erwin Brocato

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(The ideas expressed in this paper reflect the opinion of the author and not necessarily the best interest or the policies of the National Port Authority of Honduras and or/the government of Honduras, O S U, or the School of Oceanography.)

Contents

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Finally I am indebted to my advisor Victor T. Neal who gave me constant support, encouragement, and advice during my studies at Oregon State University.

Introduction

The port is a political-economic entity whose primary objective is to facilitate the movement of imported and exported cargo, through providing facilities and services to national producers and shippers,its two largest users.

Nationally, the region of a port's influence is called its hinterland This is the area from which the port receives exported cargo. Internationally, the port serves a larger region when imported products are handled through its facilities.

Two economic variables are of fundamental importance when studying the port industry: Demand, which refers to the quantity of port services required by the users; and supply, which refers to the amount of services the port industry is able to produce. Both variables are affected (in the short and long term) by different factors such as activity, seasonality of production, degree of technological development, etc., within its hinterland as well as international activities, such as the state of international economies, international markets, international prices, etc.

This paper is divided in two parts: the first details technological and institutional developments in the shipping and port industry. The second part is a theoretical work which explores alternative ways to induce demand in the Honduras port system so as to increase the volume of cargo handled through its facilities. To achieve this objective the author proposes to the port authority that it consider strategic pricing and image

(quality of services) as its two principal strategies. Assuming that the services provided by the Honduran Port System have been proven to be of good quality, pricing becomes the most important factor to be considered. Prices should then be aimed to:

Encourage new users to shift their cargo to the port system of our interest; and

Discourage the shipping lines and conferences from absorbing the total economic incentives offered by the port, thereby nullifying its efforts.

These policies take into account that economies of scale are achieved whenever the port increases the volume of cargo moved through its facilities. Because the rate of utilization of Honduran Port System facilities is presently low, any part of the port system will be better off if new cargo is handled.

Port cost analysis is very important. The port administration needs to offer an price incentive in order to attract additional cargo. This should be equal to or larger than the variable cost of cargo handling per unit weight or volume. It should also be attractive enough to motivate the users to demand more of its services.

A drawback found when writing this paper was unavailability of actual data from the Port Authority of Honduras. Therefore, the analysis done is theoretical and has limited value. I hope that actual practice will confirm its validity.

Finally, even though I have only addressed economic problems here, physical elements are also of considerable importance in shaping the overall

efficacy of the port. Factors such as sedimentation in access channels, weather regime, physical location of the port, and pollution of its waters are so important that any one of them may preclude successful port operation.

Transportation Systems

Transportation is an economic function. It serves in the production of goods and services in the economy; it creates the utility of place and time.

Raw materials or a product may have little or no usefulness in one location at one time, but may have great utility in another place at another time. For example, oil in the middle of the desert is worth very little in comparison to the same oil after refining, and located in the middle of a city crowded with automobiles. The same can be said about lumber (within the forest), industrial goods at the factory, etc.

Transportation is one of the tools required by society to serve its purposes. Viewed from economic, political and military standpoints, transportation is unquestionably one of the most important industries in the world.

Four basic modes of transportation are presently used worldwide: (a) air (airplanes), (b) water (different types of vessels), (c) railroad, and (d) trucking system. To a lesser degree inland transportation has developed another modes: barges for inland waters (lakes and rivers); pipelines (oil and gas) and conveyor belts (dry bulk) in special routes.
Each mode is capable of handling certain cargos and/or passengers.

Besides development in transportation technology, advances have also taken place in institutional and organizational aspects. Concepts such as unification, multimodal transportation, cartels, etc., have existed for a few decades.

Technological Changes in Transportation

The last two decades have seen a revolution in the development of means of transportation. Oceangoing vessels capable of handling one-half million tons of liquid cargo and airplanes that can carry more than 125 tons of dry cargo have been built. The most important changes however, were carried out in the field of break bulk cargo handling, when the concept of unification was developed. 1/

This development has been so important that many international organizations have received it with open arms, claiming that a new era in transportation has opened. Others, especially those located in less developed countries, have considered this movement as a threat to stable jobs in ports and national transportation systems. What is so important about this concept ?

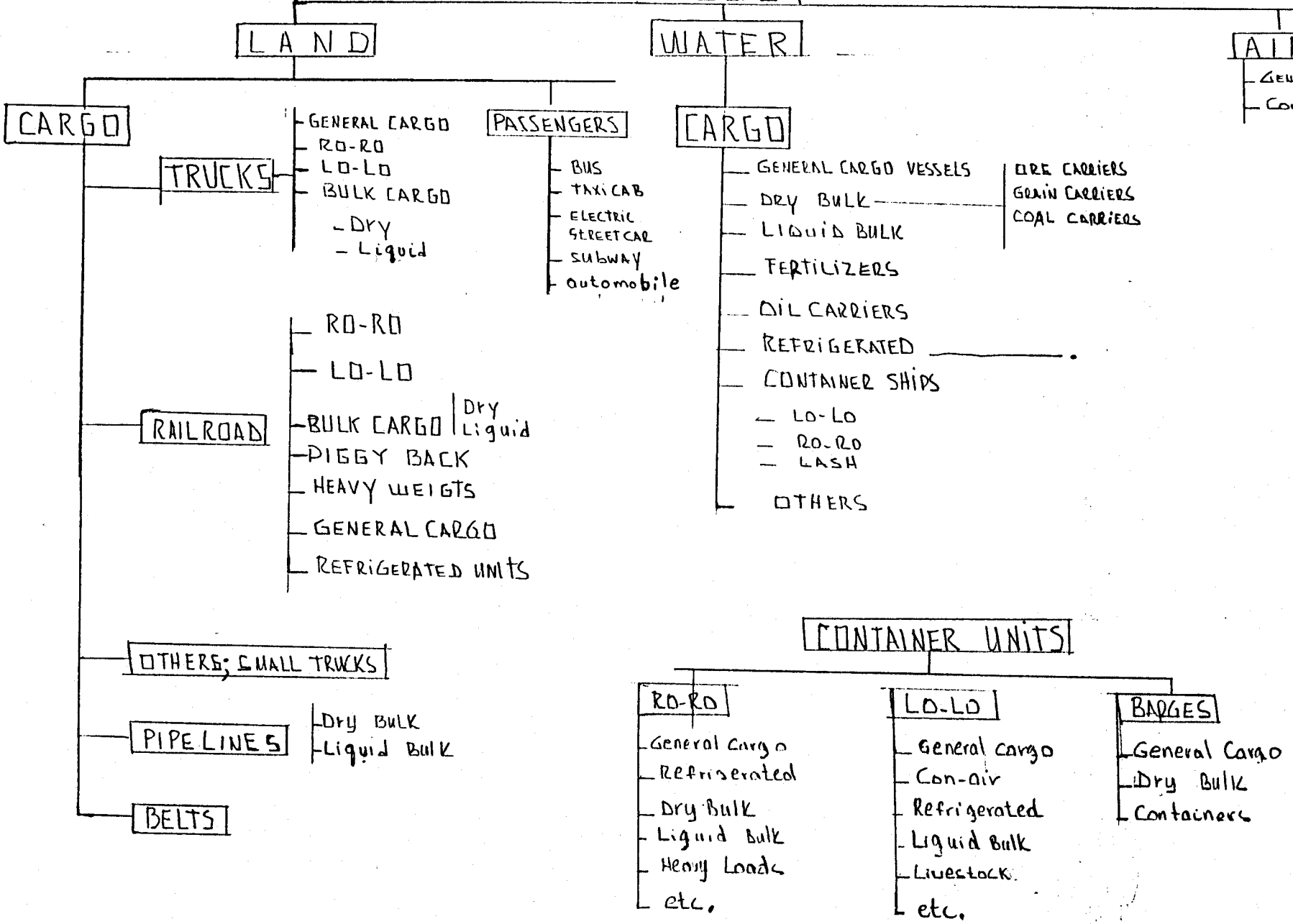
The container and the unified pallet.

Before the standard container was in use, there was experimentation with the concept of unification. Packages were fixed together and to a disposable pallet 3/ by a plastic bag. These so called "unified pallets" were strong enough to last one trip only, and were disposed of at the destination. This concept was not completely accepted by shippers of the world, even though many pallet carriers were built and are still in service. Only Norway has accepted this system and has built full capacity facilities.

The International Container Bureau defines a container as follows: "An article of transport equipment (lift van, movable tanks or similar structure) a) of a permanent character and accordingly strong enough to be suitable for repeated use, b) specially designed to facilitate the

Figure No. 1

TRANSPORTATION TECHNOLOGY



carriage of goods, by one or more modes of transport without intermediate reloading ; c) fitted with devices permitting its ready handling, particularly its transfer from one mode to another; d) so designed as to be easy to fill empty; and e) having an internal volume of one cubic meter or more. 2/ The most important feature of the container is its capacity of being reusable."
Therefore the container is not only a package, but a means of transportation which may be tranferred from one mode of transportation to another.

After the container, a new development took place. A large barge was developed capable of being transported internationally and unloaded from a mother vessel to any bay or area of calm water where it remains until its cargo is unloaded. Two types of barge-carrier systems are operating in the world, one from/to the USA, called LASH (lighter aboard ship) and the European version called SEABEE. (Figure 1 shows successful development in transportation technology to handle cargo and passengers.)

Institutional Changes

Transportation has seen many changes over the last few decades, from shipping lines to multimodal transportation.

Shipping lines, Conferences, Cartels, Unification.

Shipping Lines

Shipping lines are companies whose objective is to provide marine transportation between ports which are usually located in different

countries. These are one of the first and oldest organizations in marine transportation.

Conferences

Conferences are groups of shipping lines which exploit a specific route with the objective of reducing or eliminating competition between them, through unified (or standard) rates and/ or regulations.

Cartels

Cartels are a new development in which the conferenced lines have bought a small number of highly specialialized vessels (specially con - tainerized) with which they carry out the services in the route exploited by the conference.

Each conferenced line shares space in the vessels each time they load cargo at the ports in the route served.

Unification

The unit load consists of any device or system for combining a number of small packages or small units so they can be handled as a single unit at one time. The principle was developed in manufacturing industries. The need to reduce the cost of handling numerous packages in both shipping and receiving resulted in the application of unit load handling to transportation.

This concept has been wholly accepted by the transportation industry.

Two types of unified units are used by carriers, pallets and containers.

Multimodal Transportation

Transportation has always been multimodal. Exports are moved from land to a seagoing vessel or to an airplane. When we import the opposite is true. The modern concept of multimodal transportation is institutional. The shipping companies (or cartels) offer at present a transportation package (multimodal) under one contract. In the contract, it is specified that the operator (of multimodal transportation) will carry out the service from the point of origin to a destination (specified in the contract.)

Four types of origin/destination combinations are possible under this arrangement.

a) Door to door service (from factory to factory)

b) Door to port of destination

c) Port of origin to door of destination

d) Port or origin to port of destination

In any case, depending on the service specified in the contract, the operator may assume responsibility for the following expenses:

a) Terrestrial transportation expenses in country of origin.

b) Port expenses in country of destination

c) Marine transportation expenses

d) Port expenses in country of origin

e) Terrestrial transportation expenses in country of destination

f) Any other expenses incurred as documentation, commission, etc.

It is important to note that multimodal transportation is functional only after the development of the unified system of transportation and the

availability of the necessary technology in the countries of origin and destination.

The Port as a Subsystem in International Transportation

Ports have historically been treated as terminals, or the end of one means of transportation and the beginning of another. In this report, however, ports are seen as the linkage between two modes and as subsystem of the larger international transportation system.

In its simplest form, the International Transportation System consists of:

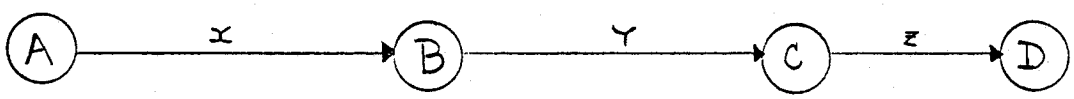
(A) A point where cargo originates

(B) A port of origin

(C) A port of destination

(D) A point of destination

The following diagram shows the mentioned points. It also shows



the directions of the flow of the cargo besides the type of transportation used where:

X-------Terrestrial transportation, country of origin.

Y-------Marine (or air) transportation (international)

Z------Terrestrial transportation: (country of destination)

The above pictured system is highly simplified. Cargo flows are not unidirectional. Actually cargos flow in both directions at the same time.

Transhipment might also exist along the route. To maintain an operational system many vessels, brokers, national and international transporters, suppliers of equipment, customhouses, etc., gather at the port and work in concerted action to shape this modern port industry.

Port Industry

As we already saw, the port is not an isolated unit, but a dynamic part of a greater transportation system, with which it interacts. At the same time, the port itself is a system which has its own environment, inputs, processes and outputs. The port industry thus covers a wide spectrum of activity and is defined as "the economic activity that is directly needed in the movement of waterborne traffic." Six elements are directly needed when servicing the waterborne traffic:

a) Physical facilities to serve vessels and cargo. These include access channels, covered wharves and open storage space, and equipment (tugboats, cranes, etc.).

b) An organization which must contain at least an operations department, a financial, economic, and development department and a management unit.

c) brokerage services

d) customhouses

e) utility services (water, electricity, telephone, etc.)

f) users (shippers, importers and exporters)

g) government agencies

Organization of the Port

Many ports, especially those in developing countries, are administered by a national port authority. It is usually autonomous, which permits its managers to make decisions without interference from the central government. In United States and some European countries, ports may be private or public, or both.

Services provided by the port

The port serves three groups of users: shippers, importers/exporters and national transporters.

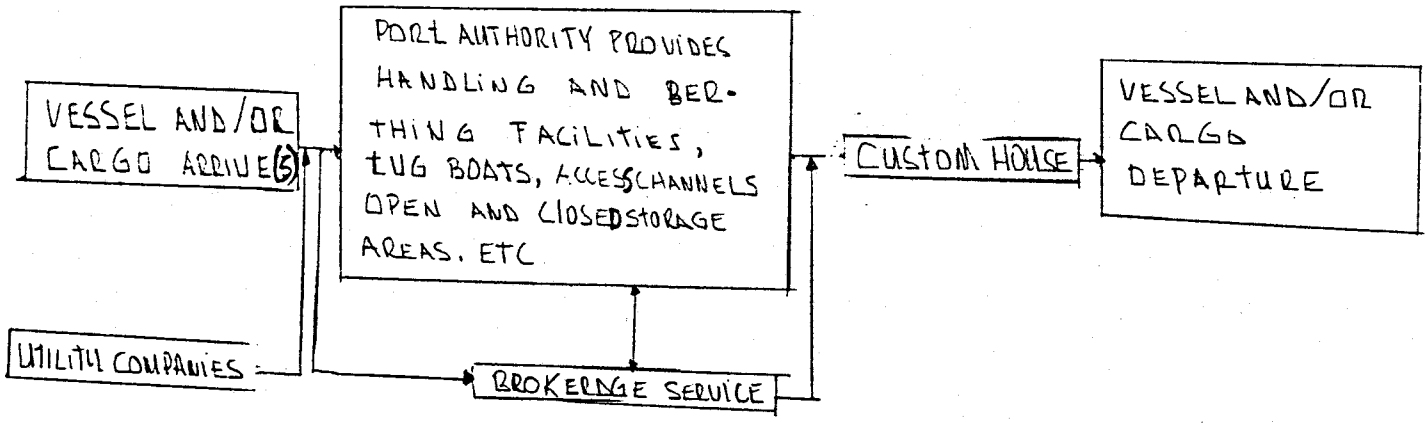
Shippers are the owners or operators of the vessels. They demand from the port physical facilities such as access channels, tugboats, pilots, wharves, and services such as brokerage service and supplies (food, water, fuels, etc.).

Importers/Exporters are usually the owners of the cargo. As vessels and cargo complement each other, any service demanded by the ships are also necessary for the achievement of transportation of cargo, but in addition importers/exporters require closed and open storage space and various equipments.

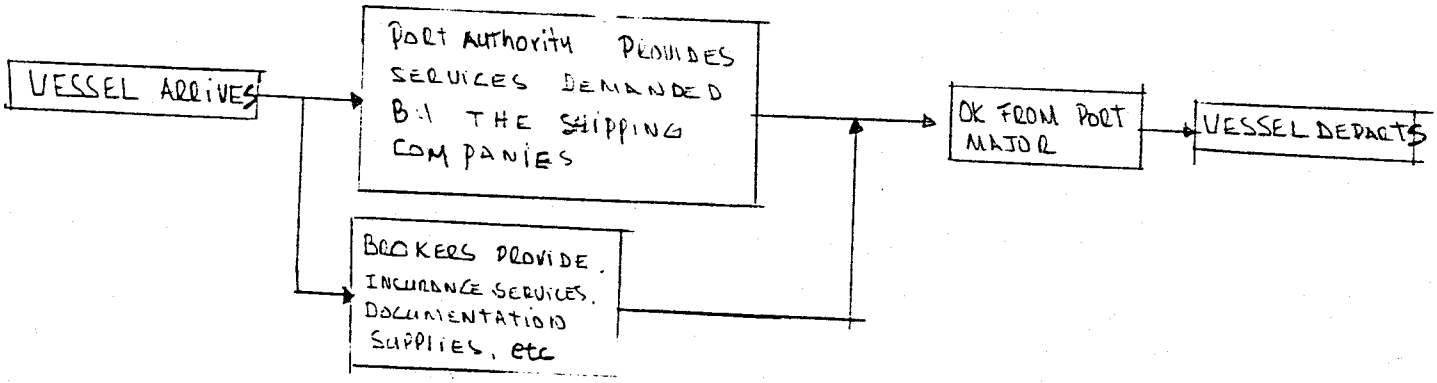
The National Transporters develop a specific activity. They transport the cargo (break bulk, containers, solid bulk, etc.) from the port to the port's hinterland and vice versa. National transporters include inland transport systems such as railroad services, trucking companies, and barges. Fig 3 shows the services provided by the port.

THE PORT

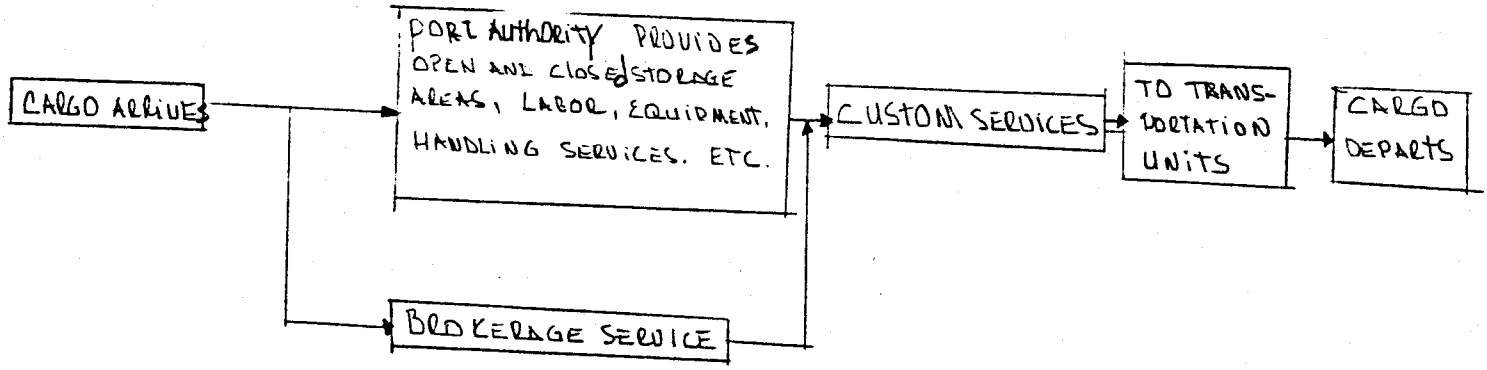
Figure No 3



(B) THE VESSEL



(C) THE CARGO



The changing face of the port

As was indicated above, the port serves three large groups of users: shippers, exporters/importers, and national transporters. The supply of port services has to mantain a balance that satisfies all groups. Consequently, equipment, physical facilities and institutional arrangements at the port have to be designed to fit the requirements demanded by these groups, but particularly the shipping companies, which historically have been the most dynamic and organized of the three user groups.

Filling these requirements has been the main goal of the modern port industry. In the process, port configuration (institutional and physical) has changed. Physically, all port facilities are now oriented to provide specialized services through independent terminals (dry and liquid cargo terminals, container terminal, etc) .

In the same way, the administrative configuration of the port has changed notably. From a dependent customhouse unit, which was the common organization at the beginning of the century, the port has become an independent entity with unique characteristics.

This reorganization has made ports a powerful industry. Most of the governments in less developed nations have created National Port Authority, using the ports' economic and political power to generate employment, accelerate regional development and increase general welfare.

Demand for Port Services

The demand for the port services (as in the case for transportation

in general) is generally a "derived" type of demand. This means that the port services are inputs for other products and depend on:

a) elasticity of demand for products imported/exported through the port;

b) cost of inland transportation from/to the port(distance plays an important role in inland cost);

c) quality of inland transport and quality of infrastructure within the port hinterland;

d) dynamics of the economic activity within the port hinterland;

e) availability of shipping services in the region and actual shipping prices;

f) finally, port competition. If the port competes with other ports located in bordering countries, political consideration would be very important.

Also internally controlled factors are:

a) availability of adequate and efficient facilities, and a port organization

b) port pricing policies, and actual port prices.

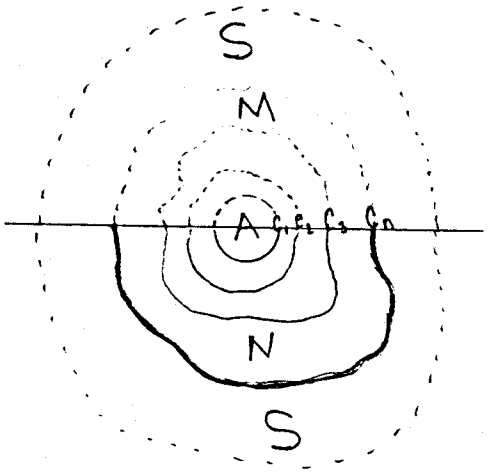
These elements will be studied in the following sections.

Analysis of Port Hinterland

The hinterland is the drainage area of cargo for the port. In other words, it is the area all the exported cargo comes from and all the imported cargo goes to.

Graphically, the hinterland can be drawn as a group of concentric lines. In doing this we have:

Figure 4



a) The port, which is represented by the letter (A) at the center.

b) The customarily accepted port hinterland which is the lower half area bounded by the solid line. (usually landward hinterland, represented by the letter N)

c) The upper half area bounded by a dotted line, (letter M) and considered in this work as expanded hinterland. This is a kind of seaward cargo - drainage area for the port.

d) Concentric lines (c_1, c_2, ...c_n) which represent a set of curves of indifference for the products exported or imported through port A. Each iso-shipment curve will measure the distance at which a product or set of products is economically possible of being produced and exported or imported through port (A). Factors affecting this decision are:

a) The ratio of price to volume or price to weight of the products. The higher this ratio, the farther away the industries producing this good can be located, expanding the port hinterland.

b) Topography and geography

c) Politics. The hinterland of port (A) may include areas in other countries, when: a) the port is located close to the borders of both countries or when b) the port is the only one which offers a given specialized service in the region.

d) Transportation routes.

The set of indifferent curves are not the same for imported products (incoming) as for those exported (outgoing) in the same region.
Another important feature of Fig 4 is the extended hinterland (S), considered a marginal area and a fertile ground for future port influence.
The reason why this region is so considered is because the port system of any country or region (at present) is, in general, powerful enough to dictate the necessary economic policies to modify the size of its hinterland, expanding or shrinking it at will.
Therefore, correct measures and policies will encourage marginal producers to shift from traditional transportation routes to one which is more attractive(port A in our case). These measures will undoubtedly influence the demand for port services.

Elasticity of Demand

The elasticity of demand for port services differs greatly within its hinterland. In general, demand should be inelastic in current hinterland 4/ and relatively more elastic within the area of intersection (area C) where influence of competing ports exists.

Graphically,

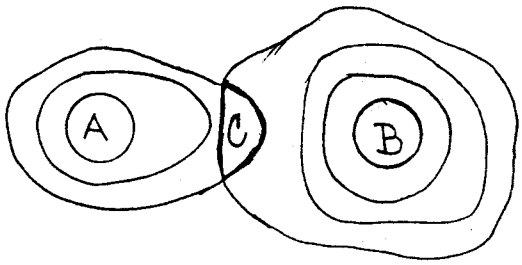


Fig. 5

(A) and (B) are neighboring ports

(C) area where hinterland of both ports intersect.

The reason why the elasticity of demand is relatively more elastic in area (C) is because the users located in this region have two alternative ports to chose from. This is shown graphically in Figures 6.a and 6.b

Port Demand Curves

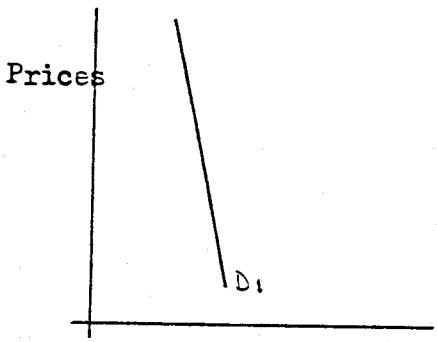


Fig. 6.a
Relatively inelastic port-demand curve.

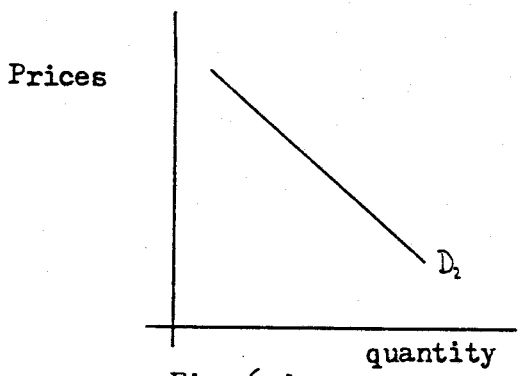


Fig. 6.b
A more elastic curve. As in area (C)

Pricing policies favoring users located in area (C) will influence their choice of ports, especially those producers whose products have high elasticity of demand in international markets.

It is the task of a port which decides to expand its hinterland to find what those products are, what the elasticities are, and then provide a better service at an attractive price.

Analysis of Distance

Another factor affecting port demand is distance. As we already saw in the hinterland analysis, those products with higher price/volume and price/weight ratio might be produced farther from the port and consumer markets. It is also true that products with lower ratios will not be

produced in areas too far away from the port or market because all economies due to transportation will be lost.

In general, the flow of cargo (imported/exported) will tend to move through that route (including the port) which offers the lowest transportation cost.

Remenber that the total transportation cost for the user (importer/exporter) is $TC = T_p + T_m + T_t$

Where: T_p = Total port costs

T_m = Marine transportation costs

T_t = Inland transportation costs

Therefore, the user will tend to move his cargo where TC= Minimum given the same quality of service.

This is so because transportation costs will affect the price of the goods at the final market. The effect of TC is proportional to the distance from the market. Graphically:

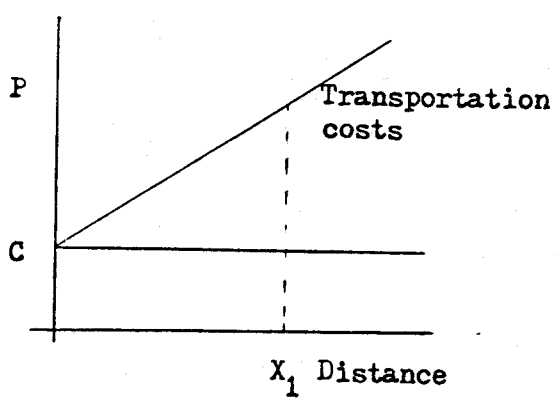


Fig. 7.a

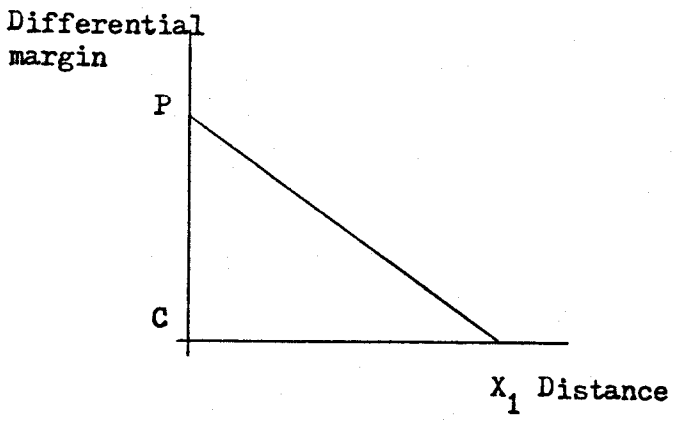


Fig 7.b

P= market price

X_1 = distance of no differential margin

In any free market economy, the producer is forced by competition to maintain low cost if he is to stay in business. Therefore, it is logical that the user of transportation facilities will shift his cargo to those routes, operators, or ports which offer a substantial savings in total transportation costs, or at least at the same price, with better quality of service.

A third important factor affecting the demand for port services is the degree of development of infrastructural services (physical and institutional) within the hinterland. Better roads will tend to drain more cargo to the port. High quality transportation services (railroad, trucks, etc.) will produce the same effect.
More developed technology used on highways and marine services (e.g. container) will make it necessary for the port organization to build required facilities and acquire adequate equipment.

It is also true that if all the factors mentioned are positive for the port, the port hinterland will expand up to the most external line of indifference (C_n) Fig. 4. This line usually marks the area where no more economies due to transportation are achieved.

Dynamic of the Economic Activity within the Hinterland

This is the most important consideration in the long run. Imports and exports will be determined by the dynamics of the economic activity within the port hinterland.

Politics of the Region

When the port hinterland includes areas in other countries, the

politics in the region and policies of governments must be taken into consideration. Artificial barriers are sometimes created to force a producer to export through his own country's port system. This is especially true in small bordering nations or in politically sensitive areas.

Port Service Supply

Because comparative advantages are achieved in the process of production in different countries, international trade is developed. Countries become specialized in producing those goods for which their production factors (labor, land and capital) are better suited. In the process of distributing those products internationally, the need for facilities (general infrastructure) and institutions are created. Ports, as part of this distributive system, need to be developed.

Historically, the supply of port facilities has always followed the demand for port services. When these two categories are not in equilibrium two things will happen:

a) users will import/export through the port system of other countries or regions farther away, and
b) the dynamics of economic activity within the country or hinterland (and the demand for port services) may be substantially reduced.

Consequently, a strong port system results from a sound economy. But is also true that a strong economy relies heavily on a strong port system. Several factors affect the supply for port services, the most important being:

a) Soundness of the economy in the region served by the port

b) technological development of transportation means

c) institutional development within the port hinterland

d) governmental policies regarding this industry

e) size of hinterland served

f) managerial ability

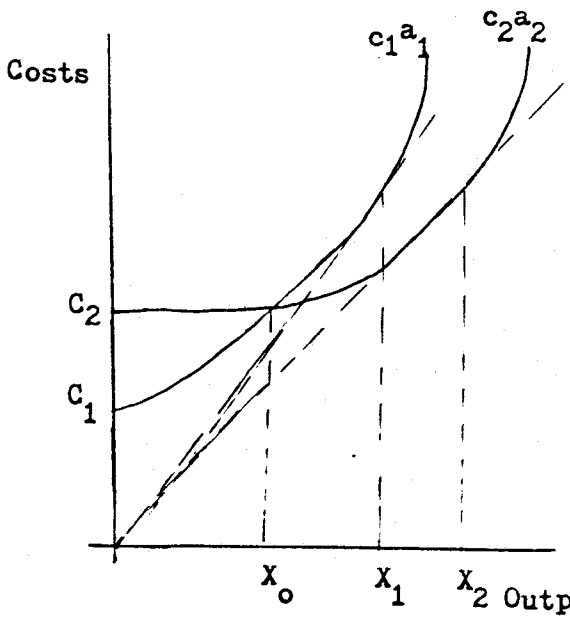
g) land availability at the site

The combination of those factors will determine the makeup of the port system, technically and economically. Also it is this configuration which will dictate the quality and quantity of port services produced.

Capacity of the Port System

The capacity of the port system can be measured in two ways. First it can be measured in physical units of output, usually tons handled per month or year. A second way is output versus costs consideration. This second manner is illustrated in figure 8

Fig. 8



c_1 a_1 = Total cost curve of port (A)

c_2 a_2 = New total cost curve of port (A) when facilities to expand its capacity were built.

X_o = Level of output where costs are the same.

X_1 = Optimum level of output with old facilities.

X_2 = Optimum capacity when new facilities were built.

Curve (c_1 a_1) shows the distribution of costs of a port. Before building new facilities, the port had a maximum efficient output of X_1. Beyond this point, costs will be excessively high and no more cargo will be attracted. Curve c_2 a_2 shows the distribution of costs when the decision was made to build new facilities. Even though there is a higher initial cost, the new expanded capacity will guarantee future economies of scale and lower future costs.

Bennaton Ensra 5/ pointed out that "for the port that is going to be in business for a long time it is always economic" to overbuild capacity, even with traffic below (X), and enjoy the future low cost of increased traffic in later years.

A practical way of measuring the percentage of capacity being used is by creating a set of indicators of port activity. Commonly accepted are: 7/

a) Vessels' turnaround

b) Vessels' berthing time/ (total time) (# of berths) = Berth occupancy

c) Tons of cargo handled per unit of time

e) Demurrage (caused by unavailabity of berths)

f) Cost per ton handled

The first two are indicators about the behavior of the vessels at the port. Port administration would like to know if vessel turnaround time is increasing or decreasing and the causes. The same is expected for the berthing time. It is extremely important to maintain good records of these two indicators, because of potential port congestion.

The last two indicators measure the efficiency of cargo handling at the port. It is advisable to separate different types of cargo in accordance to handling procedures and by terminals. So cargo in containers is classified apart from liquid bulk, etc. All four indicators are related, therefore a careful analysis of the port capacity actually used should include all of them.

Part II

Alternative ways to induce port demand for the Honduras port system

Generalities

The present analysis has the purpose of searching for alternatives to expand the demand for port services in Honduras. Due to the high investment in port facilities and improved services, Honduras faces a temporary excess of installed capacity. The National Port Authority therefore might be willing to expand the present port system hinterland to include other areas with low port capacity or non-existent port facilities in the Caribbean and Pacific coast of Central America.

The port authority has invested in two large ports in the Caribbean ocean and one medium-size port in the Pacific ocean. The approximate distance from the ports to the city capitals of other countries and approximate routes are shown in Figure 9 (fig. in miles). City capitals are considered as the main markets in Central America for imported products. Export products are collected along the route.

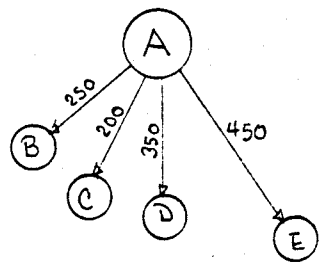


Fig.9

It is important to observe that in Central America , centers of population are located along the Pacific Coast and the central region. Consequently the major port developments have taken place in this area.
The letters (B) through (E) are the markets sought, (A) is the location of the port facilities.

Honduran Port Organization

The port system of Honduras is organized under government auspices. Recent investments have created temporary over-capacity.

The objective of the system is to contribute to national development through providing efficient and adequate port facilities.

The port system is considered mature in organization, infrastructure and operation.

Decisions are made by a Board of Executives which defines policies and a General Manager who implements them.

The port system is considered a natural monopoly within its country's borders and an oligopoly within the Central American and Caribbean region.

The ports lacks a marketing department. No concerted marketing research or development has been conducted to utilize the present excess capacity. However, cargo from the region has been moving through the system.

Shipping Industry Organization

The Caribbean coast of Central America is serviced by international shipping companies organized in conferences or agreements to exploit different routes from/to the area. During the 1970's, a rush toward containerization spread along the main routes. This has had a dramatic effect and will continue to affect on the Central American port systems. Main traffic routes to/from the region are:

Europe, Caribbean and Central America East Coast

These routes are served by a European consortium (some shipping lines were conferenced before) which inaugurated a weekly container service from/to

European countries.

Also, non-conferenced conventional services exist from/to European countries.

USA, Central America (East Coast)

Many lines and tramps are servicing this route. LASH, LO-LO 7/ and RO-RO 8/ service is provided as well as conventional cargo. No conferenced organizations exist on this route.

USA, Caribbean and Central America

Same services. Freight from the United States' East coast is sometimes incremented by the Panama canal charges.

Far East Central America (East and West)

Service provided by Japanese conference and Korean and Taiwanese shipping lines. East coast ports are subject to higher freights due to Panama canal service.

The shipping lines (or conferences) exploiting the different routes to and from Central America are organized in monopolies. Very little competition exists on some routes and none on others.

These monopolies are presently moving toward higher levels of technology (especially containers and barges) to handle break bulk cargo, lumber, solid bulk, etc., which provide higher financial returns and will probably block any competitive effort by smaller shipping industries. A trend toward a different type of shipping organization is also observed. The present conference system (which allows competition among lines) is shifting its organization toward the container service cartel in which the space in each vessel is shared by the lines within the conference. This will give those

lines equal participation in the market and its benefits.

The next effect of this movement is toward a higher degree of monopoly in the routes serviced. This may create the following effects:

1- Lower marginal costs for the shipping companies (cartel)

2- Relative increase in marginal revenues (MR)

3- Shift of demand curve toward the MR curve. In a monopoly, MR= D.

4- Will probably charge monopoly prices (abandon marginal cost Mg pricing policy.).

If this happens they will handle only q_1 tons instead of q_0 in marginal pricing policy.

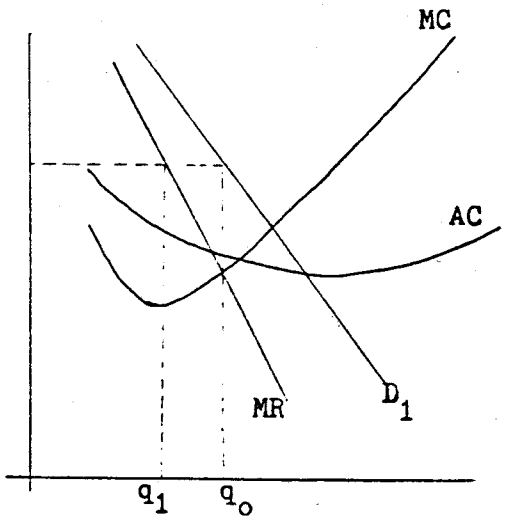


Fig. 10

The monopoly prices, however, will not be maintained as high as the traffic could bear. This is because the conference is mobilizing industrial goods from industrialized countries and moving raw materials and tropical fruits in return. To be competitive, the governments of industrial nations have in the past susidized the conference and will probably continue to do so in the future.

It is common practice at present for the European/ Central America and Caribbean conferences to increase their annual rate (for westbound traffic) much less than for eastbound traffic. This has the effect of deteriorating the "terms of trade" for the small inland Caribbean countries served.

Transportation

The quality of inland transportation is affected by three factors:

a) Infrastructure

b) Organization

c) Level of technology (equipment)

The region in this study has a good highway system to and from the main markets.

The main constraint faced by the land transportation system is related to its organization, as thousands of small companies (many of them of only one person) produce the transport services required. The equipment is mostly adapted to handle break bulk cargo. Very few containers and other heavy equipment can be handled.

A fair number of trucks (tractors) for handling RO-RO containers already exist in the country. Inefficiencies have been identified through study "The Central American Transportation System", which is being use by Central American governments as a guideline to improve this service.

Capacity of the Honduran Port System

As was shown in part 1, the indivisibility of investments in port facilities may temporarily create excess capacity in the system. This is the situation at present in the Honduran Port System.

Investments in new berths (see table 1) and equipment to maintain a balance with changing international transportation have increased the ability of the system to supply services beyond its present demand. Investments have also been made in human capital to increase expertise in this industry.

Table No. 1

New investments in the Honduras port system. (1975-1980)

Area	Year	Facilities	Capacity (Number of berths)
Atlantic (Puerto Cortes)	1975	Container terminal equipped to fully accommodate containerships and handle, store and reship container units.	3
Atlantic (Puerto Castilla)	Since 1978	New port in construction. Will contain full facilities to handle general containerized cargo. Also administrative and all other necessary services for operation (conecting roads, water services, maintenance facilities, etc.	3
Pacific (San Lorenzo)	1975-79	New port is finished. Will handle general cargo as well as a few containers.	2

Source: Empresa Nacional Portuaria, published data. 1978-1980

As was stated before, a good indicator of port activity is the measure of the percentage of the system's capacity actually being used. Two types of demurrages, caused by non-availability of berths and berth-occupancy, are the best indicators from the records of the Honduras National Port Authority. Its largest ports berth-occupancy ranges from 45-55% (in 1978), which is a low figure in this business; yet at the same time, demurrages caused by the company were in 1978, only 218 hours out of 13,000 spent in port by all arrived vessels. At the present rate of growth, the excess capacity may last until the late 1990's when it has been estimated that new facilities will be required.

The goal of this analysis, then, is to search for ways to expand the present hinterland to marginal areas, which will have the effect of accelerating the demand for services all over the system. Or, as seen in fig. 8, to push the value of X (tons handled) to approximate (X_2), as soon as possible, in order to achieve economies of scale.
Careful analysis has to be done in order not to push demand beyond the X_2 point at X values higher than X_2, because the cost for port services would be excessively high and it is highly probable that congestion would result.

Inducing Port Demand

Can the demand for port services be induced? Bennaton Ensra 9/ states that many ports located in Asian countries use price discrimination policies to attract cargo. Other ports, such as Amsterdam and Rotterdam in Europe and Kingston in Jamaica, have become main distribution centers

for transhipped cargo. Kingston, for example, offers a volume rebate. Any company handling more than a fixed volume of cargo per year accrues an automatic discount, credited during future operations in that port.

Economic incentives have been applied appealing to two types of traffic transhipment and transit. a) Transhipment: The worldwide trend toward more rational route planning and the need to reduce the number of port calls made by large, fast and expensive oceangoing vessels on a trunk route gives increased importance to the transhipment function of a port.

A different class of ship (feeder ship) is introduced as redistributor capable of working in restricted draft conditions and with a high load factor. Even though some economic studies have concluded that economies are obtained when transhipment occurs these results have been challenged by many authors. Transhipment service implies rehandling of the container unit, hence, increased total freight.

The typical transhipment activity is shown in Figure 11. A and B are main routes ports. Ports E and D are out of the main route and served by feeder vessels. Feeder ports as (E and D) may become main ports if traffic increases and the companies administering them decide to build the required facilities.

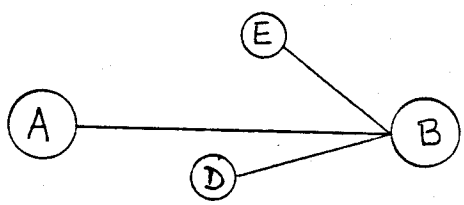


Figure 11

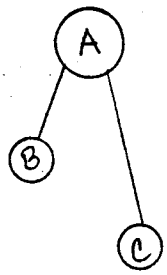
Cargo in transit, the second element mentioned, is similar to transhipment but specific to some region where the cargo is sent to its destination via land transportation.

Cargo transit may be:

i) Addressed to someplace within the country or

ii) In transit to another country.

Graphically:



A= Port of entry

B= Cargo being sent somewhere in the same country

C= Cargo to another country

Fig. 12

Cargo in transit is not the same as conventional cargo moving through the port. The difference resides in the legal status of the goods. While conventional cargo is registered by the customhouses at the port of entry, cargo in transit is registered at any internal customhouse or simply moves through the country if the owners are located outside of the national borders.

Any strategy oriented to attact additional cargo has to be aimed at these two types of traffic.

Strategic Pricing

Price discrimination seems to be the most reasonable policy to follow. Three elements or strategies are considered:

a) To apply special regulations and/or pricing to cargo in transit

b) To apply special regulations and/or pricing to cargo in transhipment

c) To apply special rebates to those lines which handle a large volume of cargo on a yearly basis.

The first two strategies are designed to motivate possible users. The third is designed retain current users of the port system.

Pricing Cargo in Transit

Suppose our system consists of only two competing ports.

Then we have:

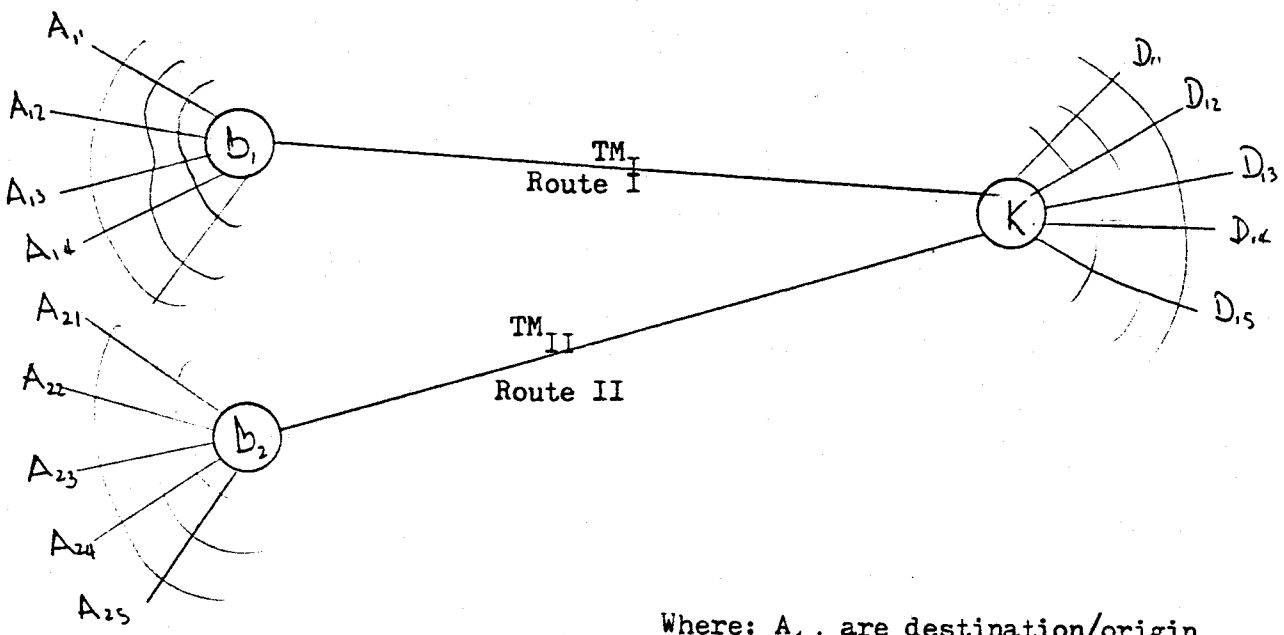


Figure 13

i= 1,2,3..n

j= 1,2,3...m

Where: A_{1j} are destination/origin

B_i = Competing Ports

K = Port outside of the region

D = Hinterland of port K

TP = Cost of port services

TM = Marine freight

TI = Inland freight

TC = Total transportation costs

Note: All costs and freights mentioned in this section are seen from the users's point of view except when otherwise noted.

The total cost of transportation for the user will depend on the partial cost of each mode. The following situation may occur:

i) That total cost of transportation in route I (TC_I) equals total cost of transportation on route II (TC_{II}) so:

$$TC_I = TC_{II} \text{ and}$$

i) $C^*_{AI} = C^*_{AII}$ Where: C^*_{AI} and C^*_{AII} are average cost per unit distance in hinterland of port B_1 and B_2 respectively.

$TP_{BI} = TP_{BII}$

$TM_I = TM_{II}$

$C_{DI} = C_{DII}$

- TP_{BI} and TP_{BII} are costs of services provided by ports B_I and B_{II}
- TM_I and TM_{II} are marine freights for routes I and route II
- C_{DI} and C_{DII} are costs per unit distance on hinterland of port K.

Pricing Considerations

Suppose that this the actual case and we are interested in inducing demand through port system B_I,

Our prices should be:

$$P_{BI} \geq VC_{BI}$$

Where: P_{BI} = Incentive price for port B_I

VC= Variable cost for port B_I .

This has to be so because in order to remain in business the company has to recover at least its variable costs. Fixed costs are to be recovered

from the captive national demand. So as $TP_{BI} = TP_{BII}$, an incentive price to possible users located near or within the hinterland or port B_{II} has to be low enough to compensate the excess in inland freight plus a percentage discount to motivate them to try our services. Port B_I incentive price, will therefore be:

Model (i) $$P_{B_I} \geq VC_{B_I} = TC_{B_{II}} \pm \left[X\left(C^*_{A_I} - C^*_{A_{II}}\right) + E\right]$$

Where X= distance from port to destination

and E, is a percentage discounted from TP_{BI}

ii) If the case is $TC_{BI} \neq TC_{BII}$; then the price should be:

Model ii)

$$P_{B_I} \geq VC_{B_I} = TP_{B_{II}} \pm \left[X\left(C^*_{A_I} - C^*_{A_{II}} + \left(TP_{B_I} - TP_{B_{II}}\right) + \left(TP_{K_I} - TP_{K_{II}}\right) + X\left(C^*_{D_I} - C^*_{D_{II}}\right) + E\right]\right.$$

But as we have only one port of origin/destination (K_I); then terms

The model is reduced to:

$$P_{B_I} \geq TP_{B_{II}} \pm \left[X\left(C^*_{A_I} - C_{A_{II}}\right) + \left(TP_{B_I} - TP_{B_{II}}\right) + \left(TM_I - TM_{II}\right) + E\right]$$

This is to say that the incentive price should never be lower than the variable cost of port B_I and that the port B_I will actually compensate users of port B_{II} for any difference in cost between the two routes if they (users of port B_{II}) decide to shift this cargo to port B_I.

Note also that, in any case, if the cost of handling through route 1 equals the cost of handling through route II, model (ii) is reduced to model (i).

iii) If port facilities do not exist in area B_{II}, then the charge will be:

$$PB_I = TP_{BI} \pm E$$

b) Pricing Transhipment

Transhipment occurs because port facilities to handle specialized containerships don't exist in origin/destination ports, or because the port is outside of the main transportation route.

When pricing transhipment we have to account for all elements taken into consideration in case (a), (cargo in transit). The only difference is that the cargo is reshipped in vessels instead of trucks as in case (a).

Therefore, both model (i) and (ii) developed above will be good enough to use when pricing transhipment.

c) Rebates

Once shipping companies or inland users have tried our services for the first time, the goal is to maintain their loyalty. A market technique that can be applied is to offer rebates (on an annual basis) to those users that keep using facilities of port B_I.

This rebate is a fixed quantity per/volume handled or per number of units. (tons, containers, etc.).

Example:

0--------5000 units X% rebate

5001---------10,000 T Y% rebate

and so on.

An important final consideration the port should take is to take the necessary measures to make certain that the consignee of the cargo

will actually receive the economic incentive allowed by the port authority.

Conclusions

The port is neither a terminal nor an isolated unit. It forms part of a continous and larger international transportation system.

Decisions in technological development and organizational changes in this larger system affect the port policies and practices.

Because of the indivisibility of port investment, temporary excess capacity of port services may accrue in the port system when a new wharf is built or new container facilities are acquired, etc.
This situation, even though temporary, creats financial pressures on the administration and economic loss to the system when economies of scale are not achieved.

Decisions aimed to increase the rate of usage of the facilities are advised. Careful analysis of the demand is necessary so as not to push it beyond the system's capacity and cause congestion.

Two alternative ways of traffic are recommended, transhipment and transit. In both methods the use of containers is heavy. Our efforts, therefore, should facilitate these type of services.

Finally, as the port holds monopoly authority, pricing policies should recover fixed costs from the port's captive hinterland and export excess capacity to marginal areas (where the elasticity of demand for its services is greater)charging as minimum the variable costs of its services.

Additional Considerations

The following additional considerations complement the ideas stated in the body of this report and have the goal of increasin its comprehension and clarity.

A.- Price discrimination

Price discrimination occurs when the same commodity is sold at more than one price; for example, when a particular item or service sells at a higher price to a rich person than to a poor one.

In the port industry, the port authority sells services. The necessary conditions for a successful policy of price discrimination exist when the buyers (users of port facilities) fall into classes: and when considerable differences in the elasticity of demand for port services exist among the products imported or exported. It is also a condition that these classes can be identified and segregated at moderate cost. The differences between classes of buyers in the elasticity of demand for port services may be due to differences in the availability of other ports in the region.

Discrimination by type of cargo

A practical way for the port authority to carry out price discrimination is to segregate the cargo by type the mode of handling it for example, containers, dry bulk, general cargo, etc. and to decide which type of cargo is most commonly served. As for the Honduran port system, the interest should be centered around containerized cargo because it is in this area that the port authority has excess capacity. Price discrimination between

national and foreign users (handling cargo in containers) is possible if the rate structure of the port is segregated in accordance to: a) traffic b) condition or state of the unit (FCL, LCL 1/ or empty) and c) type of product handled by the container. 2/

Traffic. Producers, importers and exporters are located geographically in different markets. If located outside the hinterland of the Honduran port system, and alternative ports exist, these consumers' elasticity of demand for port services will be greater than the elasticity for producers located closer to any particular port.

Any pricing policy designed to attract customers presently moving their cargo through alternative routes should include a careful spatial equilibrium analysis. The anlysis must take into account: 1)total transportation costs from/to markets when additional cargo is handled through Honduran ports and 2) total transportation costs if some cargo were to be handled through an alternative port system, elaborating on costs incurred when using the Panama Canal.

Condition of the unit

Another way to apply price discrimination to container units to segregate them by loading condition, for example, full container load (FCL); less than a container load (LCL) or empty.

1/ LCL stands for less than a container load and FCL for full container load.

2/ At present, the same price is paid to the Honduran ports regardless of traffic or condition of the unit.

It matters little to the port authority if the unit handled contains cargo or not as the same cost is incurred in any case. For the unit itself, however, the demand elasticity for port services will be greater for empty units and less for LCL and FCL.

This difference occurs because the relative port costs for an empty container are much higher than for a full one, and because the shipping companies have many alternative ports in which to store an excess of empty units. A wise policy of pricing may also attract this type of unit, and LCL and FCL consigned on transhipment or on transit. A careful study of space and equipment availability within each port is necessary before issuing such a policy.

Product Segregation

In addition to segregating by condition of the unit, a further discrimination by products is advisable because: a) each product has a different absolute market value, hence, a different elasticity of demand for transportation and port services, and b) as each product has different value, consequently the risk of loss (to the port authority) is proportional to the value of the commodities handled and the probability of loss of the unit.

Therefore, when price-discriminating by product we should bear in mind that 1) the higher the value of the commodity handled, the lower will be its price elasticity of demand for port services and 2) the higher the value of the commodity the higher the risk of loss.

Pricing policies should a) calculate the price elasticity of demand

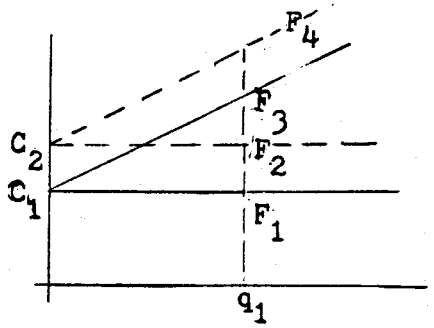
for port services by type of product b) give an economic incentive to those products of greater elasticity of demand and c) deliver a higher quality service (speed, careful handling, etc.) to those commodities of high price and inelastic demand for port services. The price for this quality service should accordingly be higher.

B) Price discrimination and allocation of costs:

It was stated before that the port authority has monopoly power within its hinterland (national borders) but competes with other port authorities outside these borders. Note that the reverse is also true if these competing organizations hold similar economic and political power.

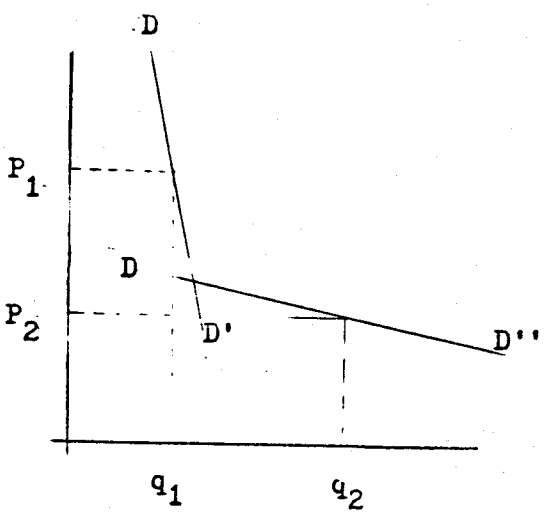
It is this situation which makes it possible for the port authority to charge different rate for services provided to national and foreign consumers and the power to allocate its costs differently. For example, the port authority may charge the whole burden of fixed costs to consumers located within its hinterland and apply at least the variable costs to those users located outside it.

The range of costs for users based outside the hinterland will therefore vary between a minimun equal to the variable cost of delivering the service and a maximum equal to the price paid by the national consumers, depending on the elasticity of demand for port service characteristics of the product to be handled. For example, if the total quantity of services demanded is q_1 (includes foreign demand), and the port authority costs are as pictured in Fig. 14



then C_1 F_1 are fixed costs incurred when serving national consumers, C_2 F_2 are total fixed costs and C_1 F_1 C_2 F_2 are cost incurred when serving foreign demand. The curves C_1 F_1 F_3 are variable costs for internal demand and C_1 F_1 F_4 are total variable costs. The area C_1 F_3 F_4 C_2 are variable costs for additional traffic. This area also represents the minimum applicable charges for this traffic.

Fig. 15 represents the probable demand curves for both types of traffic.



DD' represents the portion of traffic going to national consumers, the portion DD'' represents a more elastic situation such as the demand from consumers located outside the national borders. P_1 is the price charged to the national market. P_2 is the incentive price for foreign consumer. q_1 and q_2 are quantities demanded at prices P_1 and P_2 respectively.

C.- What price should be charged ?

If the port authority decides to practice price discrimination it must make two decisions: how much output should be allocated to consumers located outside its hinterland; and what prices should it charge to buyers in each market?

First, the port authority will allocate to foreign markets only that output necessary to make up the difference between its long run output equilibrium and its current demand.

In fig. 16 , A C represents the long term average costs, D is long term demand, q_0 is the long run output equilibrium of the firm. If q_1 is the the present output, the difference $q_0 - q_1$ represents its excess capacity. That amount $(q_0 - q_1)$ is to be allocated to foreign trade.

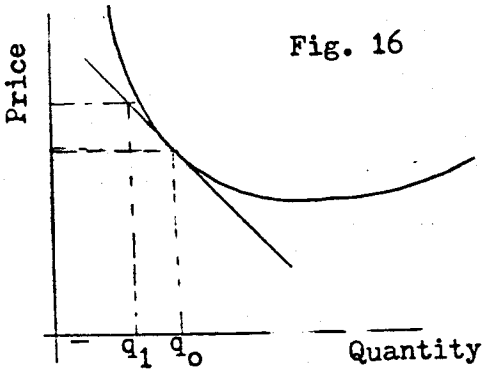


Fig. 16

For the second question let us suppose that the port authority is handling only one product (full container load) for both national and foreign vessels. Let us also (consider the fact) that the goal of the port authority is to maximize employment rather than profits. Then we combine figs. and make D'D and D''D the demand curves for service to full containers. The result is pictured in fig 17in which P_1 is the price per unit to be charged internally, P_2 is the price to be charged to buyers located outside the port's hinterland and P_o is the equilibrium price when the long run equilibrium output (q_o) is reached.

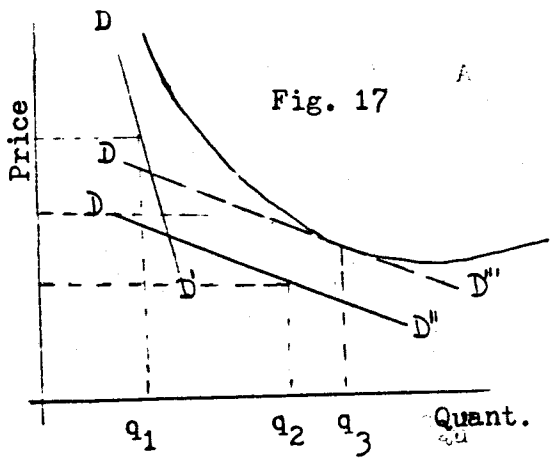


Fig. 17

DD''' is the total demand curve.

The value of P_2 will actually be determined by a process of trial and error or by negotiations with the shipping companies and/or users.

D.- Competition

If the Honduran port system starts a policy of price discrimination

for its services, a move toward the same policy must be expected from port authorities located in other Central American countries and the Caribbean.

In this case, other aspects such as geographical location, and maturity of the port system -- two conditions already accomplished by the Honduran port authority-- become very important elements to take into consideration.

Foot Notes

1/ Unification is a simple concept. The idea consists of putting together small heterogeneous pieces to form a larger, easier to handle homogeneous unit. Three types of unit are in use at present: pallets, containers and barges.

2/ Definition from Pan American Union, OAS, "Recent development in the use and handling of unitized cargo," Washington, D.C. 1964.

3/ A pallet is a wooden or steel device, designed to be used as on aid for mechanical handling (using a forklift) of heterogeneous units of cargo in transportation.

A unified pallet is designed to last only one trip and is disposed of at its destination.

4/ Bennathan Ensra and Walters A.A. "Port pricing and investment policy in developing countries." They state that the price elasticity of demand of port services is 0.01.

5/ Bennathan Ensra. Op. cit.

6/ United Nations "Port Development". op. cit. p.p. 26

7/ RO-RO stands for Roll on-roll off. The containers have a set of built in wheels. Therefore, this can be loaded or unloaded using a tractor only. (vertical movement)

8/ LO-LO stands for lift on-lift off. The unit is unloaded using a specially designed crane (horizontal movement).

9/ Op. cit page 12

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