DEMAND DETERMINANTS FOR SHIPPING SPACE AT THE PORT OF BEIRUT*

by

Sabbah A. Al Haj**

Introduction :

The Port of Beirut serves as a major commercial outlet on the Mediterranean for Lebanon and for a number of its neighboring countries, accommodating their foreign trade and offering them complete transit service facilities. Beirut's strategic position as a commercial center and as a transit port was accentuated after the seizure of the competitive port of Haifa, by the Israeli authorities in 1948, which has been boycotted by Arab countries since.

On the average 82 percent of total inbound cargo unloaded at the Port of Beirut were imports destined to the Lebanese market, about 12 percent were sea-land transit cargo destined to neighboring countries, namely Syria, Jordan, Iraq, and Iran : roughly 2 percent were sea-free-zone-sea transit cargo, and the remaining roughly 1 percent were transhipments[1].

The Port of Beirut registered a severe drop, about 30 percent, in the volume of total inbound cargo in 1958 due to political unrest in the country. The loss incurred by the different types of inbound cargo varied considerably; imports suffered about 11 percent; sea - land transit trade scored the heaviest

(1) Data computed from Tables 1 and 3.

loss of about 60 percent; while sea - land transit cargo and transhipped cargo maintained their previous years' records.

The drop in the volume of inbound cargo and the subsequent reshuffle in the composition of inbound cargo, monitored by the variation in the percentage of the shares of each component of total inbound cargo, has significant economic bearing on the projected business activity of the Port of Beirut, and of the service industries catering to transit trade. The sharp decrease in the volume of sea - land transit cargo that occurred in 1958 and was followed by milder losses in succeeding years, inflicted losses on the service industries catering to transit trade, namely, stevedoring, warehousing, transportation, banking, not to mention the losses incurred by the public sector.

Total outbound cargo dropped in 1958 about 30 percent of its previous years' level, and continued to decrease at a slower rate until it reached a minimum of 280,484 tons (refer Table 3) in 1960 which is 55 percent of the pre crisis volume of 1957. This decline was mainly due to the development and expansion of the Port of Akaba in Jordan and Latakia in Syria by their respective governments, who came to consider, after 1958, the Port of Beirut as an unreliable outlet for their foreign trade.

The purpose of this study is to delineate the major determinants of the demand for inbound and outbound shipping space at the Port of Beirut. Certain economic determinants are to be analyzed and their impact is to be determined, nevertheless the study will acknowledge the significance of non economic determinants although no attempt will be made to quantify and gauge those variables. Such information is of significance, and relevance to decision makers :

a)   The Beirut Port authorities. who by the use of the proposed model could project future cargo movement through the Port of Beirut, and by the application of modern quantitative tools such as linear programming and queuing theory, could determine the necessary anchorage, stevedoring, and warehousing facilities to accomodate projected increase at any future date. This information will enable the Port authorities to assess the available facilities in the wake of projected growth of cargo

traffic through the Port of Beirut, and accordingly plan the financing and construction of necessary facilities to be added to existing ones.

b) Foreign sea freight companies, who wish to establish agency offices in Beirut, and local companies who either own or plan to purchase their own shipping equipment, would find the information generated by the proposed model useful in their computations of the profitability and feasibility of the venture.

This study has its limitations :

a) The reliability of some of the data incorporated in the model may be questioned.

b) The role of competitive ports in the area, namely, the Ports of Akaba in Jordan, and Latakia and Tartouse in Syria. was left out of the model because of the prohibiting difficulties encountered in attempting to obtain this data.

c) Competitive means of transport were excluded from the model. Although the volume of air freight has been increasing at a very accelerated rate, its absolute magnitude is still insignificant relative to the total volume of cargo movement in and out of Lebanon, and henceforth its omission does not significantly bias the findings of this study. Airborn imports increased from about 4 thousand tons in 1956 to 14 thousand tons in 1967 (about 1 percent of the volume of seaborn imports). Volume of exports rose from about 10 thousand tons in 1956 to roughly 19 thousand tons in 1967 (about 7 percent of volume of seaborn exports), while transit trade has increased from 2 thousand tons in 1956 to about 3.7 thousand tons in 1967 (about .5 of one percent of total transit cargo via Beirut).

Nature of Demand for Shipping Square :

Shipping space is demanded to carry imports, exports, and transit cargo, seeking carriage by sea, from one point to another. The determinants of the demand for shipping space thus lie in the demand determinants of those three categories of cargo.

The main determinants of the volume of imports and of exports are also the basic economic variables that monitor the

level of economic activity and of economic growth in a country namely, population, capital inflow, per capita income, relative price index, and the currency rate of exchange vis - a - vis other currencies. Any variation in the magnitude or rate of change of any of the above variables vould induce a change in the level of investment and production which in turn affects imports and exports. Imports are demanded by domestic producers to meet their industrial needs and production equipment that are not produced locally. Consumers also have an interest in imports where goods are imported because they are cheaper than domestic substitutes, or have no close substitutes.

Exports make possible a large scale of production with lower unit cost. Conversely a high state of technology, with an adequate supply of economic and social capital contribute to low cost production of goods which render them competitive and enhances their exports to foreign markets thus increasing the demand for shipping space.

Transit cargo determinants are exogenous to the economy of the transit country except for the costs of services and facilities offered by the transit port and these are usually highly associated with the level of economic development of the transit country.

Demand for Shipping Space
At the Port of Beirut

The demand for shipping space at the Port of Beirut is a two-fold demand; demand for space for inbound cargo and space for the outgoing cargo. Though the space on incoming vessels could be utilized for outgoing cargo, each of these demands should be analyzed independently because of the basically different determinants underlying each of them, and the different outcome and implications that depend on each.

The unit of measurement suggested by Professor Richard Farmer in an analysis of the cargo transport, is the « Ton - mile[2] ». This would have been the logical unit of measurement

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(2) Richard Farmer, **The Economics and Management of Transport Enterprise** (Beirut : American University of Beirut, 1957), p. 18.

to be used for this study, were the data on the sources of import and destination of exports through the Port of Beirut available. The data on imports and exports are handled in fact, as two lumped entries, by the Port of Beirut authorities, in tons. The ton was therefore used as the unit of measurement for this study[3], at the risk of eliminating the distance effect and thus the freight rate influence on the demand for shipping space[4]

Considering the above general nature of demand for shipping space, it becomes obvious that any demand analysis with respect to sea freight transport should analyze the demand for each type of commodity and on each trade route. Such an analysis seems to be theoretically feasible. However, it is very difficult if not impossible to accomplish in practice. To overcome this impasse, a less detailed classification of demand was used, namely, demand for outbound and demand for inbound shipping space.

I. Determinants of Demand for Incoming Shipping Space.

The demand for shipping space on Beirut-bound vessels is a function of the demand for imports, sea - land transit trade, sea - free - zone - sea transit cargo destined Eastward or Westward carried on limited routes vessels, and transhipments.

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(3) A complementary index is recommended with respect to the measurement of shipping space by tons, since the former is a volume measure, while the latter is a weight measurement. Hence, the stowage factor or « register coefficient », as suggested by Anljot Svendsen, in his book Sea Transport and Shipping Economics an index relating weight in tons and volume measurement in cubic capacity, could be used for the conversion of tons into cubic meters and vice-versa.

(4) In the interest of alleviating concern regarding the reliability of the proposed demand analysis when no direct consideration has been given to shipping rates and fares, it should be pointed out that the shipping rates elasticity of demand for shipping space is quite low i.e., highly inelastic for two main reasons : (a) shipping costs of sea-borne cargo constitute a relatively small percent, on the average, of the total cost of imported goods, (b) shipping rates are set periodically at international shipping conferences, and are not subject to competitive variations, consequently the demand for shipping space, fares being fixed, is more sensitive to variations of other factors than distance.

A. *Imports :*

Lebanon whose industrial production meets a relatively small portion of its demand for industrial and consumers goods, depends largely on Eastern and Western Europe, as well as the U.S.A., for the imports of most of its industrial goods and a substantial part of its consumer goods. It, thus, becomes relevant to analyze the determinants of the demand for imports if any estimation and/or projection is to be made of the needed shipping space on Beirut - bound vessels.

Factors that theoretically determine imports into any country under a free import policy are population, credit facilities, capital inflow, per capita income, inflow of tourists, prices of imports, and prices of locally produced commodities. However, preliminary analysis revealed that only three of these factors were closely associated with imports, namely capital inflow, volume of tourism and income per capita[5].

Other significant determinants of imports, namely, the internal political stability of the country, the general economic activity, bilateral trade agreements, import restrictions, tariffs, quotas, and others, were precluded from the study either because of their non - quantifiable nature, or due to lack of data.

Although the above mentioned determinants were omitted, their influence on imports and the analyzed determinants was manifested by variations in the magnitudes of both imports and determinants throughout the period under study. Hence their exclusion should not reflect on the reliability of the model.

1 — Capital Inflow : Lebanon is a refuge for Arab capital. The socialistic movement that swept some of the neighboring Arab countries and the political chaos emanating from this state of unrest in the early sixties, was instrumental in funelling capital into Lebanon. Moreover, the growing Lebanese banking

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(5) Simple regression analysis of each of the above mentioned variables on imports was conducted and the regression coefficients were then tested for significance.

sector with its accomodating Secrecy law of commercial banks was a further attraction to capital scared away by socialism.

Short - term capital inflow into the Lebanese banking system influenced the demand for imports through the creation of secondary deposits by banks swamped with deposits seeking investment opportunities for their idle balances. A portion of these short-term deposits was reinvested abroad, and its magnitude of contribution to the demand for imports was limited to the net returns realized by banks from the discrepancy in interest rates charges to foreign borrowers and paid to depositors.

The inflow of long-term capital has a more lasting effect on the economy than that of short-term capital, in that it meets the needs of long-term investors who seek this special type of credit for the fulfillment of industrial and agricultural projects. Certain economists go as far as analyzing the Lebanese balance of trade in terms of capital inflow. It is argued that the huge deficit in the current account of the Lebanese balance of payments since the early fifties, has been offset largely by surpluses in the capital account[6]. This implies that the huge deficit in the current account would not have been possible without the surplus in the capital account.

2 — Volume of tourism[7]. The touristic sector generates a substantial income for Lebanon. Tourists from neighboring Arab countries resort to Lebanon during summer to escape the hot weather that prevails in their countries, and usually take advantage of their presence in Lebanon to shop for consumer durable and non-durable goods of Western make that are not available in their respective countries.

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(6) Khalil Salem, **Lebanese Balance of Payments for 1961**, A. U. B., The Economic Research Institute, 1964, pp. 23 - 4.

(7) Data on person - visits to Lebanon reflect a curvilinear pattern in the number of tourists visiting Lebanon between 1956 and 1967 with a drop in the number of tourists in 1957 followed by a further drop in 1958. This curvilinear behaviour of the data on tourists visiting Lebanon would generate a bias in the estimated coefficients because the tools used for the solution of the model assumed linear relationship between the dependent and the independent variables. The justification for proceeding with the linearity assumption lies in the behaviour of the other sectors in the model whose behaviour befit the linearity assumption most closely.

The volume of tourism is therefore considered as a major determinant of demand for imports. Moreover, tourists bring into the country foreign exchange which would reduce the exchange rate of Lebanese pounds in terms of foreign currencies and hence increase the demand for imports.

Three different units for measuring volume of tourism are suggested by Nikerk[8], namely person-visits, transit - day use of the country, and group - visits. There are administrative advantages and disadvantages to each type of unit of measurement used; however, person - visits was chosen as the unit for two main reasons. First, expenditures or transit benefits and costs are related to the number of persons visiting the country, and second because the data were available in this form.

TABLE 1

Movement of Inbound Cargo; Imports, Sea - Land, Sea - Free - Zone - Sea, Transhipments Through the Port of Beirut, 1956 - 1967

(Tons)

Year	Imports	Sea-Land	Sea-Free-Zone-Sea	Transhipments	Total Inbound Cargo
1956	1,125,582	352,779	26,273	12,741	1,517,375
1957	1,117,279	364,468	31,959	11,099	1,524,805
1958	889,802	153,397	39,269	14,397	1,096,865
1959	1,133,593	153,795	32,074	16,440	1,335,902
1960	1,236,131	163,763	29,005	13,676	1,442,575
1961	1,177,776	147,682	19,300	14,367	1,359,125
1962	1,033,095	151,496	25,802	18,843	1,229,236
1963	1,169,598	140,360	39,736	13,023	1,362,717
1964	1,358,477	167,647	36,144	25,649	1,587,917
1965	1,505,456	156,108	27,336	28,034	1,716,934
1966	1,526,718	207,421	45,485	31,402	1,811,026
1967	1,354,326	303,616	37,344	9,351	1,704,637

Source : La Compagnie de Gestion et d'Exploitation du Port de Beyrouth, Trafic Maritime, Statistiques Diverses. 1956 - 1967.

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(8) J. V. Nikerk, «Problèmes du Marché Touristique», The Tourist Review, July / September 1967, p. 103.

3) Income per capita : The income elasticity of demand for imports is relatively high for Lebanon since Lebanon is a net importer of most capital and consumer goods. It is therefore assumed that a functional relationship exists between income per capita[9] and imports.

B. *Sea Land Transit Trade :*

The strategic location of the Port of Beirut arises from the transit services which it renders neighboring countries which lack a developed port on the Mediterranean Sea. Hence, the sea - land transit cargo through the Port of Beirut is a function of external forces originating in the neighboring importing countries, and distant exporting countries, with Lebanon playing an active role in determining the possible physical achievement of this potential flow. In the event the physical facilities at the Port of Beirut are unable to cope with the problem of unloading a number of ships simultaneously and under climatically unfavorable conditions, shipping companies may divert their vessels to less crowded neighboring ports to escape losses due to demurrage.

Other factors considered by shipping companies in choosing between the Port of Beirut and other ports in the area for loading and unloading transit cargo, which would have a significant bearing on the volume of transit cargo through the Port of Beirut, are docking fees, stevedoring charges, ware-

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(9) The per capita income figures for this study were obtained by dividing the adjusted national income figures by the population figures estimated by the United Nations for the years 1956 - 1967. The Central Bureau of Statistics figures on national income were used for 1964, 1965, 1966, and 1967, while data for previous years were obtained from the **International Financial Statistics** and the Publications of the Economic Research Institute, American University of Beirut.

TABLE 2

Determinants of Demand for Imports Through the Port of Beirut, 1956 - 1967

Year	Net Capital Inflow (a) (L.L.000.000)	Volume of Tourism (b)	Income per Capita (c) L.L.
1956	170	859,154	1047.1
1957	190	549,593	1082.1
1958	144	224,045	930.2
1959	165	352,884	1072.6
1960	258	533,083	1111.9
1961	219	529,361	1160.2
1962	140	625,827	1184.4
1963	157	729,883	1198.8
1964	266	963,441	1220.2
1965	272	1,220,370	1273.3
1966	272	1,513,443	1306.4
1967	102	1,218,119	1406.8

a.   Net Capital Inflow :

— For 1956, arbitrary estimate based on the principle of continuity.

— For 1957 - 60, Khalil Salem, *«Unclassified Lebanon»* : Balance of Payments 1968, (Type - written).

— For 1961 - 63, Khalil Salem, *Lebanese Balance of Payments for 1962 - 65,* Economic Research Institute, A. U. B., pp. 12 and 13.

— For 1964 - 65, George Medawar, *Lebanese Balance of Payments for 1964 - 65,* Economic Research Institute, A. U. B., pp. 28 - 9.

— For 1966, Elias Saba, *Lebanese Balance of Payments for 1966,* Economic Research Institute, A. U. B.

— For 1967, George Medawar, estimates of the 1967 balance of payment presented to Central Bureau of Statistics.

b. Volume of Tourism :

— National Council of Tourism for Lebanon (interview).

c. Income Per Capita :

— For 1956 - 58, *International Financial Statistics*, Vol. 16, December 1965.

— For 1959 - 60, Joseph Coppock, *Foreign Trade of the Middle East; Instability and Growth,* 1946 - 52, Economic Research Institute, A. U. B., 1966, p. 130.

— For 1961 - 64, *International Financial Statistics,* Vol. 21, August 1968.

— For 1964 - 67, Interview with Mr. Pierre Mas'ad of the Bureau of Central Statistics, on July 24, 1968.

housing costs, taxes, supplementary service charges, and additional transportation costs incurred in delivering the transit cargo to its final destination. Finally, political stability both on the local and the regional levels have a significant effect on the volume of land - sea transit trade. The internal political disruption of 1958 reduced the volume of sea - land transit trade to about 50 percent of that of 1957. On the regional level, the ideological differences between Lebanon and some of its neighbors induced them to seek their own outlets on the Mediterranean and to establish competitive ports offering transit service to Lebanon's traditional customers.

TABLE 3

Movement of Outbound Cargo; Exports, Land - Sea,

Sea - Free - Zone - Sea, Transhipments Through

the Port of Beirut, 1956 - 1967

(Tons)

Year	Exports	Land-Sea	Sea-Free-Zone-Sea	Transhipments	Total Outbound Cargo
1956	234,627	168,758	26,273	12,741	442,399
1957	271,845	178,493	31,959	11,099	493,396
1958	156,069	121,477	39,269	14,397	331,212
1959	133,687	145,909	32,074	16,440	328,110
1960	107,041	139,762	29,005	13,676	280,484
1961	142,610	105,956	19,300	14,367	282,233
1962	236,059	122,563	25,802	18,843	403,267
1963	202,064	121,734	39,736	13,023	376,557
1964	229,434	169,236	36,144	25,649	460,463
1965	296,353	103,587	27,336	28,034	455,310
1966	271,325	118,152	45,485	31,402	466,364
1967	246,178	290,655	37,344	9,351	583,528

Source : La Compagnie de Gestion et d'Exploitation du Port de Beyrouth, **Trafic Maritime. Statistiques Diverses. 1956 - 1967.**

The sharp decrease in the volume of sea - land transit cargo in 1958 did not recover to its former magnitude as expected after the country resumed its normal political life, but climbed abruptly in 1967 in consequence of the Arab - Israeli war.

D. *Sea - Free - Zone - Sea Transit Trade.*

The East - West and reverse flow of goods through the Port of Beirut is another important determinant of demand for shipping space. Cargo originating from distant western ports and destined to the Arabian Gulf and the Far East, or moving in the opposite direction on limited - route vessels, find in Beirut a relay port for resuming its journey to its final destination. This activity affects equally the demand for shipping space on inbound and outbound vessels.

What has been deductively assumed about sea - land transit trade applies in principle to sea - free - zone - sea transit trade in that the factors determining the volume of this type of transit cargo movement through the Port of Beirut lies outside Lebanon. The dissimilarity between these two types of transit trade, however, originates from the difference in their reaction to political and economic crises. While sea - land transit trade is very sensitive to economic and political aberrations in the area, sea - free - zone - sea transit trade is usually unaffected by these factors. The consistency of the volume of sea - free - zone - sea transit trade during the 1958 political disruptions in Lebanon (Table 1) is ample proof of this independence.

E. *Transhipments.*

Transhipment is the unloading of cargo from a vessel unto another travelling in the direction of the cargo's destination. Transhipped cargo, therefore, demands space on outbound vessels equal to the space occupied on the inbound carrier. Thus it was included with the determinants of demand for inbound and outbound shipping space.

Transhipped cargo is in essence another form of sea-sea transit cargo and differs from sea-free-zone-sea transit cargo in the time-lapse between the arrival and the departure of the shipments.

This similarity in the nature and origin of determinants and the distant destination of these types of transit cargo, along with the insensitiveness to local political and economic girations is reflected in the consistent increase of the transhipped cargo during the period under study, with the exception of 1967 when transhipped cargo dropped to about 9 thousand tons. (Table 1).

II. Determinants of Demand for Outgoing Shipping Space

The demand for shipping space on sea-bound vessels from the Port of Beirut is determined by Lebanese exports, land-sea transit trade, sea-free-zone-sea transit cargo and transhipments. The latter two determinants are common to the demand for space on inbound and outbound ships.

A. *Exports* :

The determinants of demand for Lebanese exports are of two major categories, namely, internal and external.

The internal factors include the availability of natural resources, the degree of technological advancement reflected in the efficiency and cost of production of locally produced goods ; the quality and the efficiency of the distribution channels and promotion techniques of the middlemen. External determinants on the other hand hinge on the price and quality competitiveness of Lebanese products.

B. *Land-Sea Transit Trade* :

Land-sea transit trade through the Port of Beirut is an exogenous determinant of demand for shipping space. The real components of this determinant lie within the neighboring countries, the points of origin of those exports via the Port of Beirut. The volume of land-sea transit trade is the aggregate sea-borne exports of Syria, Jordan, Iraq, and Iran minus whatever is exported through their own or other foreign ports.

The Port of Beirut plays only a catalytic role in fulfilling that portion of the sea-borne exports of the aforementioned countries, by offering land-sea transit service.

Methodology

Total cargo movement through the Port of Beirut was classified into inbound and outbound cargo. The volume of inbound cargo was determined by summing up the volume of imports, sea-land transit cargo, sea-free-zone-sea transit cargo and transhipped cargo (Table 1). Detailed data on the determinants of imports namely net capital inflow, volume of tourism, and income per capita were also collected for further analysis of this component due to its dominant magnitude relative to the other components (Table 2). The volume of outbound cargo was measured by summing up the volume of exports, land - sea transit cargo, sea - free - zone - sea transit cargo and transhipments. (Table 3). The latter two are mutual components of inbound and outbound sea - borne cargo and thus were included in the computation of both values.

Figures on inbound and outbound cargo were collected for the years 1956 through 1967. Previous data were too rough an estimate of reality, inconsistent with later data, or not available which limited the observed number of years to twelve.

A simple mathematical model was constructed reducing the problem to additive relationships of the essential components and determinants of the volume of inbound and outbound sea - borne cargo.

The Proposed Model

Demand for Inbound Shipping Space :

$$D_I = I + T_{s-L} + T_{s-f-s} + T_r \quad \text{.....................} \quad (1)$$

$$I = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \quad \text{.....................} \quad (2)$$

$$T_{s-L} = c + z_1 t_s \quad \text{.....................} \quad (3)$$

$$T_{s-f-s} = d + v_1 t_f \quad \text{.....................} \quad (4)$$

$$T_r = e + w_1 t_r \quad \text{.....................} \quad (5)$$

Demand for Outbound Shipping Space :

$$D_o = E + T_{L-s} + T_{s-f-s} + T_r \quad \text{.....................} \quad (6)$$

$$E = f + n_1 t_e \quad \text{.....................} \quad (7)$$

$$T_{L-s} = G - m t_1 \quad \text{.....................} \quad (8)$$

Where :

D_1 = Demand for shipping space on incoming vessels.

I = Imports in metric tons through the Port of Beirut.

T_{s-L} = Sea - Land transit trade through the Port of Beirut in tons.

T_{s-f-s} = Sea - Free - Zone - Sea transit trade through the Port of Beirut in tons.

T_{L-s} = Land - sea transit trade through the Port of Beirut in tons.

T_r = Transhipped cargo at the Port of Beirut in tons.

D_o = Demand for shipping space on outgoing vessels .

E = Exports of Lebanese products through the Port of Beirut in metric tons.

x_1 = Total net capital inflow to Lebanon in millions of Lebanese pounds.

x_2 = Number of tourists visiting Lebanon.

x_3 = Income per capita in Lebanese pounds.

t_1 = Respective time period.

$b_{1\ ..\ 3}$ = Multiple regression coefficients that represent the relative association between the independent and dependent variables.

z_1 , v_1 , w_1 , n_1 , and m_1 = Regression coefficients denoting the relationship between the dependent and the independent variables in equation 3 through 8.

The proposed model is composed of two demand equations; demand for inbound shipping space (1), and the demand for outbound shipping space (6). The demand for inbound shipping space is represented by an addative equation of the four components of inbound cargo· The demand for outbound shipping space is an addative function of the four components of outbound shipping space; exports, land - sea, sea - free - zone - sea, and transhipped transit cargo.

Except for the demand for imports, time series analysis was used to estimate the direction and magnitude of the components of the demand for inbound, and outbound shipping space. The justification for the use of this main tool of estimation is the

exogenous nature of the determinants of those components to the Lebanese economy.

Multiple linear regression was used to analyze the relationship of imports to the proposed determinants (equation 2). The coefficient of determination was adjusted for the bias generated from the limited number of observations relative to the number of variables[10]. The data were then tested for auto - correlation, using the Durbin - Watson test. The results were inconclusive[11]. The coefficients were then tested for significance using Fisher and Student t-tests. The partial regression coefficients were then normalized, presented in Beta - coefficient form[12], thus enabling the reader to determine the relative contribution of each independent variable in explaining the dependent one.

The determinants of the other components of inbound cargo; sea - land, sea - free - zone - sea, and transhipped transit cargo and outbound cargo; land - sea transit and exports, as previously mentioned, are exogenous to the Lebanese economy, and thus time series analysis was resorted to, to derive a meaningful estimate of the magnitude and direction of the annual change in each determinant.

Simple linear regression offered the closest fit to the observed data on sea - land, sea - free - zone - sea, transhipped, land - sea transit cargo as well as exports[13]. The regression coefficients were then tested for significance.

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(10) $R^2 = R^2 \dfrac{(n-1)}{(n-k-1)}$ where n = number of observations
    and
    k = number of constraints

(11) $d = 1.0943$

(12) $B_i = b_i \left(\dfrac{s_{x_i}}{s_y} \right)$

(13) At F - test revealed no significant difference in fitting the data to a second degree curve or higher over that of linearity in any of the above mentioned cases.

Interpretation of Results

It was hypothesized that the major determinants of imports were net capital inflow, number of tourists and income per capita. The adjusted coefficient of determination, was computed to be .93 which implies that the three selected determinants explain 93 per cent of the variations in the volume of imports into the country.

The regression coefficient of net capital inflow on the volume of imports indicates that a significant correlation exists between the two variables (tested at 90 percent confidence). The regression coefficient of the number of tourists on the volume of imports ($b_2 = .20$) was significant at 80 percent confidence. The regression of income per capita on imports was not decisively established. The result of the regression analysis of income per capita on imports failed to attain a state of significance when subjected to a t-test at 90 percent level. Had the number of observations been larger a more satisfactory decision might have been reached.

Import Demand Equation

I	=	169703.592016 +	.001310 +	.206870 + 543.379306
$r^2 \, I \, x_i$			(.709337)	(.451463) (.411987)
S_{b_i}			(.000242)	(.065826) (187.3974)
t_{b_i}			(1.387603)	(.747752) (.689920)
B_i			(.002724)	(.000142) (543.379306)
R^2	=	.93		
$S_{i \, x}$	=	52120.442047		

Sea - Land Transit Trade

The following trend equation of sea - land transit trade demonstrates no determinable pattern of variation in the volume

$$T_{s-L} = 174,159.1978 + 2,198.2362t$$

$$S_{T_{s-L}\, t_s} \qquad (91,121.6588)$$

$$r^2 \qquad (\quad .0081)$$

$$t \qquad (\quad .1665)$$

of sea - land transit trade over time. The regression coefficient (2,198.2362) proved statistically insignificant when compared to the standard error of estimate (91,121.6588) in a t - test, though the volume of this component has demonstrated an appreciable increase during the last two years under study (1966 and 1967). The sharp increase in the volume of sea - land transit trade during 1967 could be attributed to the closure of the Suez Canal after June 5, 1967 and the derailing of an appreciable part of Saudi, Gulf countries, and Jordan sea - born imports to the Port of Beirut.

Sea - Free - Zone - Sea Transit Trade

The historical pattern of the movement of sea - free - zone - sea transit cargo through the Port of Beirut demonstrates variation around 32,000 tons except for 1961 which was marked by a severe drop to 19,000 tons.

The linear secular trend fitted to the data generated an insignificant regression coefficient that could not be assumed to be the annual increase in the volume of sea - free - zone - sea transit trade at any level of confidence.

$$T_{s-f-s} = 27,499,3182 + 765.8356\; t_f$$

$$S_{T_{s-f-s}\, t_f} \qquad (6563.0966)$$

$$r^2 \qquad (\quad .13)$$

$$t \qquad (\quad .1776)$$

The mean volume of sea - free - zone - sea transit cargo is as good an estimate of this component as the trend value since there seem to be no definite increase or decrease in the trend for the sea - free - zone - sea cargo movement. With the disruption in the Suez Canal route, all sea - sea cargo transhipment at the Port of Beirut were expected to dwindle in volume.

Transhipments

Cargo transhipped at the Port of Beirut has increased stea-dily during the first eleven years under observation, but fell sharply during 1967. As with sea - free - zone - sea transit cargo, transhipped cargo movement has suffered a substantial loss in volume in consequence to the ineffectuation of the Suez Canal in June 1967. The regression equation representing the trend of transhipped cargo over the years revealed that the

$$T_r \quad = \quad 10839.9090 + 1012.0909t_r$$

$$S_{T_r t_r} \qquad\qquad (5853.3714)$$

$$r^2 \qquad\qquad (\quad .26 \quad)$$

$$t \qquad\qquad (\quad .2359)$$

regression coefficient, which represents the slope of the trend line, is statistically insignificant and that projections attained with the use of the regression equation are unreliable at best.

Volume of Exports

The regression equation that offered the closest fit to the data on sea - born exports of Lebanon for the 12 years under study was the following linear function :

$$E \quad = \quad 120523 + 12288.2252t_e$$

$$S_{Et_e} \qquad\qquad (65047.1275)$$

$$r^2 \qquad\qquad (\quad .33 \quad)$$

$$t \qquad\qquad (\quad .3635)$$

The sharp decrease in the volume of exports in 1958 (Table 3), reasons already discussed, followed by annual mild losses until 1961, and the following instable pattern of recovery, offe-red no clear notion as to the direction nor magnitude of future volume of exports. The deviations of the observed data from the trend line were relatively large hence minimized the signi-ficance and meaning of the slope of the trend line. An interes-ting phenomenon was observed, while analyzing the data on

exports, namely that losses of exports incurred during short periods of time required much longer periods for recovery· This is probably due to obstacles and uncertainties facing producers in resuming previous levels of production as well as efforts and expenses required for reclaiming lost markets.

Land - Sea Transit Trade

Lebanon experienced a severe drop in the volume of land - sea transit cargo loaded at the Port of Beirut in 1958 (Table 3) parallel to the loss suffered by the sea - land transit trade during the same year.

This congruency in the pattern of loss of both types of transit trade characterized the initial period under study, but from 1958 onward the volume of land - sea and sea - land transit cargo movements developed in two different directions. While sea - land transit trade recovered its pre 1958 volume of inbound cargo, the loss in land - sea transit trade seems to be permanent and increasing at a very mild rate until 1967 when both transit cargo movements registered an abrupt increase in magnitude. This was due, as previously explained, to the diversion of Saudi, Gulf, and Jordan-bound cargo to the Port of Beirut after the blockage of Suez Canal.

Conclusion and Recommendations

The demand for inbound shipping space is a composite demand comprised of shipping space demanded by imports and space demanded by the various forms of inbound transit cargo. The study revealed that the hypothesized economic determinants of imports, except for net capital inflow, reflected no significant bearing on imports. Furthermore an intriguing phenomenon which was observed while reviewing the outcome of the analysis is that the highest normalized regression coefficients obtained, number of tourists and net capital inflow, are both highly sensitive to political crises; both flee politically tense areas and seek stable and safe spots. The demand for imports behave in a similar manner during political crises. This characteristic suggests a reasonable explanation of the relatively higher correlation between (1) imports and number of tourists and net

capital than between (2) imports and any of the other critical determinants. Those correlations are of the associative type and not the causative and thus are more indicative in nature than active in forecasting an event. A postulate of the above interpretation is that political turbulencies, which are predominant in regulating the flow of inbound transit cargo, play a fundamental role in determining the volume of imports. They overshadow economic determinants during crisis years. The significant decrease in the volume of imports in 1958 and in 1967 (Table 1) supports this hypothesis.

The second largest components of inbound cargo, sea - land transit cargo destined to neighboring countries, is extremely sensitive to intra - and inter - regional political crises. The volume of sea - land cargo dropped to 153,397 tons in 1958 from 364,468 tons in 1957 because of political turbulencies. Conversely in 1967 sea - land transit cargo jumped to 303,616 from 207,421 in 1966 (Table 1) because of the closure of the Suez Canal and the detailing of Saudi, Jordanian, and Kuwaiti imports to the Port of Beirut.

The other two components of inbound cargo viz., sea - free zone - sea and transhipped cargo which contribute less than 3 percent to total inbound cargo, were not affected by the 1958 crisis but reacted differently to the 1967 war with Israel. Transhipped cargo, i.e. cargo heading East and changing carrier at the Port of Beirut or vice versa, dropped severely (Table 1) in volume after the through way, the Suez Canal, was blocked.

The more pertinent aspect of sea - born cargo movement to local companies and shipping offices is outbound shipping which is generated by outbound cargo movement, namely exports, land - sea, sea - free - zone - sea and transhipments.

The volume of Lebanese exports is limited by two categories of constraints; the local production capacity and the foreign demand for Lebanese products. A time series analysis of exports was conducted to avoid a detailed analysis of the numerous variables forming each of the previously mentioned constraints. Internal political struggle in 1958 hampered local production

which was reflected in a sharp drop in the volume of exports. The 1967 June War had no significant effect on the volume of sea - born exports for two reasons : first, Lebanon's non - participation in the June War saved its industrial establishments from destruction and costly work disruption; second, Lebanon's reliance on land transport in exporting its agricultural and industrial products to Saudi Arabia, the Gulf States, and Jordan limited the effect of the obstruction of the Suez Canal on Lebanese exports.

Land - sea transit cargo, the second largest component of outbound cargo, surpassed the volume of exports in 1967. This substantiates the hypothesis that the fundamental determinants of transit cargo movement which are economic in nature, are overshadowed by political considerations. Land - sea transit trade lost about 30 percent of its volume in 1958 and maintained approximately the same level until 1966. In 1967 the volume of land - sea trade increased by 150 percent to surpass the volume of exports. This drastic increase was again a result of a political crisis.

It can, therefore, be concluded from the results of this analysis that the demand for shipping space at the Port of Beirut and the volume of transit cargo movement, though basically manifestations of economic phenomenon at work, are very susceptible to political problems and crises. Predictions in the sea freight industry have been and will continue to be unreliable as long as the future is obscured by political uncertainties.

In the wake of the above conclusion the following recommendations might be worthy of consideration :

a) The highly competitive and atomistic structure of the sea - freight industry, along with the high degree of political instability that haunt the region, renders investment in the shipping industry at the local level risky and potentially unprofitable. Consequently, serious thinking and planning is necessary to reshape the structure of the industry. This could be brought forth through mergers, and the formation of few large competitive firms that would render better services, operate on

a profitable basis, and endure unforeseen losses that may occur due to occasional suspension of a line or a transit route or other probable contingencies.

b)   Local shipping firms should develop flexibility in ope-rations and structure, and avoid limiting their routes and bu-siness to the Middle East. This might be easier said than done but it still is a wise policy guideline. Diversification is an insu-rance against political uncertainty.

c)   The public and private sectors should join efforts to retain business diverted from other Ports to Beirut after the closure of the Suez Canal.

d)   Unnecessary political alienations of neighboring coun-tries should be avoided. Restrictions imposed by an offended neighboring government that bar its businesses and citizens from using the Port of Beirut facilities form a detrimental threat to the Lebanese transit cargo industry and all the indus-tries that cater to it.