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IN INTERNATIONAL TRADE

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THE STRUCTURE OF TRANSPORTATION COSTS IN INTERNATIONAL TRADE

By

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ABSTRACT

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This study had three objectives. The first was to estimate the structure of ocean liner freight rates; that is, the relationship between commodity characteristics and rates charged for shipping them. A second aim was to compare the level of effective protection afforded U. S. manufacturing industries by the structure of international transportation costs and by tariffs. In the final section, effective protection estimates were used to gain insight into the relative factor proportions structure of international trade.

Three sets of effective protection calculations were presented in this study. First, rates of effective protection stemming from transport costs and post-Kennedy Round nominal tariffs were provided for fifty-four United States import competing industries. A second set of estimates compared the magnitude of the

barrier imposed by transport costs against U. S. export industries with that provided U. S. import competing industries in trade with the nine country European Community and with Japan. In making these comparisons, the different manner in which tariff and transport cost structures interact under alternative import valuation systems was examined. Lastly, nominal and effective protection rates were assessed for U. S. productive activities by stage of fabrication.

Results indicated that the overall degree of protection afforded U. S. industries by transport costs exceeded the level of protection afforded by post-Kennedy Round nominal tariffs. The ranking of industries by combined levels of effective protection was observed to differ from that suggested by a comparison of effective tariff rates alone. Whether measured in nominal or effective terms, protection from transport costs was not found to bear more heavily on U. S. export industries than on U. S. import competing industries. Transport costs did not display a tendency to escalate with stage of processing.

A significant positive relationship was established between the percentage of unskilled labor in U. S. manufacturing activities and both combined nominal and effective rates of protection from transport costs and tariffs. By erecting a substantial barrier against relatively unskilled labor intensive imports, both barriers can be held responsible for the Leontief Paradox.

To

Lola R. Dodge

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CHAPTER I

INTRODUCTION

Transport costs insulate domestic producers from foreign competition as do such artificial restrictions as tariffs and import quotas. Insofar as freight charges reflect the actual service cost of transporting commodities, the "natural" protection afforded to domestic industries from freight charges differs from artificial tariff protection in that the former is compatible with economic efficiency and does not entail economic waste. The usual practice of assuming "zero transport costs" in expositions of standard international trade models stems from a recognition that such charges are important; so that the exclusion of their effects from the analysis must be made explicit. Transportation costs are changing in importance relative to tariffs with each new round of multilateral tariff reductions, exchange rate realignments and petroleum price increases. Yet, there have been few studies of even nominal shipping charges; and previous attempts to compare effective rates of protection stemming from actual transport charges with that of tariffs employ transport cost information more than a decade old.

This study has three purposes. The first is to examine empirically the commodity structure of ocean liner freight rates, i.e., the relationship between commodity characteristics and rates charged for shipping them. A second goal is to compare the degree of effective protection afforded United States manufacturing activities by transport charges and by tariffs. Finally, these estimates are used to gain insight into the relative factor proportions structure of U. S. production and trade.

Data on transport charges are obtained from liner conference freight rate schedules maintained on file at the Federal Maritime Commission. Rates are normally quoted on a per unit basis. To estimate their influence as a barrier to trade, the charges must be transformed into ad valorem equivalents. Unit freight rates expressed as a percentage of import unit values are commonly referred to as "freight factors." The level of commodity freight factors and their stability over time will depend on the pricing policy of ocean liner conferences. A theoretical assessment of conference rate-making behavior is presented in Chapter II. Product unit value, the stowage factor (ratio of volume to weight), and competitive conditions on the trade route are established to be the major factors responsible for commodity differentiated rates. Chapter II assesses empirically the relative importance of each rate-making factor in explaining variations in freight charges among individual commodities. This analysis is extended to investigate whether inbound-outbound rate differentials exist on commodities moving in United States trade after product and route characteristics are taken into account.

The degree of protection afforded domestic productive activities from freight factor and from tariff structures is estimated by employing the effective protection model commonly used to analyze the restrictive effect of tariff structure alone. Balassa (5) has suggested the model's application to freight factor protection rate calculations, but did not provide empirical estimates. This effective protection concept recognizes that trade barrier structures affect production activities in two contrasting ways. First, nominal duties on the imported final products cause a divergence between domestic and foreign relative prices, which serve as a subsidy to import competing activities. Second, duties on imported inputs tax users of these materials by raising their cost. Rates of effective protection are arrived at by determining the net subsidy to or tax on domestic value added in the various productive processes. The effective rate of freight factor protection is defined as the percentage difference between industy value added per unit of output under freight factor protection and what value added would have been in the absence of such charges. Chapter IV presents the analytical framework required to estimate effective freight factor and tariff protection rates. A discussion of data sources and methodology follows in Chapter V.

Three sets of effective protection calculations are presented in Chapter VI. First, comprehensive industry level estimates of effective protection rates will highlight the manner in which freight factor and tariff structures interact to determine the combined level of protection afforded each U. S. import competing industry. Tariffs, unlike freight factors, are determined by commercial policy. Each trade barrier is expected to display a unique protection pattern among industries. The direction of resource flows between industries induced by the combined effective tariff and freight factor rates of protection is expected to be different from that suggested by a comparison of effective tariff rates alone. A second set of calculations compares effective freight factor protection rates enjoyed by U. S. import competing industries with that confronted by U. S. export industries in trade with the nine country European Community (EC) and with Japan. Freight factors place U. S. exporters at a competitive disadvantage in West European markets, as intracontinental trade is not so protected. A final set of effective protection calculations is presented for U. S. processing activities by stage of fabrication. Tariff structures of most industrial nations follow a common pattern. Raw materials enter virtually duty free. Higher tariff rates are charged on intermediate products, still higher rates on semimanufactures, with even higher tariffs on final product imports. This structure gives rise to effective tariff rates on final manufactures which are much higher than nominal rates suggest. The extent to which freight factor inclusion preserves or offsets the pattern of tariff escalation is explored in this section.

Chapter VII employs effective protection calculations to investigate the impact of freight factors and tariffs on the relative factor proportions structure of U. S. production and trade. Although the U. S. is among the most capital abundant countries in the world, Leontief (37) has discovered that a representative bundle of U. S. exports embodied more labor relative to capital than did one of U. S. imports. This conclusion contradicts the familiar Heckscher-Ohlin proposition that countries will specialize in the production of commodities intensive in their relatively abundant factor. Travis (50) has argued that U. S. nominal tariffs, by restricting relatively labor intensive imports, is responsible for the Leontief "scarce-factor" paradox. Investigations by Basevi (9) and Cheh (16) have not confirmed the existence of a positive relationship between combined effective tariff and non-tariff protection rates, and direct labor use in U. S. import competing industries. The present study tests the nature of the relationship between the theoretically preferred total labor requirements for industry output and combined rates of protection from tariffs and freight factors to determine the impact of these restrictions on the factor proportions structure of U. S. trade.

The following chapters examine the determinants of freight factor levels, estimate the magnitude of the barrier imposed by freight factor structure in international trade, and investigate whether this restriction protects labor in U. S. manufacturing activities. All data pertain to the year 1974. Freight charges will have had the opportunity to adjust in response to recent advances in maritime technology, changing competitive conditions, currency realignments, and to major petroleum price increases that occurred in late 1973 and early 1974. More recent data than were previously available are also used to estimate industry input requirements as they would exist in the absence of tariffs and freight charges. Production coefficients are obtained from a 1970 input-output table compiled by the Bureau of Economic Analysis, U. S. Department of Commerce. A discussion of the study's major findings is presented in Chapter VIII.

CHAPTER II

THE INTERNATIONAL SHIPPING INDUSTRY

2.1 Introduction

Ocean transportation charges play a significant role in the activities of international trade by helping to determine which goods enter trade, the volume of freight moving in trade, and which countries will be exporters and which will be importers of a particular commodity. The demand for ocean carriage is a secondary, or derived demand, based not so much on the actual price of ship space, but rather on that price in relation to other factors which are considered when contemplating a foreign trade sale. Additional factors include the f.o.b. (free on board) plant price, the c.i.f. (cost, insurance, freight) price available in the foreign market, delivery schedules, competition from other carriers and from other trading nations. If these conditions do not threaten the product's competitive position, and the price of ship carriage is right, the goods will move.

Broadly speaking, two distinct categories of ocean transport services are open to the general public, each with a distinct rate structure. In one case, liners offer regularly scheduled service, operate along a specific trade route, and publish their rates. In the other case, tramp shippers provide spot services under charter terms. No fixed rate schedules are involved. Rates for specific shipments are negotiated between the shipper and shipping company. Although liner and tramp rates generally fluctuate in the same direction, liner rates are considerably more stable and less subject to frequent alterations in response to changing demand and supply conditions. If regularly scheduled services are not required, a tramp will usually carry cargo for less.

This study is concerned with ocean freight rates charged by liner shipping conferences. Rates are published for United States trades, held open for public inspection, and are applied under the supervision of the Federal Maritime Commission. A regular schedule of sailings between specified ports is considered to be more important from a marketing standpoint than is the quantity of cargo for a specific sailing. Service dependability combined with a stable rate structure are the major factors distinguishing liner operations from those of independent tramps.

The liner conference system is one of the oldest institutions of the international ocean transportation industry. Conferences persist as the key means for controlling rates and services in ocean shipping. Approximately 380 conferences are currently in operation worldwide. One third of these control commodity movements over major trade routes, while 40 percent operate on routes of lesser importance, with the remaining associations serving local trades.[1] The majority of cargo carriers and shippers whom they serve continue to prefer the conference system over alternative modes of operation. In this chapter, conference operating methods are reviewed, with special emphasis placed on their rate-setting procedure.

2.2 Shipping Conferences

A conference is an association on liner companies, operating along a distinct trade route on the basis of a fixed schedule with a written agreement requiring that all members charge identical freight rates. Conferences coordinate sailing schedules of their members, assign ports of call, berthing, handle complaints, monitor business practices in the trade and impose penalties upon errant members. The associations undertake to fix traffic shares but usually refrain from apportioning revenues, profits, or specific cargoes and customers along member lines.[2] A conference is involved with cargo movement in

[1] A summary of conference operations is presented in Lawrence (36).

[2] See Lawrence (36, p. 17).

only one direction along a route. Liner companies operating in one direction may or may not return along the same route. Thus liner companies frequently hold membership in several associations. Although conferences have members in common, the cargo, facilities, and methods involved in trade in one direction along a route may differ substantially from the other direction. Each conference develops its own highly complex rate structure involving literally thousands of commodity classifications.

The conference system evolved in reaction to "cut-throat" competition prevailing among shipping lines during the 19th century. In liner shipping, direct out-of-pocket costs associated with carrying an additional cargo ton are but a small fraction of the average costs which must be covered in order to make the service viable over the long run. Groups of shipowners interested in cargo flows along specific routes soon discovered an incentive to cooperate in administering a uniform pricing system to check the competitive urge to secure any revenue yielding a margin over out-of-pocket costs before fully allocated costs of the sailing schedule are recovered. Since identical rates are charged by all member lines, the conference forms a type of international cartel. Members argue that the purpose of a conference is to stabilize the conditions of trade by offering to shippers a dependable schedule of sailings at a uniform rate. Conferences have drawn criticism for maintaining excess capacity, charging rates designed to meet the needs of their highest cost members and for fostering price disparities out of line with cost of service criteria. Yet, liner conferences remain international bodies, and maritime nations exercise little control over conference policy.

2.3 Government Review of Shipping Conferences

The international character of liner associations insulates them from overt national control. Conference activities are usually not tied to national manufacturing sectors. In the United States, conferences are specifically authorized by the Shipping Act of 1916. The act exempts them from antitrust legislation. It permits the formation of shipping conferences for the purpose of establishing and enforcing rules and rates, requiring only that they be published. The Act also creates what is now the Federal Maritime Commission (FMC) with powers to disapprove rates found to be detrimental to U. S. commerce.[3]

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[3]A history of United States shipping legislation may be found in Hazard (26, pp. 318-24).

Maritime nations typically refrain from regulating activities of liner conferences. The FMC is the most active of any governmental agency in its efforts to review and influence conference policies. Japan and the West European nations regard actions of the FMC to secure revenue and cost information from all national flags as an intrusion of foreign authority over their trade. Recently, competitive pressures from Soviet lines have begun to disrupt conference operations in some areas of the world. The European Community (EC) is moving toward rate regulation, schedule registration and the establishment of quotas on sailings to and from EC ports.[4]

Over the years, national organizations have not reached an agreement as to the proper relationship between governments and conferences. Shipping associations continue to be free from direct government control. As a result, the rate setting practices of liner conferences have remained virtually unaltered for almost a century. The following section develops a theoretical foundation for the structure of liner freight rates; that is, the factors which account for commodity rate differences.

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[4]"Shipping: EC Nations Fight Communist Tactics," Business Week 12 December 1977, p. 69.

2.4 Conference Rate Making--Theoretical Analysis

Liner conferences are characterized by complex multiple pricing systems. The reason for this is the voyage cost structure. Once a shipping schedule is set, most costs become fixed; and fixed costs are common to all commodities carried. There is no satisfactory way to allocate fixed costs between units of heterogeneous commodities. Shipping services also entail joint costs, as the supply of outbound carriage leads to the supply of inbound carriage as well. Over the years, conferences have attempted to allocate costs by assigning individual commodities a rate in accordance with well established service cost and demand criteria. Most theoretical explanations of the rate-making process are based on the premise that a conference rate schedule reflects cost and value of service factors and that it is consistent with competitive conditions prevailing on each shipping route.

One factor accounting for variations in freight rates on individual commodities is the stowage factor, or the number of cubic feet of ship space occupied by one long ton of each item. The commodity stowage factor, as a supply determinant, influences the cost of producing transport service. Cargo density is important to ship operators because the capacity of a ship was two constraints--the deadweight capacity and volume capacity. Most liner cargo is of low density so the stowage factor is used as an index of the amount of cargo which must share the common cost of vessel operation.[5] The opportunity cost of accepting a commodity which stores at 80 cubic feet per ton will be twice that of one occupying 40 cubic feet. Alternatively stated, the elasticity of voyage costs with respect to the stowage factor is unity.

A frequently employed rule is that one long ton of cargo equals 40 cubic feet of ship capacity. This is known as a stowage factor of 1 in liner trades. The rate making scheme presumes that commodities with a stowage factor less than 1 do not incur volume costs. These commodities are assigned a rate according to shipment weight, regardless of the space they occupy. Commodities which store at more than 40 cubic feet per long ton are rated according to density as dictated by their stowage factor. Whether rated on a weight ton basis or on a measurement ton basis (40 cubic feet per long ton), the charges assigned to individual commodities are intended to reflect differences in actual cargo density. It is, therefore, reasonable to expect rates charged on individual commodities will be an increasing function of their stowage factor.

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[5]The relative importance of low density cargo is discussed in Heaver (28, p. 17).

Unit value is a second factor held responsible for commodity differentiated rates. It enters the rate determination process on the demand side. In a perfectly competitive market, fully allocable liner costs would entirely account for the structure of freight rates. However, liner conferences are cartels. Members behave as discriminating monopolists. Rates are expected to deviate from costs according to what "the traffic will bear." It is common practice to use commodity unit value as an index of the relative rate elasticity of demand for shipping service. The reasoning is as follows. If one commodity is more expensive relative to another, a given increase in the transport charge will add less in percentage terms to its price than to that of the expensive product. If both commodities face the same import demand elasticity, both sales and the purchase of shipping service will decline less for the high value commodity. A lower elasticity of derived demand for shipping service will be associated with the relatively expensive product and it will in turn bear a higher freight charge. This practice represents the least cost method for obtaining estimates on shipping demand elasticities. One would expect rates charged on individual commodities to be an increasing function of their unit values.

A number of additional factors commonly held to be liner rate determinants are conveniently lumped into the category of competitive pressures from alternative means of transport. When individual commodities move in large quantities and a fixed delivery schedule is not required, competition from independent tramps and tankers is expected to influence the demand for liner service. Competition on the route may limit the extent to which conference rates can deviate from costs according to what the traffic will bear. It is reasonable to expect that conferences grant lower rates for commodities which move in large quantities. When large physical quantities are involved, it may be possible to use tramp shipping. Large annual cargo movements also imply security of revenue for the conference which is likely to be reflected in a low conference rate. Liner conferences are alleged to maintain low rates on commodities which are prone to tramp/charter competition to prevent these outsiders from obtaining a foothold and subsequently gaining entry into the more profitable part of liner business. However, the importance of deterrent pricing as an explanation of conference rate making behavior has been questioned by Jansson (29). It is unlikely that conference members would persist in carrying low rated commodities simply to deter potential competition when liner company's profits are modest anyway.

2.5 Conclusions

Liner conferences hold a position of prominence in the international shipping industry. This fact is important from a research standpoint for a number of reasons. First, liner conference rate schedules applicable to United States trades are maintained on file at the Federal Maritime Commission. They are held open for public inspection and comprise the most extensive sets of transport charge data currently available.[6] Rates are arranged according to the S.I.T.C. (Standard International Trade) or the B.T.N. (Brussels Tariff Nomenclature) classifications at various levels of aggregation. A direct comparison can be drawn between rates and commodity trade data. Second, liner rates are considerably more stable than are tramp rates. Commodity rates are based in part on product unit value. The liner freight rate and U. S. import value indices move in the same direction. As a result, the ratio of transport charge to unit value for most commodities remain relatively constant over time. Finally, each conference operates along a specific trade route and data are available on commodity movement by

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[6]A survey of international trade and transportation literature indicates that the availability of such data is not widely known. Most studies employ c.i.f./f.o.b. ratios from actual trade statistics to approximate transport charges for individual items. A discussion of measurement errors encountered in c.i.f./f.o.b. calculations may be found in Bhagwati (12).

trade route. Chapter III offers an empirical assessment of conference rate-making behavior.

CHAPTER III

EMPIRICAL VERIFICATION OF THE CONFERENCE RATE-MAKING PROCESS

3.1 Introduction

This chapter examines empirically the commodity structure of ocean liner freight rates; the relationship between commodity characteristics and the rates charged for shipping them. Several previous empirical studies have attempted to show that liner rates can be systematically explained by cost and demand factors. All but one study found the most important single factor accounting for variations in freight rates on individual commodities to be the stowage factor, a measure of costs. The role of unit value as a demand factor in the rate determination process was discovered to be of secondary importance.[1] This study represents the first attempt to assess the impact on liner rates of tramp and tanker competition along specific trade routes. In addition,

[1] See, for example, United Nations Conference on Trade and Development (54), Heaver (27, 28), Carman (15), Bryan (14), and Shneerson (47). Lipsey and Weiss (40) identified unit value as the most important rate determinant. However, stowage effects were probably aggregated away in the 3-digit S.I.T.C. investigation.

the stowage factor-rate relationship is examined separately for high density and low density cargo.

3.2 The Freight Rate Estimating Equation

The basic estimating equation is as follows:

$$FR = aV^{b}ST^{c}[(ST-40) \times DST]^{d}LT^{e}DTRA^{f}DTA^{g} \qquad (3\text{-}1)$$

where: FR is the freight rate per long ton ($ per 2240 pounts)

V is value per long ton

ST is the stowage factor (cubic feet per long ton)

DST is a density dummy variable permitting slopes to vary above and below 40 cubic feet per long ton

LT is the number of long tons of each product carried annually by conference members

DTRA is a dummy variable for cargo shipped on tramps

DTA is a dummy variable indicating tanker cargo movements.

The log-linear functional form was chosen to reflect the asympotic nature of freight rates with respect to unit values.[2]

Unit value represents an index of the relative rate elasticity of demand for transport service. Relatively expensive commodities are better able to bear

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[2] A linear form was also tested. Results of the log form were superior.

high transport charges as the rate will add less in percentage terms to its price than to the price of inexpensive products. Conferences are discriminating monopolists and higher rates can be expected on high value products than on low value products. If liner conference rates are based primarily on "what the traffic will bear," unit value will be the most important rate setting factor.

Cargo density, as reflected in the stowage factor, constitutes the major cost based rate determinant. Most liner cargo is of low density so the stowage factor represents an index of the amount of cargo which must share the common costs of vessel operation. It is reasonable to expect that commodities with large stowage factors will incur relatively higher rates.

In liner trades the concensus appears to be that commodities with stowage factors less than 40 cubic feet per long ton do not incur volume costs. Rates are assessed on a weight basis irrespective of the volume of cargo space they occupy. Low density commodities (occupying more than 40 cubic feet per long ton) pay according to their stowage factors. High density commodities and low density commodities are therefore expected to exhibit different stowage factor/rate relationships. This hypothesis is tested by employing dummy variable DST which permits the equation's slope to vary above and below the crucial stowage factor value. If the coefficient on DST is found to be statistically significant, the estimating equation without DST will be tested on high and low density cargo data separately.

The remaining explanatory variables are intended to capture the influence on liner rate levels of competition from other modes of transport. Conferences are believed to charge lower rates on commodities which move in large quantities to discourage competition from tramps. It is also reasonable to expect lower rates on all commodity movements capable of being shipped by tramp or tanker.

Each conference operates along a distinct trade route in only one direction. Conference membership, cargo capacity, methods of operation, and competitive conditions may vary substantially in opposite directions along the same route. Data are not available to expand the model to encompass every variable which might have an influence on freight rates. It is, therefore, necessary to test the basic estimating equation on data pertaining to each separate route direction.

3.3 Data and Methodology

The equation was fitted by ordinary least squares to data pertaining to inbound and outbound legs of two "essential" United States foreign trade routes. Essential foreign trade routes are those determined by the Maritime Administration to be essential for the promotion, development, expansion and maintenance of U. S. foreign commerce. Actual route patterns were identified with the aid of a recent Maritime Administration publication (66). The report contains data on the relative importance of each route in U. S. commerce. Trade route No. 5-7-8-9 covers 38 percent of liner exports and over 50 percent of liner imports in the North Atlantic/Western Europe trade. Over half the liner exports and 45 percent of the liner imports involved in the U. S. Pacific/Far East trade are accounted for by trade route No. 29. Conferences operating along each route leg were identified with the help of Federal Maritime Commission officials and from information contained in (43). Contract rates on traded commodities were obtained from liner conference rate schedules maintained on file at the Federal Maritime Commission.[3] Unit values were computed from United States trade statistics, and like rate data, were converted to a long ton basis. All values are expressed in U. S. dollars and pertain to the year 1974. Stowage factor tables for U. S. exports and

[3]Contract rates apply to shippers who agree to send cargo exclusively within the conference for a particular length of time. They are generally 10 to 15 percent lower than noncontract rates. No allowance can be made for rebates (which are illegal in the United States) or for other deviations from the published rate schedule.

imports are contained in Leeming (37).[4] Tonnage data on commodities carried by liners, tramps, and tankers over specified trade routes were obtained from Maritime Administration Report Number CMA 012P02, Commodity Shipments by Trade Route and Type of Service, 1974. Data are compiled under the 4-digit Schedule A code for U. S. imports and under Schedule B for U. S. exports.

3.4 Regression Results

Regression results are summarized in Table 3.1. Coefficients on the stowage factor and unit value variables are statistically significant at the 5 percent level for the majority of cases. Conference members are found to behave as discriminating monopolists in charging "what the traffic will bear," but the most important factor in explaining variations in freight rates on individual commodities is the stowage factor, a measure of service cost. The high levels of explanation of rates achieved by multiple regression analysis constitute one of the most striking results of this investigation. Data are

[4] Tables contain stowage factors as computed from actual weights and measurements of commodities packed for shipment. No allowance is made for broken stowage. Stowage factors for U. S. exports and imports are recorded separately in Leeming (37), as variations exist between packing methods at U. S. and foreign ports. Additional stowage factor tables are contained in Ford (21), Thomas (49), and Garoche (22). Weight/volume conversion tables are contained in Martin (42).

TABLE 3.1.--Freight Rate Estimating Equation: Regression Results

Route	Number of Observations	Constant	V	ST	[(ST-40) x DST]	LT	DTRA	DTA	R^2	Partial R^2 for ST	F
5-7-8-9											
Inbound	80	2.067	.114*	445**	.022	-.023	.046	.088	.46	.35	10.35
			(2.73)	(1.87)	(.20)	(-.78)	(.38)	(.72)			
Inbound ST < 40	11	3.804	.070	.088	--	-.019	-.050	-.146	.22	.03	.29
			(.67)	(.37)	--	(-.29)	(-.19)	(-.66)			
Inbound ST > 40	69	1.367	.091**	.679*	--	-.019	.019	.110	.45	.31	10.24
			(1.96)	(5.35)	--	(-.59)	(.14)	(.81)			
Outbound	86	2.992	.077**	.292*	.099	-.021	-.060	.047	.60	.45	19.60
			(1.83)	(2.15)	(1.64)	(-1.21)	(-.58)	(.43)			
Outbound ST < 40	19	3.327	.124*	-.052	--	.006	-.125	.380*	.56	.01	3.32
			(2.32)	(-.41)	--	(.08)	(-.99)	(2.40)			
Outbound ST > 40	67	1.748	.055	.694*	--	.034	-.073	.032	.53	.37	10.32
			(1.10)	(6.00)	--	(1.33)	(-.61)	(.24)			
29											
Inbound	82	1.721	.255*	.217*	.148*	-.018	.196**	.055	.82	.62	56.03
			(5.78)	(2.19)	(3.00)	(-.97)	(1.89)	(.50)			
Inbound ST < 40	20	2.646	.177*	-.017	--	.024	.109	.297	.56	.03	3.52
			(3.11)	(-.64)	(.59)	(.54)	(.99)				
Inbound ST > 40	60	-.211	.149*	.900*	--	-.021	.061	-.041	.87	.72	76.09
			(3.75)	(12.48)	--	(-.127)	(.64)	(-.46)			
Outbound	79	2.532	.149*	.279*	.122*	-.012	.109	.034	.68	.52	25.62
			(3.50)	(2.03)	(2.06)	(-.57)	(1.19)	(.33)			
Outbound ST < 40	17	3.618	.075	.231*	--	-.026	-.088	-.139	.53	.20	2.50
			(1.42)	(2.03)	--	(-.98)	(-.61)	(-.88)			
Outbound ST > 40	62	-.617	.152*	1.048*	--	-.001	.164*	.165**	.81	.70	48.15
			(3.72)	(11.58)	--	(-.04)	(2.01)	(1.78)			

Figures in parenthesis represent t-statistics.
*Significant at the 5 percent level.
**Significant at the 10 percent level.

not available include a wide variety of the variables commonly held to be rate determinants.[5]

An index of the relative contribution of product bulk in explaining freight rate dispersion along each route leg is obtained by calculating a partial R^2 for the stowage factor variable(s) in each equation. Results are displayed in the table. As expected, low density products exhibit a widely different stowage factor/rate relationship than do high density products. The stowage factor is found to exert a strong influence in the rate determination process for bulky items, but enters significantly in only one instance when high density products are considered. Rates assigned by conferences to individual commodities are intended to reflect differences in actual cargo density, regardless of whether items are rated on a weight ton or a measurement ton basis. The opportunity cost of accepting a commodity which stows at 20 cubic feet per long ton should still be twice that of one stowing at 10 cubic feet per long ton. Since the stowage factor variable does not figure significantly in the rate determination process for high density products in most of the cases under study, it appears that commodities

[5]Bryan (14) lists 27 factors believed to enter the rate setting process. These include susceptibility to pilferage, fragility, heavy lifts, extra lengths, insurance, and lighterage (requirement that items be unloaded offshore via barge).

occupying less than 40 cubic feet per long ton are assessed rates which do not reflect their opportunity cost. A limited number of commodities actually fall into this category. Items of major importance include iron, steel and nonferrous metal primary shapes and manufactures.

The magnitude of the coefficients on the stowage variable for low density products displays only minor variations on inbound and outbound legs of the same route, but is observed to differ substantially across routes. Shipping economists interpret this result to indicate the presence of similar degrees of excess capacity along each leg of the same route. Relatively more excess capacity is expected along the route displaying lower values for the stowage factor coefficient. The importance of the stowage factor variable in explaining rate dispersions is also expected to increase as ship capacity limits are approached.[6]

Results suggest that competition from tramps and tankers does not influence the level of liner rates. Marx (43) and Heaver (28) were the first to suggest that tramps afford liners with only limited competition. Conferences do not appear to grant lower rates for commodities which move in large quantities to discourage their

[6]See, for example, Heaver (28).

shipment by tramps.[7] Coefficients on dummy variables representing cargo carried by tramps and tankers are statistically significant in only three cases, and even then are positive. If this result is taken at face value, it suggests cargo movements common to all three service types incur higher rates when shipped by liners. Service dependability and a stable rate structure are likely to be responsible for these items being carried on liners when less expensive services are available.

3.5 Discriminatory Ocean Freight Rates: Empirical Investigation

In hearings before Congressional committees during the early sixties, the Joint Economic Committee advanced the theory that liner conferences on certain routes were unjustly discriminating against United States exporters.[8] These conferences were alleged to do so by charging on the average in all U. S. trades, as well as on identical cargo movements in both directions, higher rates on

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[7]Statistical results do not differ when total value or total volume are used as an index for liner cargo movements.

[8]U. S. Congress, Joint Economic Committee. Discriminatory Ocean Freight Rates and the Balance of Payments, 88th Congress, 1st and 2nd sess., parts 1 through 5, June 20 and 21, 1963, October 9 and 10, 1963, November 19 and 20, 1963, and March 25 and 26, 1964; and 89th Congress, 1st sess., parts 1, 2, and 3, April 7 and 8, 1965, May 7, 1965, June 20, 1965.

outbound than on inbound shipments.[9] Ocean freight rate disparities were held to pose a significant barrier against U. S. export trade. An additional penalty was assessed against U. S. exporters as most foreign tariffs and consumption taxes are applied on a c.i.f. basis.

Several investigations were undertaken by various research organizations to test allegations that exorbitant rates on U. S. exports were subsidizing exports to this country. United States Government studies determined that on trades between the U. S. Pacific and the Far East, between U. S. Atlantic and Gulf ports and the Far East, as well as on cargo movements in the Atlantic coast/ Western Europe trade, freight rates on American exports exceeded rates on corresponding imports for the majority of items sampled. Conferences acknowledged these disparities, but argued that the prevailing rate structures were consistent with commodity and route characteristics in these trades.

Definite conclusions about discrimination could not be reached in the absence of a consistent theory on liner shipping operations. The only clear-cut case of unjust freight rate discrimination occurs when one exporter of a product is charged a higher rate than

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[9] A summary of the issues involved may be found in E. Bennathan and A. A. Walters (11).

another exporter of the same good on the same route leg. Problems arose in attempts to determine whether or not a general disparity of rates existed inbound and outbound along the same route. Cargo characteristics, volume, ship capacity, facilities, operating methods, conference membership, and competitive conditions involved in trade in one direction may differ widely from the other. In light of this, it is not surprising that the Federal Maritime Commission settled for the less ambitious task of comparing rates on individual commodities which move in both directions on a route. The end result of many years of investigation was to identify seven outbound rates on commodities of minor importance as being so unreasonably high as to be detrimental to U. S. commerce. Yet, United States producers and exporters continue to voice complaints that discriminatory rates are weakening their competitive position abroad, while enhancing the competitive strength of foreign suppliers in the home market. Sixty-one such complaints are documented in a recent U. S. Tariff Commission survey of non-tariff barriers (68).

Table 3.2 identifies rates on identical commodities moving inbound and outbound along Trade Route No. 29 (Far East/U. S. Pacific Ports), and Route No. 5-7-8-9 (U. S. North Atlantic/Western Europe). Route patterns

TABLE 3.2.--Freight Rates on Selected Inbound and Outbound United States Foreign Trade Routes

Schedule A or B Code	Commodity	Route No. 29 Far East/U. S. Pacific Coast							
		Inbound				Outbound			
		Rate	Unit Value	Ad Valorem Rate	Liner Tonnage	Rate	Unit Value	Ad Valorem Rate	Liner Tonnage
0484	Bakery products	357	1431	25	1584	300	1158	26	360
0555	Vegetables, dried	90	642	14	28739	90	597	15	5030
0741	Tea	109	1069	10	2995	121	2370	5	114
1123	Ale, beer	75	249	30	491	116	207	56	5935
2311	Rubber, crude	117	512	23	5820	92	787	12	732
2312	Rubber, synthetic	112	632	18	14571	111	773	14	4556
2763	Sodium Chloride	85	175	48	13	116	170	68	241
3325	Lubricating oil	74	160	46	26	113	264	43	26040
5333	Paint	122	2222	5	188	127	1435	9	8579
5419	Bandages	201	8152	2	10	191	6246	3	538
6312	Plywood	61	653	9	46200	88	484	18	184
6415	Paperboard	135	777	17	774	133	616	21	19501
6422	Stationary	266	1933	14	42	370	1937	19	61
6512	Yarn, wool	266	5224	5	17	447	8051	5	74
6556	Twine, cordage	214	11614	18	3619	265	3331	8	19
6645	Glass, cast, unworked	43	286	15	1817	104	353	29	22
6731	Iron or steel wire rods	53	274	19	892	81	330	24	1950
6734	Iron or steel angles	60	318	19	14663	76	397	19	106
6744	Iron or steel sheets	53	293	18	23468	70	317	22	2190
6747	Tinplate	36	351	10	3868	77	310	25	1861
6748	Iron or steel plate	73	349	21	18921	98	281	35	1309
6781	Cast iron pipe, tube	48	695	7	1	98	848	11	1515
6822	Copper and Alloys, wr.	75	2416	3	3377	119	3034	4	2858
6922	Metal containers	363	990	37	564	372	1374	27	953
6942	Bolts, nuts, iron or steel	45	976	5	82153	75	2131	4	212
7115	Engines, internal combustion	111	3195	3	14890	193	4233	5	8772
7173	Sewing machines	281	5021	6	11706	128	5088	3	134
7197	Bearings, ball or roller	79	5114	1	12453	75	4956	2	15723
7291	Batteries	117	2498	5	7046	145	2953	5	560
7299	Electrical machinery	406	2207	18	14831	429	2091	20	1214
7321	Motor vehicles	289	2141	13	59288	232	2484	9	26755
8921	Books	156	1622	10	9693	181	2254	8	953

TABLE 3.2.--Continued

Schedule A or B Code	Commodity	Route No. 5-7-8-9 U. S. Atlantic/Western Europe							
		Inbound				Outbound			
		Rate	Unit Value	Ad Valorem Rate	Liner Tonnage	Rate	Unit Value	Ad Valorem Rate	Liner Tonnage
0221	Milk, condensed	89	812	11	1915	96	828	11	941
0613	Sugar	72	536	13	2410	72	577	13	10
0616	Honey	106	1206	9	558	90	1129	8	652
2312	Rubber, synthetic	116	674	17	8911	90	724	12	2901
2621	Wool, greasy	72	1596	4	319	135	2131	6	7
2925	Seeds	145	2099	7	619	113	1999	6	1370
5133	Inorganic Acids	82	394	21	1761	61	234	26	6989
5135	Metal oxide	64	658	10	27912	95	780	12	6403
5142	Sulphates	82	256	32	57857	81	266	30	44
6312	Plywood	86	663	13	732	90	419	21	399
6412	Printing, writing paper	62	1664	4	1153	80	1581	5	20651
6415	Paperboard	64	777	8	2719	86	687	12	25213
6821	Copper and alloys, unwr.	67	1275	5	25455	70	1613	4	31114
6822	Copper and alloys, wr.	64	2335	3	26955	71	3190	2	7733
7114	Engines, aircraft	321	3954	8	15558	341	4356	8	643
7115	Engines, internal combustion	104	3101	3	66641	107	3986	3	26597
7141	Typewriters	134	11041	1	7894	233	12088	2	1252
7142	Calculating machines	100	11394	1	1002	185	13450	1	291
7152	Metalworking machinery	93	2758	3	3016	110	2614	4	2756
7171	Textile machines	127	5047	2	26900	189	4548	4	8031
7173	Sewing machines	288	5037	6	3343	470	7114	7	490
7181	Pulp, paper machinery	130	5335	2	5273	150	5556	3	3133
7242	Radio receivers	284	12161	2	631	245	11968	2	156
7293	Electron tubes	95	22014	0.4	94	93	28436	0.3	12150
7321	Motor vehicles	253	2621	10	85190	297	2658	11	24169

NOTE: Rates and unit values are measures in U. S. dollars per long ton (2240 lbs.).
Liner tonnage is measured in long tons.
All data pertain to the year 1974.

are displayed in Figures 3.1 and 3.2. Commodity unit values, the ad valorem rate and liner tonnage are presented in Table 3.2. A comparison of the data pertaining to Route No. 29 confirms the existence of a general outbound rate disparity which cannot be explained in terms of differences in commodity unit values or liner tonnage. Higher rates are observed for outbound commodity movements in twenty-two of the thirty-two cases. Larger outbound commodity movements are associated with one third of these commodities. The rate differences are large, ranging from 2 percent to well over 100 percent. The largest outbound rate disparities are observed for cast glass, tinplate, cast iron pipe, wool yarn, bolts and nuts, engines, copper products, beer, iron and steel wire rods, lubricating oil, plywood and stationary. Ad valorem rates are higher for outbound commodity movements in nineteen of the thirty-two cases. These differences range between 1 percent and 26 percent, and are largest for beer, sodium chloride, tinplate, cast glass and iron and steel plate.

The outbound rate disparity in the U. S. Atlantic/ Western Europe Trade (Route No. 5-7-8-9) is not so severe. Higher rates are associated with outbound commodity flows in seventeen of the twenty-five cases. The rate differences range from 1 to 85 percent, being largest for wool, calculating machines, typewriters, sewing machines, and

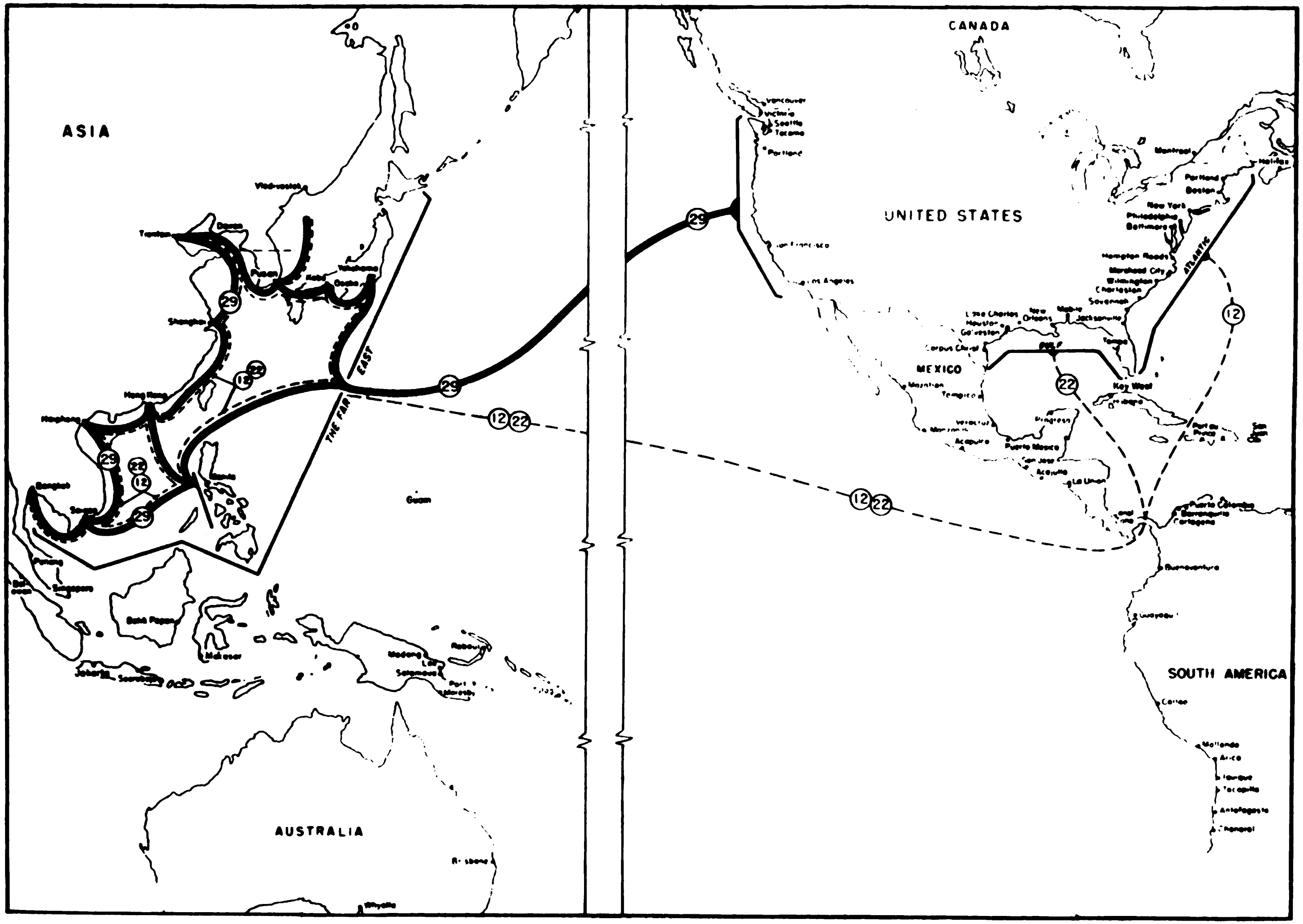

Figure 3.1.--Trade Route No. 29, Far East/U. S. Pacific Ports.

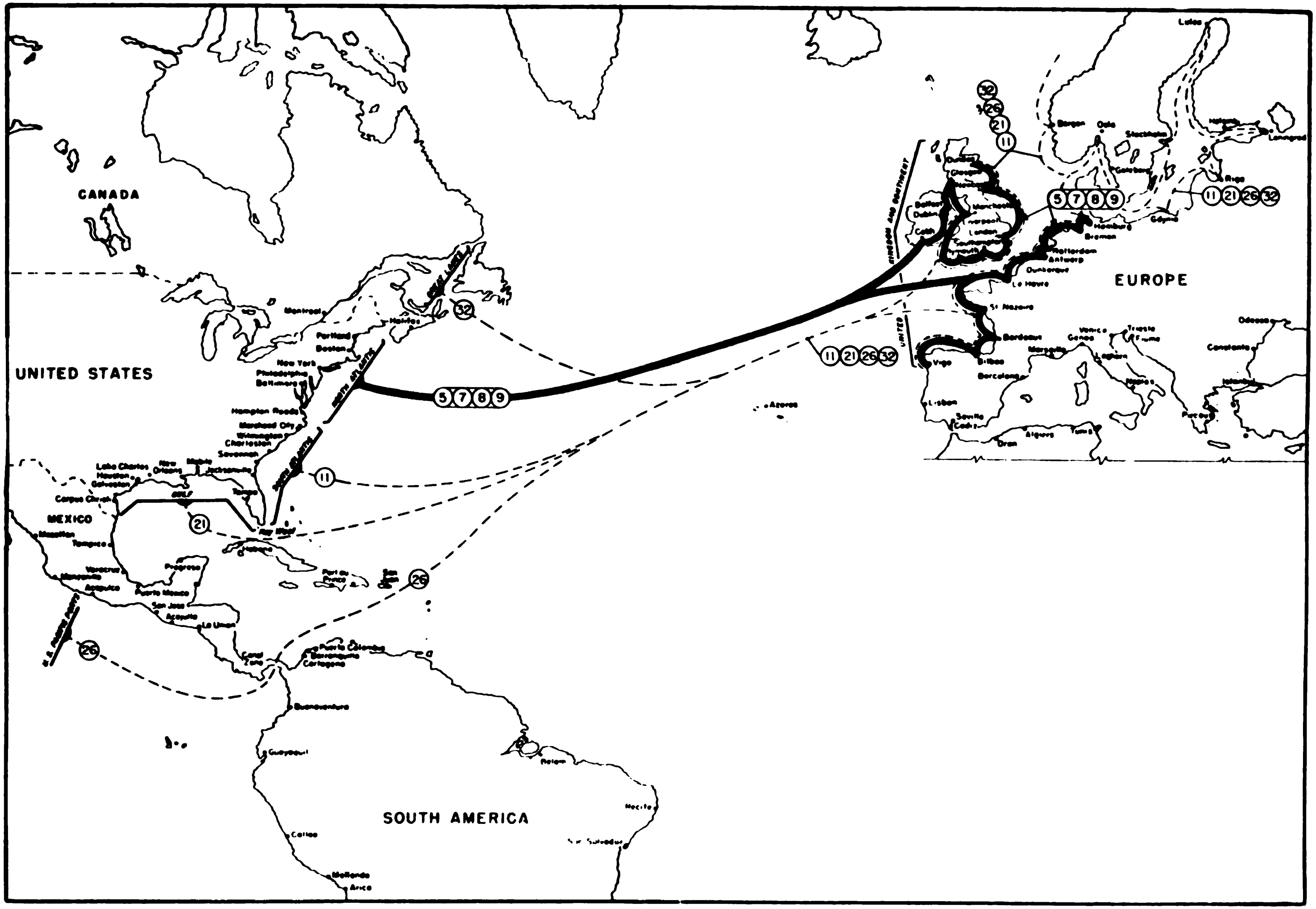

Figure 3.2.--Trade Route No. 5-7-8-9 U. S. North Atlantic/Western Europe.

inorganic acids. Outbound rates are substantially lower for seven commodities. Ad valorem rates are higher outbound for twelve of the twenty-five commodities. The ad valorem rate disparity is highest for plywood (8 percent), inorganic acids (5 percent), and paperboard (4 percent), but represents only a 1 or 2 percent difference for the remaining commodities. Higher average U. S. export unit values appear to be responsible for the rate disparity observed in the U. S. Atlantic/Western Europe trade.

The hypothesis that outbound rates are unjustly higher than inbound rates along distinct trade routes cannot be tested on the basis of regression analysis. Data are not available to expand the basic freight rate estimating equation to include the entire range of commodity and route characteristics commonly held to be rate determinants. Data and results from the previous section of this study do afford a rough indication of the extent to which inbound/outbound rate level disparities exist after unit value, product bulk, liner cargo volume, and competition from tramps and tankers are taken into account. One can only speculate about the causes of any observed differences in rate setting behavior observed.

This analysis proceeds by pooling data on inbound and outbound commodity movements along each trade route, assigning a dummy variable (A = 1 for outbound) to distinguish between items shipped in either direction. If this dummy variable contributes significantly to the explanation of rate levels, some limited conclusions may be drawn. The practice of combining data from each route leg may be valid for U. S. trades. It seems likely that stringent regulation of liner conferences by the Federal Maritime Commission could contribute to the development of similar rate-making behavior on each leg of a particular route, but not necessarily across each route.[10] To preserve the large sample size, no attempt was made to identify identical commodities moving in either direction. Regression results for the Far East/U. S. Pacific route (No. 29) and the U. S. Atlantic/Western Europe trade route (No. 5-7-8-9) are as follows:

$$\text{(No. 29)} \quad \begin{aligned} FR = \underset{(6.53)}{1.947} + \underset{(6.26)}{.178V} + \underset{(3.14)}{.249\,ST} \\ + \underset{(3.69)}{.137}[(ST-40) \times DST] - \underset{(-.905)}{.012\,LT} \\ + \underset{(2.09)}{.142DTRA} + \underset{(.511)}{.037DTA} + \underset{(7.64)}{.438A} \quad R^2 = .79 \\ F = 75.37 \end{aligned} \qquad (3.2)$$

[10]It will be recalled from Table 3.1 that for low density products, stowage factor coefficients were observed to be of comparable magnitude along each leg of a particular route.

No. 5-7-8-9)

$$FR = \underset{(5.51)}{2.637} + \underset{(3.29)}{.098V} + \underset{(2.57)}{.355\,ST} + .069[(ST - 40) \times DST] - \underset{(-1.18)}{.023} - \underset{(-.26)}{.021DTRA} + \underset{(.49)}{.040DTA} - \underset{(.69)}{.051A} \qquad R^2 = .51,\ F = 20.87$$

where: figures in parenthesis represent t-statistics

Dummy variable (A) contributes significantly to the explanation of rate levels for route No. 29 only. Results suggest that the outbound rate level is slightly higher than the inbound rate level for the Far East/U. S. Pacific coast trade after a limited number of commodity and route characteristics are taken into account. No such rate level disparity is observed for route No. 5-7-8-9.[11]

Differences between routes and across routes in the number of conference members and the relative importance of companies of different nationalities have been advanced by Heaver (28) as one explanation for such a finding. Conference membership on inbound and outbound legs of route 5-7-8-9 are identical with four of the seven companies registered under U. S. flag.[12] Membership

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[11]If these findings are applicable to other routes as well, they appear to refute an argument of Bennathan and Walters (11) that competitive pressures from tramps explain generally lower rates inbound than outbound.

[12]Conference rate schedules, maintained on file at the Federal Maritime Commission, identify members according to nationality. Shipping lines operating over one direction of a route frequency return along another route.

uniformity increases the likelihood of similar rate-making behavior observed in either direction along a particular route. Conference membership differs substantially along inbound and outbound legs of route No. 29. Nine members operate inbound and the conference is dominated by Japanese lines. The outbound conference consists of 19 members, five registered under U. S. flag. Difficulties in reaching rate agreements among diverse membership in a large conference may be partially responsible for the outbound rate disparity along route No. 29. Each conference member enjoys one vote in rate setting decisions. It is also common practice to fix rates at a level for which all carriers earn at least enough revenue to cover costs. The large number of outbound conference members increases the changes that relatively high cost members will be included in the group. A number of factors which may be responsible for observed rate level differences cannot be quantified and included in this analysis. Thus, definite conclusions cannot be reached regarding the presence of unjustly high rate levels on outbound U. S. trade routes.

3.6 Conclusions

Results of this chapter confirm earlier findings that liner conference rate schedules can be systematically explained by cost of service and demand factors. Although conferences act as discriminating monopolists in charging "what the commodity can bear," the most important single variable accounting for commodity differentiated rates is found to be the stowage factor, a cost based determinant. Competition from independent tramps and tankers is not found to exert a significant influence on liner rate setting behavior. The study also confirms the existence of a general rate level disparity on inbound and outbound legs of trade route No. 29 which cannot be explained by unit value, product bulk, the quantity of liner cargo movements, or competition from tramps and tankers. Data are not available to determine whether other commodity and route characteristics are responsible for the higher outbound rate level. Thus, results are not conclusive.

CHAPTER IV

INTERNATIONAL TRANSPORTATION COSTS, TARIFFS AND THE CONCEPT OF EFFECTIVE PROTECTION

4.1 Introduction

Transportation costs, like artificial tariffs and import quotas, tend to insulate domestic producers from foreign competition. Interest in transport costs as a barrier to trade centers not on the freight rate, which is measured in dollars per unit, but rather on the ratio of freight charges to shipment value. Unit freight charges expressed as a percentage of commodity unit values are commonly referred to as freight factors.

In recent years the effective protection concept has received considerable attention by international trade specialists.[1] The theory enhances our understanding

[1]Following Clarence Barber's path breaking article (8), there have been numerous attempts to develop, refine, and extend the theory of effective protection as it relates to national tariff structure. That transport charges may have an effect on value added similar to tariffs was first recognized by Balassa (5). The following discussion and derivations borrow from contributions by Balassa, Johnson (31), Corden (17), and other effective protection theorists. Grubel and Johnson (25) provide an extensive bibliography of theoretical and empirical research in this field.

of how the structure of a trade barrier affects a nation's production pattern by specifying what effect the restriction has on value added in productive activities rather than on the price of the protected industry's output. Protection of value added (the effective freight factor) rather than the cost of shipping competitive imports (nominal freight factor) is of primary concern to domestic producers who are influenced by the extent to which freight factor structure permits production at a direct cost (value added) higher than that obtained in the absence of such charges. Conversely, effective freight factor protection rates indicate the extent to which producers must reduce direct production costs in order to be competitive in "naturally" protected markets of foreign nations.

This chapter proceeds in four parts. First, the analytical framework required to estimate rates of effective freight factor protection is presented. Second, the model is extended to include an analysis of tariff and freight factor interaction under f.o.b. and c.i.f. customs valuation bases. The two valuation bases hold different implications for world resource allocative efficiency in production under tariffs and freight factors. A third section summarizes policy implications to be explored with effective protection calculations.

Previous empirical studies are reviewed in the final section.

4.2 The Effective Freight Factor Model

The effective rate of protection (E_j) accorded to the jth industry by freight factor structure is normally defined as the percentage difference between industry value added per dollar of output under freight factor protection (V_j') and what its value added per dollar of output would have been in the absence of such charges (V_j).

$$E_j = \frac{(V_j' - V_j)}{V_j} \tag{4-1}$$

Either explicitly or implicitly, the effective protection model assumes: (a) domestic prices of tradables equal world market prices plus freight factors, (b) production functions are of fixed coefficient form with zero elasticity of substitution between imported inputs and domestic primary factors, (c) foreign import supplies are infinitely elastic, (d) primary factor inputs to domestic industries are available in less than infinitely elastic supply, (e) the domestic supply elasticity of nontraded inputs is infinite, and (f) production and trade continues for all goods after freight factor protection is introduced.

The model derives directly from its definition and assumptions. Let a_{ij} represent value of the input of factor i per dollar value of output j in the absence of freight factors. Domestic value added expressed in terms of the cost of n inputs becomes

$$V_j = 1 - \sum_{i=1}^{n} a_{ij} \tag{4-2}$$

When imports, that are perfect substitutes for final product j, incur a freight factor (d_j), the price of that product is permitted to rise by amount (d_j) in the domestic market. Since product j's material inputs are assumed to be available in perfectly elastic supply, values for the a_{ij}'s remain unaffected by the price increase which is entirely allocated to raise value added.

$$V_j = 1 + d_j - \sum_{i=1}^{n} a_{ij} \tag{4-3}$$

The model can be formulated to include freight factors on material inputs (d_i).

$$V_j' = 1 + d_j - \sum_{i=1}^{n} a_{ij}(1 + d_i) \tag{4-4}$$

Since $(V_j = 1 - \sum_{i=1}^{n} a_{ij})$, the above equation simplifies to:

$$V_j' = V_j + d_j - \sum_{i=1}^{n} a_{ij} d_i \qquad (4\text{-}5)$$

The formula for effective freight factor protection rates expressed in terms of input shares and freight factors on material inputs and final products is obtained by substituting equation (4-5) into (4-1)[2]

$$E_j = \frac{(d_j - \sum_{i=1}^{n} a_{ij} d_i)}{(1 - \sum_{i=1}^{n} a_{ij} d_i)} \qquad (4\text{-}6)$$

It will be evident from equation (4-6) that for any positive difference between the freight factor on final product j (d_j), and the weighted average freight factor on imported inputs, the effective rate of freight factor protection (E_j) will be greater the smaller the share of value added. Given this value added, the effective rate will exceed, equal, or fall short of the nominal freight factor on output j when (d_j) exceeds, equals, or falls short of the average nominal freight factor on

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[2]The freight factors presented here measure only the degree of protection accorded domestic production activities by ocean freight and insurance components of the total freight bill. The net effect of inland freight and service charges will add or subtract from this protection. Expressed in terms of f.o.b. value, the total freight bill decomposes as follows: port (10 percent), inland (28 percent), and ocean freight (62 percent). Percentages are calculated from information contained in Organization for Economic Cooperation and Development, Ocean Freight Rates as a Part of Total Transport Costs (46).

material inputs. When freight factors are observed to raise the cost of imported inputs by a larger absolute amount than the price of final product j is increased, effective protection rates will be negative. Implications of equation (4-6) are summarized as follows:

$$\text{If } d_j > d_i, \text{ then } E_j > d_j > d_i \qquad (4\text{-}7)$$

$$\text{If } d_j = d_i, \text{ then } E_j = d_i = d_i$$

$$\text{If } d_j < d_i, \text{ then } E_j < d_j < d_i$$

$$\text{If } d_j < \sum_{i=1}^{n} a_{ij} d_i, \text{ then } E_j < o \text{ (negative effective protection)}$$

Equation (4-6) can be decomposed to illustrate the dual tax subsidy influence of freight factor structure.

$$E_j = \frac{d_j}{1 - \sum_{i=1}^{n} a_{ij}} - \frac{\sum_{i=1}^{n} a_{ij} d_i}{1 - \sum_{i=1}^{n} a_{ij}} = S_j - T_j \qquad (4\text{-}8)$$

S_j represents the gross subsidization rate per unit value added accorded to process j by nominal freight factors imposed on imports of the jth commodity. T_j may be interpreted as the implicit tax rate per unit value added in the jth production process resulting from nominal freight factors on imported inputs to that process. Negative effective protection rates will result when the tax element resulting from nominal freight factors on imported inputs exceeds the subsidy permitted by such rates on the output of process j.

4.3 Freight Factor/Tariff Structure Interaction Under Alternative Valuation Bases

Thus far, this chapter has been concerned with the concept of effective protection as it relates to freight factor structure in the absence of tariffs. Freight factor and tariff structures interact to determine the combined level of protection accorded to each U. S. import competing industry. To assess this consequence for the structure of U. S. production and trade, tariff protection will be considered in conjunction with protection from freight factors.

It will also be of interest to estimate the magnitude of the barrier imposed against U. S. export industries by the combined tariff and freight factor structure of other nations. The two trade impediments differ substantially in application. While tariff rates, aside from preferential agreements, apply equally to all importers, freight factors are known to vary with the geographical pattern of trade. One distinguishing characteristic of international trade is the existence of freight factors exceeding those associated with inland commodity movements, particularly for intercontinental trade. For example, international freight factors are expected to place U. S. export industries at a competitive disadvantage in trade with Western Europe, as intra-European trade is not so protected. One goal of this study is to calculate rates of effective freight factor and tariff protection for a representative sample of U. S. export and import industries in trade with the European Community and with Japan. In preparation for this undertaking, it will be necessary to examine the manner in which tariff and freight factor structures interact to determine the combined level of effective protection under alternative customs valuation bases.

There are two major customs valuation bases: the f.o.b. price and the c.i.f. price. The former stands for free-on-board and represents the price of the commodity on board ship at the port of exportation. The latter designation stands for cost-insurance-freight and represents the commodity's value at the port of importation. It includes freight, insurance and other charges incurred in transporting the merchandise from the port of exportation and generally placing the item alongside ship at the port of entry. When tariffs are levied on f.o.b. value as in the United States, the combined effective protection rate (Z_j), is expressed as the sum of the rate of effective tariff and effective freight factor protection. European nations and Japan calculate tariffs on c.i.f.

value which includes the cost of freight and insurance. The corresponding level of effective protection (Z_j') is not just the simple sum of effective tariff and effective freight factor rates of protection. This sum is augmented by a term representing tariffs levied on the freight factor component of total landed value. These alternatives are illustrated in equations (4-9) and (4-10).

$$Z_j = \frac{[(1+d_j+t_j) - \sum_{i=1}^{n} a'_{ij}(1+d_i+t_i) - (1 - \sum_{i=1}^{n} a'_{ij})]}{(1 - \sum_{i=1}^{n} a'_{ij})}$$

$$= \frac{(d_j + t_j) - \sum_{i=1}^{n} a'_{ij}(d_i + t_i)}{(1 - \sum_{i=1}^{n} a'_{ij})} \tag{4-9}$$

$$Z_j' = \frac{[(1+d_j)(1+t_j) - \sum_{i=1}^{n} a_{ij}(1+d_i)(1+t_i) - (1 - \sum_{i=1}^{n} a''_{ij})]}{(1 - \sum_{i=1}^{n} a''_{ij})}$$

$$= \frac{(d_j + t_j) - \sum_{i=1}^{n} a''_{ij}(d_i + t_i)}{(1 - \sum_{i=1}^{n} a''_{ij})}$$

$$+ \frac{d_j t_j - \sum_{i=1}^{n} a''_{ij} d_i t_i}{(1 - \sum_{i=1}^{n} a''_{ij})} \tag{4-10}$$

Nominal tariffs on output j and input i are represented by t_j and t_i. Value of the input of factor i per dollar value of output j in the absence of freight factors and tariffs (the free-trade-frictionless world case) is denoted by a_{ij}' and a_{ij}'' in equations (4-9) and (4-10) respectively. A final modification is required before these equations are employed in calculations of effective freight factor and tariff rates of protection. The (a_{ij}*'s) observed from the United States input-output table are distorted by tariffs and freight factors. To approximate free-trade-frictionless input shares called for in the above equations, the observed input output coefficients are deflated by freight factors and tariffs on imports of final products and inputs. The following formula is used for the f.o.b. valuation system adjustment:

$$a_{ij}' = a_{ij}^* \, [(1 + d_j + t_j)/(1 + d_i + t_i)]$$

Under the c.i.f. valuation basis the formula becomes:

$$a_{ij}'' = a^*_{ij}[(1 + d_j)(1 + t_j)/(1 + d_i)(1 + t_i)]$$

Equations (4-9) and (4-10) differ in one major respect. An interaction term for tariffs levied on the freight factor component of imported final product and input landed value is included in equation (4-10). If freight factors were equal for all imports, combined effective protection rates would be greater in absolute value for the same structure of tariffs under the c.i.f. valuation base than for the f.o.b. system. The difference is entirely attributed to the levying of tariff charges on the freight factor component of total landed value under the c.i.f. valuation basis.

Johnson (30) derives one additional implication from the different pattern of tariff and freight factor interaction exhibited under alternative valuation bases.[3] When freight factors are included in the analysis, each valuation base holds a different implication for the allocative efficiency of world resources in production under tariffs. If protection from foreign competition is accepted as legitimate, the levying of tariffs on a c.i.f. basis tends to equalize marginal costs among competing sources of imports, whereas the f.o.b. valuation system subsidizes goods produced at a greater distance as compared with goods produced near by when both have the same total landed cost.

The analysis proceeds as follows. Define units of an imported commodity such that its price in a

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[3]The following presentation parallels that of Johnson, the major difference being transport charges are expressed here in ad valorem terms, rather than as a specific duty.

particular tariff imposing country is unity. Let d_A and d_B represent freight factors incurred by the import from two alternative sources of foreign supply. Differences in freight factors are assumed to reflect differences in the real cost of transport service, free of distortion from monopolistic pricing practices. They are also assumed to vary monotonically with distance. C_A and C_B are defined as the level of costs which must be achieved for exports from each foreign supply source to be competitive with domestic production in the tariff imposing country. A tariff is levied at rate t alternatively on the c.i.f. value and the f.o.b. price. Under the former system we have

$$1 = C_A \ (1 + d_A)(1 + t) \ = C_B \ (1 + d_B)(1 + t)$$

or

$$CA = \frac{(1 + d_B)}{(1 + d_A)} C_B$$

Landed costs of the two imported goods must be equal in the tariff imposing country's market. C_A and C_B must reflect the true difference between d_A and d_B in order for both to be competitive with domestic production in the tariff imposing country's market. Requirements of efficient production for this market are satisfied by foreign suppliers. (Pareto conditions regarding resource allocations between foreign and domestic sources are violated by the tariff, which is assumed to be justified by externality conditions in the tariff imposing nation).

Under the f.o.b. valuation system we have

$$1 = C_A(1 + d_A + t) = C_B(1 + d_B + t)$$

$$C_A(1 + d_A + t) = C_B(1 + d_B + t)$$

or

$$C_A = \frac{(1 + d_B)}{(1 + d_A)} C_B + \frac{t}{1 + d_A} (C_B - C_A)$$

Table 4.1 illustrates the production cost advantage awarded the more distant country A under the f.o.b. custome valuation system. Goods from country A may cost more to produce and transport $[C_A(1 + d_A)]$, and still compete in the tariff protected market with goods from the less distant country B. The frieght factor component of total landed value reflects real cost differences in the provision of transport service, but escapes the tariff. Country A's production cost advantage is observed to diminish as the difference between d_A and d_B is reduced. When tariffs are applied on f.o.b. import value, the net effect is to promote an inefficient allocation of production among alternative foreign sources of supply.

TABLE 4.1.--Tariff and Freight Factor Interaction under the f.o.b. Import Valuation System

Case	C_A	C_B	d_A	d_B	t	$C_A(1+d_A)$	$C_B(1+d_B)$	$C_A(1+d_A+t)$	$C_B(1+d_B+t)$
1	0.645	0.870	0.50	0.10	0.05	0.968	0.957	1.00	1.00
2	0.690	0.870	0.40	0.10	0.05	0.966	0.957	1.00	1.00
3	0.740	0.870	0.30	0.10	0.05	0.962	0.957	1.00	1.00
4	0.800	0.870	0.20	0.10	0.05	0.960	0.957	1.00	1.00
5	0.870	0.870	0.10	0.10	0.05	0.957	0.957	1.00	1.00

4.4 Policy Implications of the Effective Protection Concept

Implications of the effective tariff protection concept for policy formulation have received much attention in the literature.[4] Effective protection calculations quantify the net effect of national trade barrier structures on the level and pattern of protection among industries. Tariff and freight factor structures interact to determine the combined level of protection afforded each U. S. import competing industry. This interaction is expected to modify some of the more important effective tariff commercial policy implications. It will prove a useful exercise to summarize the policy implications to be explored with combined effective protection rate calculations.

First, effective protection calculations can be used to indicate the direction of resource flows induced by trade barrier structures. While consumers are guided in purchasing decisions by relative prices of final goods which vary directly with nominal tariffs and freight factors, the effective protection rate influences producer's decisions by altering production process costs. Protection alters value added in domestic processing

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[4]A summary of effective tariff protection policy implications may be found in Kreinin (34, pp. 298-300) and Grubel and Johnson (25, pp. 4-8).

activities. Industries experiencing the greatest percentage increase in domestic value added per unit of output with the introduction of protection will tend to attract productive resources from those activities afforded lesser degrees of protection. Thus, estimates of industry level effective protection rates will indicate the direction that resources will tend to move before substitution is allowed to take place between domestic primary factors and imported inputs.[5]

Tariffs largely result from commercial policy considerations, but freight factors derive from commodity and route characteristics. There is no reason to expect the two restrictions will exhibit similar rate structures. An empirical investigation of the joint influence of tariff and freight factor structures on domestic value added is likely to reveal a pattern of protection induced interindustry resource flows which differs markedly from that suggested by an analysis of tariff protection alone.

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[5]The effective protection model, using fixed input coefficients, assigns the role of guiding resource allocation to value added. Traditional price theory rightfully assigns this role to profits. Tariff structure changes will affect value added and profit in the same way when no substitution is allowed between primary domestic factors (for example, labor) and imported inputs. Protection accorded to value added can therefore indicate the resource allocation impact of tariff structure. With substitution, a new model must be formulated to analyze the resource allocation impact as protection to value added and profit may diverge. See Kreinin, Ramsey, and Kmenta (35).

It also follows that effective protection rates would serve as a rough guide to the degree of resource misallocation resulting from the structure of trade impediments. Tariff protection promotes domestic inefficiency by allowing producers to incur higher production costs than their foreign competitors. A comparison of effective tariff rate levels should indicate the distortion in resource flows over the situation which would prevail in the absence of tariffs. The impact of artificial tariff and natural barriers on resource allocative efficiency will differ insofar as freight factor levels reflect the true service cost of shipping commodities over distance. The most important factor accounting for variations in freight charges on individual commodities is found to be the stowage factor, a measure of cost. Protection from the cost based portion of freight factors on individual commodities is compatible with economic efficiency and does not entail economic waste. This component of effective freight factor rates serves as a guide to the natural effect on resource allocation resulting from the necessity of overcoming frictions imposed by distance as compared with the frictionless world case. Factors not related to the cost of producing transport service also enter the rate determination process. Protection from this component of freight factor structure will interfere with resource allocative efficiency in the same manner as artificial trade barriers. The true impact of effective freight factor protection rates on resource allocative efficiency can only be arrived at by separating the structure of freight factors into cost and noncost based components.

In practice it is not possible to separate monopolistic and competitive elements of individual freight rates, nor can this difference be assessed for product groups on the industry level. Liner companies refrain from attempts to apportion service costs among units of heterogeneous commodities. The stowage factor cannot be used to apportion capacity costs between various commodities in the absence of data on voyage costs and capacity constraints. Jansson (29) proposes that the average cost of operating the marginal ship be employed as a practical proxy for the marginal cost of ship space. This would involve comparing the revenue accruing from the most rate elastic commodities moving along a fully loaded leg of a route with the annual unavoidable costs of operating the marginal ship. Conferences are reluctant to divulge this information. Empirical evidence on the structure of freight rates affords but one generalization. A large proportion of the variance in rates on individual commodities is explained by differences in product bulk. When total protection afforded a particular productive activity is equally divided between effective tariff and effective freight factor rates, the latter will disrupt resource allocative efficiency to a lesser degree than will the former.

Second, effective protection rates serve as a rough guide to determine comparative advantage when industries are assumed to adhere to the maximum degree of inefficiency permitted by a nation's protective structure. Ranking industries in descending order by their effective protection rates is equivalent to an inverse ranking of the degree of comparative advantage as it would exist under free market competitive conditions. Previous attempts to arrive at a comparative advantage ranking by comparing rates of effective tariff protection do not incorporate the interaction between tariff and freight factor structures which determines the combined level of protection afforded each U. S. import competing industry. The inclusion of freight factor structure may reveal a different pattern of industry ranking by degree of competitiveness in world markets.

A corollary to this analysis concerns the discovery of negative effective tariff rates for some productive activities. Negative effective tariff protection rates can result when the weighted average tariff on imported inputs exceeds the nominal tariff rate on corresponding final products. If industries remain competitive in spite of this handicap, their survival could be interpreted as evidence that the country enjoys a considerable comparative advantage in this product line. Although the net effect of the structure of tariffs is to tax the specific process, this industry could be surviving under a high rate of effective freight factor protection.

A final implication concerns the cascading effect of tariffs and the joint influence of freight factor structure in determining the overall degree of protection afforded each stage of the production process. Most industrialized nations escalate their tariff structures according to the stage of fabrication of import competing goods. Raw materials enter virtually duty free. Higher rates are observed on intermediate products made from crude materials, still higher tariffs on semimanufactures, and even higher rates on finished products. Technologically sophisticated consumer goods and capital equipment prove the exception by carrying relatively lower duties.[6] When nominal tariffs are an increasing function of the stage of fabrication, effective tariff rates on final manufactures will be much higher than nominal rates indicate. Tariff escalation is held to pose a significant

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[6]See, for example, Balassa (3).

barrier against attempts by low income nations to industrialize. When crude materials enter duty free, even modest nominal tariffs on processed raw materials translate in effective protection terms to very high duties. The problem is compounded when value added in the processing activity is low.

If the structure of freight factors is found to be an increasing function of the stage of fabrication, either for cost of service reasons or as a result of monopolistic pricing practices in charging "what the commodity will bear," both tariff and freight factor structures would be biased against the location of final assembly operations in developing areas. The heterogeneity of commodities and their intrinsic transport characteristics defy attempts to theoretically justify the existence of an escalated freight factor structure. On one hand, crude materials display relatively low unit values. A small freight charge will represent a large percentage increase in unit price. But raw materials move in large quantities, are easy to handle and stow, and are usually carried by tramps. Final manufactures display relatively large stowage factors, but move in smaller volumes and are of higher unit value. The impact of freight factor structure on tariff escalation and the relationship between total nominal and effective protection levels can only be determined from an empirical investigation.

4.5 Previous Empirical Studies

There have been few published attempts to estimate the magnitude of nominal transport charges for international commodity flows and only one study comparing effective rates of protection from tariffs and freight factors computed from actual shipping charges.[7] The reason for this lack of empirical investigation is that comprehensive data on international freight charges are not readily accessible. In principle, the difference between free-on-board (f.o.b.) and cost-insurance-freight (c.i.f.) import values obtained from commodity trade statistics represent the cost of freight and insurance. Attempts to compute these c.i.b./f.o.b. ratios for use in empirical studies encounter substantial measurement errors.[8] Various

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[7]Tables of freight factors for a limited number of product groups are contained in Moneta (45), Balassa (5), Lipsey and Weiss (40), and Kravis and Lipsey (33). Finger and Yeats (20) compares nominal and effective protection from tariffs and freight factors for United States imports.

[8]A discussion of measurement errors resulting from discrepencies in "partner country" trade statistics may be found in Bhagwati (12). Waters (70) employs c.i.b./f.o.b. ratios from trade statistics to calculate effective freight factor protection rates for U. S. import competing industries. Calculations are based on c.i.f. import values. Commodity categories and empirical results are not comparable with the present study, or that of Finder and Yeats (20) and will not be included in the following discussion.

Congressional hearings provide a second data source, particularly those of the Joint Economic Committee on Discriminatory Ocean Freight Rates and the Balance of Payments.[9] But, commodity descriptions do not correspond with commodity trade classifications, being either too specific or too broad. Finger and Yeats (20) obtain transport charge data from a 1965 Census Bureau Study of the difference between official customs and c.i.f. valuations for United States imports.[10] Ad valorem equivalents to freight and insurance costs are computed from records of actual shipments.

Finger and Yeats compare United States nominal and effective protection rates afforded thirty-eight product groupings from post-Kennedy Round tariffs and from international freight factors. The following commodity groups are included in the study: food products, textiles and products, leather goods, lumber and paper products, nonferrous metals, steel manufactures and machinery. Results

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[9] U. S. Congress, Joint Economic Committee. Discriminatory Ocean Freight Rates and the Balance of Payments, 88th Congress, 1st and 2nd sess., parts 1 through 5, June 20 and 21, 1963, October 9 and 10, 1963, November 10 and 20, 1963, and March 25 and 26, 1964; and 89th Congress, 1st sess., parts 1, 2, and 3, April 7 and 8, 1965, May 7, 1965, June 30, 1965.

[10] See United States Tariff Commission. C.I.F. Values of United States Imports, Washington, D.C., February 1967, and United States Bureau of the Census. C.I.F. Calculation Adds 9 Percent to Import Figures, Washington, D.C., December 20, 1966. Data are reprinted in Lipsey and Weiss (40) and Kravis and Lipsey (33).

indicate that both nominal and effective freight factors pose a barrier to trade at least as high as that afforded by United States tariffs. Nominal freight factors are found to exceed nominal tariffs for twenty-two of the thirty-eight product groupings. Effective freight factor rates are at least as high as effective tariffs for twenty of the groups. Six cases display negative effective rates of tariff protection, but all effective freight factor rates are positive. Effective freight factors are of sufficient magnitude to impart an overall positive effective rate for these commodities. Freight factors and tariffs are found to exhibit similar patterns of escalation with stage of processing. Both are found to bear more heavily on U. S. imports from developing rather than from developed areas.

4.6 Conclusion

Protection from international transport charges can be analyzed in the same manner as tariff protection. The inclusion of freight factors into the standard effective tariff protection framework has been suggested by Balassa (5). Tariff and freight factor structures interact to determine the combined level of protection afforded import competing industries. There exists no theoretical justification for expecting the two trade impediments to exhibit similar structures. Tariffs are a commercial policy variable while freight factors are largely determined by commodity characteristics. When allowance is made for the joint influence of tariff and freight factor structures in effective protection calculations, results should reveal a different pattern of protection induced resource flows than would be suggested by an analysis of effective tariff rates alone.

Most studies of international trade restrictions neglect freight factors by assuming them to be small relative to other price distorting influences. Finger and Yeats (20) offer evidence to the contrary. Whether measured in terms of nominal or effective rates, protection from freight factors is found to be at least as high as that afforded by post-Kennedy Round tariffs in the United States. The conclusion is based on transport charge data more than a decade old. Since this base period, freight factor levels have had the opportunity to adjust in response to advances in maritime technology, currency realignments and major petroleum price increases. An additional study is warranted to establish the relative importance of freight factor structure as a barrier to trade.

CHAPTER V

EFFECTIVE PROTECTION CALCULATIONS: DATA AND METHODOLOGY

5.1 Introduction

Effective protection calculations will require recent information concerning tariffs and freight factors on crude materials, intermediate goods and final products as well as on the share of value added by domestic primary factors in the various producing activities. There are two alternative ways to approach this problem. First, a sample of narrowly defined production activities may be selected for investigation. This method is likely to yield a more accurate representation of protection for these processes, but problems are encountered in aggregating results to assess the industry level pattern of protection. The present study employs a second approach. Input-output tables provide information required to identify import-competing industries and their input requirements. The level and pattern of protection among productive sectors is determined within the interindustry framework as portrayed by the input-output table. This method requires accepting a high level of aggregation and protection-induced substitutions between inputs are ignored.

5.2 Industry Output and Input Identification

Three distinct sets of effective protection calculations are presented in this study. First, comprehensive industry level estimates of effective protection stemming from tariffs and freight factors are provided for United States import competing industries. The tax-subsidy influence of freight factor and tariff structures will then be assessed for U. S. export and import competing industries in trade with the European Community and with Japan. Finally, nominal and effective protection from both barriers will be assessed for United States productive activities by stage of fabrication. The industry output identification procedure differs for each approach.

U. S. import competing industries are classified with the aid of an input-output table compiled by the Bureau of Economic Analysis, U. S. Department of Commerce. The publication contains input requirements for 121 sectors of the United States economy for the year 1970.[1]

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[1]Effective protection estimates frequently employ production coefficients more than a decade old. Yeats (72) estimates that input shares of this vintage imparts, on the average, an error of 12 percent in effective protection calculations. The input-output table used in the

Fifty-four sectors are investigated in this study. For specific coverage, refer to Table 5.1. The only major import competing sectors excluded from the analysis are the livestock and agricultural industries. Data for these sectors are tabulated at a high level of aggregation, making it difficult to assign freight factors to individual product groupings. Furthermore, world trade weighted tariff rates were not available for these sectors.

A recent United States Tariff Commission survey of nontariff barriers (68) is used to identify twenty-one U. S. export sectors which registered complaints against discriminatory ocean freight rates. Interest centers on these sectors for two reasons. First, if freight factors weaken the ability of U. S. exporters to compete abroad by posing a greater barrier, both in nominal and effective terms, against U. S. exporters than that encountered by foreign exports destined for the U. S. market, this pattern should be revealed in our choice of U. S. export sectors actually registering rate complaints. Secondly, a significant number of product groupings from these sectors enter trade both as exports and as imports. It was not possible to establish a close correspondence between exports and imports at this level of aggregation

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present study is the most recent table currently available.

TABLE 5.1.--United States Industry Categories

Sector	Industry	S.I.T.C.
21	Tobacco manufacturing	112.1-3
22	Broad and narrow fabrics, yarn and thread mills	651.1-4; 651.6-7; 652; 653; 655.5
25	Apparel	841; 842
27	Logging, sawmills and planing mills	242; 243; 631.8
28	Millwork and plywood	631.1-2; 631.41-42; 632.1-2; 632.4; 632.71-73; 632.81-82; 632.89
29	Household furniture	821.03; 821.09
30	Other furniture	821.01; 821.02
31	Paper products	251; 641; 642.2-3; 642.9
32	Paperboard	642.11-12
35	Chemical products	241.2; 512; 514; 515; 532 less 532.3; 533.1-2; 551.1, 561.1; 571.1-3; 599.5-7
36	Agricultural chemicals	561 less 561.1; 599.2
37	Plastic materials, synthetic rubber	231.2; 581
38	Synthetic fibers	651.61-62; 651.71-72
39	Drugs	541.1; 541.3; 541.5; 541.61-63; 541.7
40	Cleaning and toilet preparations	553; 554

TABLE 5.1.--Continued

Sector	Industry	S.I.T.C.
41	Paint	533.2
42	Petroleum products	331 less 331.01; 332; 661.8
43	Rubber products	231.3; 621, 629; 841.6; 851 pt.
44	Plastic Products	851 pt.; 893
45	Leather footwear and leather products	611 less 611.2; 612.2-3; 612.9; 831; 851 pt.
46	Glass	651.8; 664
47	Cement, clay and concrete products	273.21; 661.1-2; 662-3-4; 663.7
49	Blast furnace, basic steel products	671-677; 678.1-4
50	Iron and steel foundries	671.32; 678.1; 678.5; 679.1-2
51	Primary copper metals	283.12; 682.11-13
52	Primary aluminum	284.04; 684.1
53	Other primary and secondary nonferrous metals	283.22; 284.03-09; 683.1; 685.1; 686.1; 687.1; 689.31; 689.41-43; 689.5
54	Copper rolling and drawing	682 less 682.1
55	Aluminum rolling and drawing	684 less 684.1
56	Other nonferrous rolling and drawing	681; 683.2; 685.2; 686.2; 687.2; 688; 689 less 689.31; 693.1

TABLE 5.1.--Continued

Sector	Industry	S.I.T.C.
58	Metal containers	692.2
59	Heating apparatus, plumbing fixtures	697.1; 697.22; 812.1; 812.3
60	Fabricated structural metal products	691; 692.1; 692.3; 693.4; 711.1; 711.2; 711.7
61	Screw machine products	694.21; 694.22; 697.21; 697.23; 698.4; 698.91
63	Engines, turbines, generators	711.3; 711.6; 711.8; 722.1
64	Farm machinery	712.0; 719.64
65	Construction, mining and oilfield machinery	695.24-26; 718.4; 718.51; 719.91
66	Material handling equipment	719.31-32
67	Metal working machinery	695.24; 715.1; 715.22-23; 729.6
68	Special industrial machinery	712.91; 715.21; 717.11-14; 717.2; 718.11-12; 718.21-22; 718.29; 718.31; 718.51-52; 719.61-62; 719.8
69	General industrial machinery	698.3; 698.81; 719.11; 719.14; 719.64
70	Machine shop products	711.89; 719.99
71	Computers, peripheral equipment	714.3; 714.92

TABLE 5.1.--Continued

Sector	Industry	S.I.T.C.
72	Typewriters, office machines	714.1-2; 714.91; 718.29; 719.63
73	Service industry machines	717.15; 719.12; 719.15; 719.21-22; 719.7
74	Electrical transmission and distribution equipment	722.1-2 pt.
75	Electrical industrial apparatus	722.1-2 pt.; 729.92; 729.96
76	Household applicances	697.1; 717.3; 719.4; 725
78	Radio and TV receiving sets	724 less 724.91; 729.7; 729.93; 891.1-2
79	Telephone and telegraph apparatus	724.91
80	Radio TV transmitting, signaling and detection equipment	724.10
83	Motor vehicles	732 less 732.9; 733.3
84	Aircraft	734 less 734.92
86	Railroad and other miscellaneous transportation equipment	719.66; 731.1-7; 732.91-92; 733.11

for the remaining U. S. import competing industries. National input-output tables also differ in their industrial sector classifications. To achieve consistency in product groupings, the U. S. input-output table is used to approximate production techniques used in the European Community and Japan, under the assumption that industrial nations exhibit similar input-output relationships.

Input-output tables are not compiled in a manner which facilitates the examination of a large number of processing activities by stage of fabrication. The most detailed U. S. input-output table currently available is used to identify nine manufacturing activities by stage of processing.[2] These include tobacco manufacturing, textiles and products, leather and products, lumber and paper products, nonferrous metals and iron and steel manufactures. Three processing stages are examined for all but one case. Twenty-seven product groupings of interest to developing and developed nations are covered in the analysis.

To prepare for the comparison of products, freight factors, and tariffs, it was necessary to establish a concordance between U. S. input-output data recorded under the Standard Industrial Classification (SIC) code

[2] U. S. Department of Commerce. Input-Output Structure of the U. S. Economy, 1967, Vol. 3, Washington, D.C.: U. S. Government Printing Office, 1974.

and their matching Standard Industrial Trade Classification (SITC) number. Matching the data was facilitated by tables contained in (58). Correspondence was generally established at the 5-digit level. It was convenient to employ a higher level of aggregation for some final product groups. A recent U. S. Census Bureau publication (59) was used to identify each industry's outputs and major material inputs. Between 10 and 30 percent of total materials consumed fell into the "all other materials" category. When it was not possible to identify a specific material input, the weighted average tariff duty and freight factor associated with its product group was calculated and applied.

5.3 Imputed "Free-Trade-Frictionless" Input Shares

Production coefficients obtained from input-output tables are usually distorted by tariffs and freight factors. The effective protection formula presented in Chapter IV calls for the use of input shares as they would appear in the absence of these barriers. When the purpose is to investigate tariff protection alone, two options are available. First, one can assume that industrial input-output relationships in some industrial nations with very low tariffs can be used to approximate techniques used by all industrial countries if tariffs did not exist.[3] Second, distortion-free coefficients can be inferred by assuming that free market prices equal protected prices deflated by tariff rates on inputs and output. Both approaches have been previously used and very little theoretical or empirical evidence exists to establish the superiority of one approach over the other. The present study approximates "free-trade-frictionless" input shares through deflation of observed production coefficients by both tariffs and freight factors on outputs and inputs. This procedure is outlined in section 4.2.

Implicit in the above approach is the assumption that input coefficients remain unaltered between protection and free trade situations. Protection induced substitutions between imported inputs and value added by domestic primary factors would be expected in response to changes in the relative price of outputs and of imported inputs. When substitutions towards cheaper inputs are ignored, an upward bias of an unknown magnitude is imparted to effective protection estimates. Results could yield incorrect conclusions concerning expected interindustry shifts of domestic primary factors. Little evidence exists to assess the impact on effective protection calculations of such changes in input shares.

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[3] For an example of this approach, employing Benelux country input shares, see Balassa (4).

Balassa and Associates (2) studied tariff protection structure in seven industrial nations and concluded that effective protection rankings did not differ materially when calculated by national input coefficients versus coefficients adapted from the Netherlands and Belgium where tariff rates are low. For countries with sizable nonuniform tariffs and freight factors, the influence on rankings is likely to be small.

5.4 Nominal Tariffs and Freight Factors

Tariff rates are obtained from a recent GATT tariff study (23). Since each S.I.T.C. product group is a composite of several different commodities, it is necessary to obtain an average tariff rate and apply it to the entire group. Tariff averages computed from "world trade" weights were chosen from the GATT study to avoid the bias associated with using "own import" weights.[4] World weights are also biased to the extent that intercountry similarities in the structure of tariffs fail to reflect what the free trade composition of trade would have been for each country. Several major petroleum price increases and exchange rate realignments have

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[4]World imports are the total imports of the eighteen developed countries included in the GATT study. A discussion of the bias associated with different weighting schemes on effective tariff protection estimates may be found in Tumlir and Till (52).

occurred since the 1970 base year of the GATT study. World trade weights will avoid in large part the influence of such events on the commodity composition of trade for a particular country.

Two additional steps are required to complete the tariff assignment process. First, the GATT study had calculated tariff rates for chemicals on the assumption that the Kennedy Round "ASP" package would be implemented. Since the U. S. Congress failed to enact supporting legislation, the agreement never came into force. Chemicals ranked eighth among all United States industrial imports. It, therefore, becomes necessary to obtain a tariff average for chemical products from the United States Tariff Commission survey of nontariff barriers (68). Tariff rates reflect the effect of assessing U. S. duties on benzenoid chemicals on the American Selling Price system of customs valuation. Second, tariff rates in the GATT study are adjusted to reflect the recent unilateral reductions made in Japanese tariffs. In 1972, 80 percent of the rates of duty received reductions by 20 percent, 2 percent of the rates were made duty free and 6 percent were cut by amounts ranging from 10 to 95 percent. Rate reductions applicable to the various industrial sectors were identified from the United States Tariff Commission survey (68).

Freight factors for individual commodities are calculated from liner conference freight rate schedules maintained on file at the Federal Maritime Commission (FMC). Since freight rates are normally quoted on a per unit basis, several steps are required to obtain their ad valorem equivalents. First, major trade routes connecting the United States with the Far East, Latin America and Western Europe are identified with the aid of a recent Maritime Administration publication (66). Table 5.2 offers detailed information on the route patterns. Second, the liner conferences operating over each route leg are determined with the help of FMC officials and from tables contained in Marx (43, pp. 176-181). Freight rates for individual commodities are compiled according to the S.I.T.C. classification for most routes. The Brussels Tariff Nomenclature (BTN) classification is used on North Atlantic/Western Europe routes. A third step entails extracting freight rates for the necessary commodities and converting all rates to a long ton (2240 pounds) basis. The majority of conferences apply rates per long ton or 40 cubic feet, whichever produces the greatest revenue for the member line. Stowage factor tables are used to convert measurement ton rates to their long ton equivalents.[5] North Atlantic/West European trade route

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[5]Stowage factor tables are contained in Leeming (37), Ford (21), Garoche (22), and Thomas (49).

TABLE 5.2.--Selected Inbound and Outbound United States Foreign Trade Routes

Route No.	Code No.	Conference	Origin/Destination
5-7-8-9	8210	Continental North Atlantic Westbound Freight Conference, Tariff O, FMC-5, issued by D. J. Christiansen, Chairman	United Kingdom, Germany, Belgium, Netherlands, Atlantic France and Spain/U. S. North Atlantic
		North Atlantic Continental Freight Conference, Tariff No. 29, FMC-4 issued by Louis P. Kopley, Chairman	U. S. North Antlantic/Antwerp, Rotterdam, Amsterdam, Hamburg, Bremen, Bremerhaven
		North Atlantic French Atlantic Freight Conference, Tariff No. 3, FMC-4	U. S. North Atlantic/French Atlantic
11	5850	North Atlantic Westbound Freight Association, FMC-34	Great Britain, North Ireland/ U. S. Atlantic Coast
	7100	North Atlantic United Kingdom Freight Conference, Tariff No. 47, FMC-2	U. S. Atlantic Coast/Great Britain, North Ireland
12	3103	Japan/Korea Atlantic and Gulf Freight Conference, Tariff No. 35, FMC-6	Far East/U. S. Atlantic
		Far East Conference, Tariff No. 25, FMC-5, issued by Gerald J. Flynn, Chairman	U. S. South Atlantic/Far East

TABLE 5.2.--Continued

Route No.	Code No.	Conference	Origin/Destination
20	9648B	Inter-American Freight Conference, Section "B," Tariff No. 3, FMC-8	East Coast South America, Argentina, Uruguay, Paraguay/U. S. Gulf
1	9648C	Inter-American Freight Conference, Section "C," Tariff No. 1, FMC-6 issued by Captain Frank R. A. Levier	East Coast South America, Brazil/ U. S. Atlantic and Gulf
29	150	Trans-Pacific Freight Conference of Japan/Korea, Tariff No. 35, FMC-6, issued by R. D. Grey, Chairman	Far East/U. S. Pacific
	57	Pacific Westbound Freight Conference, Tariff No. 3, FMC-8, issued by D. D. Day, Jr., Chairman	U. S. Pacific Coast/Far East
31	78910	West Coast South America Northbound Conference, FMC-1, issued by L. D. Marshall, Chairman	West Coast South America, Peru, Chile, Columbia/U. S. Atlantic and Gulf

rates require an additional adjustment as they are assessed on the basis of 1000 kilos weight or one cubic meter.[6] Finally, unit freight rates are converted to their ad valorem equivalents. Freight rates are assessed in U. S. dollars and apply from the vessel loading terminal at the port of export to the member line terminal at the port of import. It is, therefore, necessary to express rates as a percentage of free-alongside-ship (f.a.s.) unit import values computed from value and tonnage data contained in commodity trade statistics (60, 61, 62, 63).[7] Thus freight factor calculations derive from a base representing the average unit value of actual imports which enter over the freight charge. Each commodity is then assigned a freight factor and a tariff rate. Weights are applied in the manner previously described.

5.5 Nontraded Inputs

Nontraded inputs, like services and electricity, present a problem for measuring and interpreting effective protection estimates. Consider, as do most studies,

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[6]Weight-volume conversion tables are contained in Martin (42), pp. 198-215.

[7]The alternative approach would be to subtract handling charges at the port (which are not known) from unit freight charges and express the result as a percentage of free on board (f.o.b.) unit import values.

only the effects of tariffs. Domestic prices of nontraded inputs are not strictly equal to their free market prices plus the tariff. While traded material inputs are deflated to arrive at their world market price, nontraded inputs are generally not deflated. When nontraded inputs are treated as ordinary inputs with zero tariffs, as in studies by Balassa (4) and Basevi (9), the level of protection to value added is overstated. A question arises whether nontraded inputs should be considered as a part of value added of the industry using them, or be treated as ordinary inputs with tariff rates determined by the weighted average tariff rate on their traded input content.

Consider the first approach. Corden (18) argues that nontraded goods should be treated like primary factors as both prices are determined within the system. If traded goods are assumed available in infinitely elastic supply, their prices are given parameters to be altered by tariffs. Protection for an activity producing a traded product represents protection for domestic primary factors and for nontraded inputs intensive in that activity as well as protection for domestic primary factors intensive in the nontraded input industries. To arrive at the appropriate value added share for the traded final product, one must combine with all direct contributions, the indirect contribution made by domestic primary factors through nontraded inputs into the nontraded inputs. For example, let 50 percent of the value of the final product be composed of direct traded inputs, and 30 percent of nontraded inputs. If two-thirds of the cost of these nontraded inputs consists of traded inputs while the remaining third is value added, then the total traded input share for the final product will be 70 percent. The direct contribution of primary factors (20 percent) plus the indirect contribution (10 percent) by primary factors through nontraded inputs gives the true value added. Tariffs are then applied to the indirect traded inputs.

The argument for treating nontraded goods like primary factors is based on the following example.[8] Consider a simple Heckscher-Ohlin model with two traded goods produced by labor and capital. Replace capital with a nontraded good produced entirely by a factor which cannot be used to produce either final product. Now let the price of both traded goods double with the introduction of protection. Relative prices will remain the same and nothing will change. But if the nontraded good is now treated like an intermediate input, Corden argues that the value added of the relatively labor intensive

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[8]The criticism of Corden's approach may be found in Ethier (19, pp. 34-35).

final product will fall relative to the value added of the other.

Corden's example consists of relabelling a primary factor as a nontraded good. The conclusion that both should be treated alike naturally follows. When a clear distinction is drwan between primary factors and nontraded goods, the price of nontraded goods will also be observed to double, leaving all relative values unchanged.

The second approach treats nontraded inputs as ordinary inputs. By definition, the output of a non-traded good sector cannot be traded. It also requires at least one input which can be used as an input into other industries. Protection affects the price of non-traded goods by increasing the cost of their material inputs. It is reasonable to assume these cost increases will be passed on to the consumer of nontraded goods in the form of higher prices. If nontraded goods are available to domestic industries in infinitely elastic supply, the passing on of protection induced cost increased can conveniently be represented by an upward shift in the supply schedule.

This study treats nontraded inputs as ordinary inputs. Nontraded goods are assumed available in infinitely elastic supply. When material input costs rise with the introduction of freight factors and tariffs, these cost increases are entirely passed on in the form of higher prices. For example, if 20 percent of maintenance construction costs consist of imported builder's materials subject to a 10 percent freight factor and a 10 percent tariff, we infer the price of this service is raised by 4 percent. The combined duty from both sources on maintenance construction services is, therefore, 4 percent. Empirical evidence suggests this approach and the Corden method yield similar effective protection estimates.[9]

[9]See, for example, McAleese (44, p. 11) and Lewis and Guisinger (39).

CHAPTER VI

PROTECTION FROM INTERNATIONAL FREIGHT FACTORS AND FROM TARIFFS: EMPIRICAL EVIDENCE

6.1 Introduction

This chapter presents three sets of effective protection calculations. First, effective rates of tariff and freight factor protection are provided for a comprehensive set of U. S. import-competing industries. The combined tax-subsidy influence of tariff and freight factor structures is then assessed for a representative sample of United States export and import-competing industries in trade with the European Community and with Japan. A final set of effective protection calculations is presented for U. S. processing activities by stage of fabrication. Each investigation addressed two major questions:

1. Are the levels of effective protection afforded United States productive activities from freight factors and from tariffs of comparable magnitudes?

2. Does the ranking of processes by levels of effective tariff protection differ from that given by the combined rate of effective tariff and freight factor protection?

The investigation is based on freight factor data pertaining to 1974. Empirical findings will be altered to the extent that freight rates have changed relative to import values in recent years. To indicate the direction of recent movements in these factors, freight rate indices are compared with import unit value indices for the United States. A final section summarizes the study's major findings.

6.2 United States Nominal and Effective Rates of Protection: Industry Level Estimates

Table 6.1 summarizes the industry level estimates for nominal and effective rates of protection stemming from U. S. tariffs and freight factors. The combined level of effective protection from both price distorting measures is tabulated in the right-hand column. Average rates, weighted by total OECD imports, are calculated to serve as a rough guide to the relative magnitude of the nominal and effective protection rates.

Results indicate that the average degree of protection afforded by freight factor structure is higher than that afforded by post-Kennedy round nominal tariffs. Nominal freight factors are at least as large as nominal tariff rates for thirty-four of the fifty-four industry categories. Effective rates of freight factor protection

TABLE 6.1.--Estimated Nominal and Effective Rates of Protection from United States Post-Kennedy Round Tariffs and Freight Factors (All Figures in Percents)

Sector	Industry	Nominal Protection		Effective Protection		
		Tariffs	Freight Factors	Tariffs	Freight Factors	Total
21	Tobacco manufacturing	16.6	5.8	20.0	3.2	23.2
22	Broad and narrow fabrics, yarn and thread mills	23.5	5.3	61.2	2.9	64.1
25	Apparel	24.7	4.2	45.1	1.0	46.1
27	Logging, sawmills and planing mills	0.0	36.6	-4.5	122.8	118.3
28	Millwork and plywood	10.6	19.7	27.4	22.5	49.4
29	Household furniture	6.8	31.3	7.7	80.7	88.4
30	Other furniture	8.6	10.0	12.4	7.8	20.2
31	Paper products	4.1	15.1	4.4	25.6	30.0
32	Paperboard	6.2	12.8	7.7	15.5	23.2
35	Chemical products	9.1	15.5	19.5	28.9	48.4
36	Agricultural chemicals	1.0	19.9	1.4	48.4	49.8
37	Plastic materials, synthetic rubber	8.5	5.5	11.9	1.3	13.2
38	Synthetic fibers	16.1	10.8	27.3	16.0	43.3
39	Drugs	4.6	4.1	4.8	1.2	6.0
40	Cleaning and toilet preparations	7.3	7.2	10.8	-1.5	9.3
41	Paint	6.9	12.7	12.1	20.4	32.5
42	Petroleum products	4.5	11.1	10.3	4.7	15.0
43	Rubber products	5.0	5.1	5.6	3.0	8.6
44	Plastic products	9.5	8.9	19.3	10.2	29.5
45	Leather, footwear and leather products	7.7	8.2	10.0	10.6	20.6
46	Glass	14.1	61.1	32.9	152.7	185.6
47	Cement, clay and concrete products	10.8	54.8	41.9	234.9	276.8
49	Blast furnace, basic steel products	6.1	13.5	14.5	20.4	34.9
50	Iron and steel foundries	8.7	13.1	14.1	20.6	34.7
51	Primary copper metals	1.8	2.1	2.3	-4.6	-2.3
52	Primary aluminum	4.6	5.4	9.4	4.7	14.1
53	Other primary and secondary nonferrous metals	2.6	3.9	6.6	-4.1	2.5
54	Copper rolling and drawing	3.9	2.9	7.5	3.2	10.7
55	Aluminum rolling and drawing	6.9	4.3	17.8	5.6	23.4
56	Other nonferrous rolling and drawing	7.3	5.3	14.3	7.0	21.3
58	Metal containers	6.4	34.7	8.5	152.4	160.9
59	Heating apparatus, plumbing fixtures	7.0	11.9	10.4	24.4	34.8
60	Fabricated structural metal	5.2	9.4	4.9	10.5	15.4
61	Screw machine products	6.7	9.2	8.8	10.5	19.3
63	Engines, turbines, generators	6.4	8.7	8.3	13.8	22.1
64	Farm machinery	2.1	4.9	-1.6	4.3	2.7
65	Construction, mining and oilfield machinery	5.0	8.7	.52	12.1	17.3
66	Material handling equipment	4.9	8.6	4.7	13.6	18.3
67	Metal working machinery	7.7	6.9	10.6	8.4	19.0
68	Special industrial machinery	6.4	4.8	9.1	3.2	12.3
69	General industrial machinery	6.5	6.1	8.6	6.2	14.8
70	Machine shop products	8.2	3.0	10.3	0.0	10.3
71	Computers, peripheral equipment	5.2	2.9	4.7	2.1	6.8
72	Typewriters, office machines	5.8	3.1	6.7	0.0	6.7
73	Service industry machines	6.5	5.5	8.3	3.0	11.3
74	Electric transmission and distribution equipment	7.7	8.5	10.6	12.5	23.1
75	Electric industrial apparatus	7.4	3.9	8.1	0.0	8.1
76	Household appliances	6.1	5.2	5.5	1.0	6.5
78	Radio and TV receiving sets	6.7	4.1	15.2	2.4	17.6
79	Telphone and telegraph apparatus	8.0	7.9	9.8	10.3	20.1
80	Radio TV transmitting, signaling and detection equipment	7.2	7.4	8.3	10.5	18.8
83	Motor vehicles	3.3	11.3	-1.0	24.5	23.5
84	Aircraft	5.0	5.3	4.6	7.2	11.8
86	Railroad and other miscellaneous transportation equipment	8.8	9.6	22.8	21.3	44.1
Average, weighted by total OECD imports		7.3	12.1	12.9	18.7	31.6

are as high or higher than effective tariff rates for twenty-six of the industries.

A comparison of these estimates reveals that effective tariff rates exceed nominal tariff rates in forty-four cases while effective rates of freight factor protection exceed their nominal counterparts for thirty-one industries. The average degree of escalation, as measured by effective rates minus nominal rates, for both barriers is found to differ markedly within industry categories as well as across industries. Effective rates for both barriers are frequently double their nominal counterparts. The logging, cement and metal container sectors show levels of effective freight factor protection more than triple that indicated by nominal freight factor rates. Few sectors display both high effective tariff and effective freight factor rates. This suggests that lower effective tariff rates are being offset by higher rates of effective freight factor protection for industries producing relatively bulky and/or low valued products.

One third of these industries display rates of effective freight factor protection which fall short of their nominal freight factor rates. This situation arises when nominal protection from freight factors on output is partially offset by the increased production costs resulting from freight factors on material inputs. Three sectors show negative effective tariff rates. Effective freight factor rates are negative for three additional industrial processes.[1] Tariff and freight factor structures interact to impart an overall positive effective rate for all but one case. The primary copper metals sector proves the exception by carrying a negative combined effective protection rate.

Several important conclusions derive from the order of industrial protection. First, combined effective protection calculations convey information regarding the direction of protection-induced interindustry resource flows. Resources are attracted towards productive activities which experience the greatest percentage increase in domestic value added with the introduction of protection from tariffs and freight factors. Examination of the results contained in Table 6.1 reveals that few sectors enjoy high effective protection rates from both tariffs and freight factors. The ranking of industries in descending order by combined rates of effective protection can, therefore, be expected to infer a different

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[1]Negative effective protection rates result from the weighted average nominal rate of duty on imported material inputs exceeding the nominal duty rate on final product imports. None of these negative effective protection rates result from negative "free-trade-frictionless" value added.

pattern of protection induced resource flows than that suggested by a comparison of effective tariff rates. Rank correlation coefficients and coefficients of correlation between the various nominal and effective protection measures are presented in Table 6.2. The Spearman's rank correlation coefficient between effective tariffs and combined effective rates is .507, while that for combined effective and effective freight factor rates is .814. Combined effective rates infer a pattern of industrial protection and direction of resource flows quite distinct from that indicated by effective tariff rates. Both effective tariffs and effective freight factors are found to vary positively with combined effective rates, but the strength of association differs substantially between the pairs of effective protection measures. The coefficient of correlation between effective freight factors and combined effective rate is .972 while that for effective tariffs and combined effective rates is only .459. Freight factor structure appears to exert a dominating influence in the determination of the pattern of combined industrial protection.

The protection pattern change resulting from freight factor inclusion is of interest. Effective rates of tariff protection are highest for broad and narrow fabrics, apparel, cement, glass, millwork and

TABLE 6.2.--Correlations Between Nominal and Effective Protection Measures for the United States

	Nominal Freight Factors	Nominal Tariffs	Combined Nominal	Effective Freight Factors	Effective Tariffs	Combined Effective
Nominal Freight Factors	———	.169 (.111) .081 (.280)	(.837) (.001) (.937) (.001)	.915 (.001) .948) (.001)	.189 (.086) .257 (.030)	.795 (.001) .929 (.001)
Nominal Tariffs		———	.534 (.001) .423 (.001)	.103 (.229) .045 (.369)	.878 (.001) .897 (.001)	.464 (.001) .256 (.031)
Combined Nominal			———	.737 (.001) .878 (.001)	.499 (.001) .547 (.001)	.924 (.001) .934 (.001)
Effective Freight Factors				———	.108 (.220) .240 (.040)	.814 (.001) .972 (.001)
Effective Tariffs					———	.507 (.001) .459 (.001)
Combined Effective						———

Note: The upper figure in each element is the Spearman's Rank Correlation Coefficient. The lower figure is the coefficient of correlation. Figures in the parenthesis represent levels of significance.

plywood, synthetic fibers, miscellaneous transportation equipment, tobacco, chemical products, plastic products, nonferrous rolling and drawing, radio and T.V., blast furnace products, and iron and steel foundry manufactures. When the analysis is expanded to include freight factor protection, the blast furnace and steel foundry sector rankings remain intact. Cement and glass products move up the combined effective protection scale. The rest of the aforementioned sectors decline in rank and the positions they vacate are occupied by industries which produce relatively bulky items under varying degrees of effective tariff protection. Sectors experiencing the greatest increase in rank include metal containers, logging and sawmill products, household furniture, agricultural chemicals, heating apparatus, paper products and motor vehicles. Overall, when freight factors are included, four sectors hold their ranks, sixteen industries move up on the scale and the remaining thirty-four sectors occupy lower ranks.

A second conclusion follows from the remarkably similar industrial rankings observed between each effective protection measure and its nominal counterpart. The ranking of industries by combined nominal rates appears to afford a satisfactory indication of the combined effective protection pattern. Spearman's rank correlation coefficients between effective tariffs and nominal tariffs is .878, that between effective freight factors and nominal freight factors is .915, while that for combined effective and nominal rates is .924.

Third, effective protection rate levels cannot be used to infer the degree of resource misallocation resulting from the combined structure of nominal tariffs and freight factors. Effective rates of tariff protection indicate the degree to which domestic industries require artificial support to remain competitive with imports. When tariffs are introduced, material inputs are attracted towards artificially inflated returns in protected industries. It is common practice to use the height of effective tariff rates to represent a crude index of the degree of resource misallocation resulting from the presence of tariffs. When freight factor structure is encorporated into the analysis, a different pattern of protection and interindustry resource flows emerge. The ranking of industries by their combined effective rates is different from that suggested by an observation of effective tariff rates. Furthermore, nominal freight factors are based in large part on the cost of producing transport service. Resource movements in response to protection from the cost-based component of effective freight factors do not entail economic waste. Freight factors also contain an artificial component which functions in the same manner as tariffs. In practice, the two components of freight factor structure cannot be separated. Since freight factors partly reflect actual production costs, and industry rankings by combined effective rates and effective tariff rates are observed to differ, the height of combined effective rates do not indicate the degree of resource misallocation resulting from the combined structure of freight factors and tariffs.

Finally, combined rates of effective protection can be used to assess the relative competitiveness of different industries in world markets. Ranking industries in descending order by combined effective rates is roughly equivalent to an inverse ranking of the degree of comparative advantage each sector would enjoy in the absence of tariffs and freight factors. Compared to other United States sectors, the industries found to possess the greatest competitive edge in world markets produce primary copper, primary nonferrous metals, farm machinery, drugs, household appliances, office machines, computers, electric industrial apparatus, rubber products, cleaning and toilet preparations, machine shop products, copper rolling and drawing, service industry machinery, aircraft and special industrial machinery. These products are expected to account for a large share of total United States exports.

6.3 Nominal and Effective Rates of Protection in the United States, the European Community and Japan

The previous section of this chapter compares the degree of effective protection for U. S. import competing industries stemming from freight factors and from tariffs. Also of interest is the magnitude of the barrier imposed by freight factor structure against major U. S. export industries. A distinguishing feature of international trade is the presence of freight factors which exceed those associated with inland commodity movements, particularly for intracontinental trade. Additional costs associated with overcoming frictions imposed by distance are expected to place U. S. exporters at a competitive disadvantage in trade with Western Europe, as intra-European trade is not so protected. United States exporters also voice complaints that outbound commodity movements incur substantially higher freight charges than do inbound movements of identical cargo. A secondary burden is placed on U. S. exporters as most foreign tariffs and consumption taxes are applied on c.i.f. import value.

These issues are addressed by comparing the magnitude of nominal and effective freight factor protection rates for a representative sample of U. S. export and import competing sectors in trade with the nine country European Community and with Japan. The sectors chosen for investigation are those which registered complaints against discriminatory ocean freight rates with the United States Tariff Commission. All freight factor protection rates are calculated on f.o.b. import and export unit values. In addition, combined rates of protection are calculated under the f.o.b. valuation system for U. S. imports and on the c.i.f. base for U. S. exports to highlight the different manner in which tariff and freight factor structures interact under alternative import valuation bases.

Rates of protection encountered by U. S. exports and foreign exports to the United States are presented in Table 6.3. Whether measured in nominal or effective terms, the overall barrier imposed by freight factor structure against U. S. exports to the European Community (EC) and to Japan is found to exceed the level of protection contributed by tariffs. Freight factors constitute a large part of total protection rates encountered by lumber and wood products, paper products, construction machinery, motor vehicles, and miscellaneous transport equipment exports to both foreign markets. When tariffs are levied on a c.i.f. bais, as in the EC and Japan, the result is to equalize the marginal costs among competing sources of supply for these foreign markets. Both freight

TABLE 6.3.--Nominal and Effective Rates of Protection for United States Imports and Exports in Trade with the European Community and with Japan (All figures in Percents)

Sector	Industry	U. S. Imports					U. S. Exports to European Community					U. S. Exports to Japan				
		Nominal Protection		Effective Protection			Nominal Protection		Effective Protection			Nominal Protection		Effective Protection		
		Tariffs	Freight Factors	Tariffs	Freight Factors	Total	Tariffs	Freight Factors	Tariffs	Freight Factors	Total	Tariffs	Freight Factors	Tariffs	Freight Factors	Total
27	Logging, sawmills and planning mills	0.0	36.6	-4.5	122.8	118.3	6.4	35.8	21.0	141.1	171.1	7.1	37.2	26.0	157.3	194.4
28	Millwork and plywood	10.6	19.7	27.4	22.5	49.9	10.1	18.5	19.9	20.5	43.6	10.9	16.3	22.1	13.9	38.8
31	Paper Products	4.1	15.1	4.4	25.6	30.0	12.1	17.4	27.3	33.7	66.0	7.3	15.6	13.7	26.8	42.6
32	Paperboard	6.2	12.8	7.7	15.5	23.2	5.0	19.7	-1.3	29.4	28.2	6.0	15.9	6.5	21.6	29.2
64	Farm machinery	2.1	4.9	-1.6	4.3	2.7	5.1	3.9	4.2	1.1	5.2	6.0	5.2	7.3	5.5	13.1
65	Construction mining and oilfield machinery	5.0	8.7	5.2	12.1	17.3	6.9	9.7	8.4	15.1	24.5	6.0	11.0	6.5	18.6	26.2
66	Material handling equipment	4.9	8.6	4.7	13.6	18.3	6.8	7.1	8.1	9.5	18.2	6.2	7.4	7.1	10.0	18.0
67	Metal working machinery	7.7	6.9	10.6	8.4	19.0	6.2	4.9	7.0	4.4	11.6	6.8	7.5	8.7	9.9	19.3
68	Special industrial machinery	6.4	4.8	9.1	3.2	12.3	5.5	4.6	5.9	3.6	9.6	6.6	5.1	8.7	4.8	13.7
69	General industrial machinery	6.5	6.1	8.6	6.2	14.8	6.0	5.0	6.3	4.3	10.7	6.0	6.8	6.4	8.6	15.5
70	Machine shop products	8.2	3.0	10.3	0.0	10.3	5.7	2.5	5.6	0.0	5.7	8.2	3.3	10.5	1.2	12.0
72	Typewriters, office machines	5.8	3.1	6.7	0.0	6.7	7.0	2.0	7.7	-1.0	6.6	10.2	2.7	16.3	0.0	16.7
74	Electric transmission and distribution equipment	7.7	8.5	10.6	12.5	23.1	6.1	5.6	5.3	6.6	12.2	6.4	6.7	7.2	9.1	16.9
75	Electrical industrial apparatus	7.4	3.9	8.1	0.0	8.1	6.3	3.7	6.3	1.4	7.7	6.3	4.8	7.1	3.7	11.0
76	Household appliances	6.1	5.2	5.5	1.0	6.5	6.5	5.7	6.8	3.5	10.4	7.5	5.8	12.6	4.0	17.2
78	Radio and TV receiving sets	6.7	4.1	15.2	2.4	17.6	10.7	3.6	26.2	1.2	27.8	8.1	4.0	18.7	3.1	22.2
79	Telephone and telegraph apparatus	8.0	7.9	9.8	10.3	20.1	7.2	7.6	7.2	10.1	18.1	4.5	6.1	3.3	7.7	11.2
80	Radio TV transmitting, signaling, and detection equipment	7.2	7.4	8.3	10.5	18.8	11.9	5.9	14.7	8.3	24.1	6.1	8.2	4.2	12.7	17.6
83	Motor vehicles	3.3	11.3	-1.0	24.5	23.5	11.2	12.3	20.9	22.8	46.6	9.3	12.1	16.9	21.7	40.9
84	Aircraft	5.0	5.3	4.6	7.2	11.8	5.2	6.0	4.0	7.5	11.8	11.2	5.8	16.5	6.5	24.0
86	Railroad and other miscellaneous transport equipment	8.8	9.6	22.8	21.3	44.1	9.3	11.6	24.5	31.0	58.8	6.7	10.5	12.8	24.1	38.6
	Average weighted by Total OECD Imports	4.7	9.8	4.8	18.3	23.1	7.9	9.6	13.4	19.2	34.3	7.3	10.0	12.3	20.5	34.6

factors and tariffs pose a major penalty against U. S. exporters in trade with the European Community, as intra-EC trade is not so protected.

Combined effective rates of protection are not the simple sum of effective tariff and effective freight factor protection rates when tariffs are levied on c.i.f. import values. This sum is augmented by the percentage increase in domestic value added per unit of output resulting from tariffs levied on the freight factor component of total landed input and output unit values to arrive at combined effective rates (see equation 4-10). For example, Table 6.3 reveals that U. S. exporters of millwork and plywood to the European Community confront a total effective protection rate of 43.6. Rates of effective protection from tariffs and freight factors sum to 40.4. The difference between these rates (43.6-40.4 = 3.2) represents the net subsidy rate accorded to EC millwork and plywood producers from tariffs levied on the freight factor component of total landed import values. A comparison of effective protection rates confronted by the remaining U. S. export sectors in trade with the EC and Japan reveals that foreign domestic productive activities receive, on the average a 1.7 percentage increase in domestic value added per unit of output over the situation which would prevail if tariffs were assessed on the f.o.b. value of U. S. exports.

TABLE 6.4.--Correlations Between Nominal and Effective Protection Rates for the United States, the European Community, and Japan

Type of Correlation Coefficient	U. S. Nominal Freight Factors	U. S. Nominal Tariffs	U. S. Effective Freight Factors	U. S. Effective Tariffs	U. S. Combined Effective Protection
			European Community		
Spearman Rank	.956 (.001)	.069 (.381)	.946 (.001)	.035 (.441)	.893 (.001)
Coefficient of Correlation	.967 (.001)	.113 (.313)	.989 (.001)	.229 (.158)	.957 (.001)
			Japan		
Spearman Rank	.966 (.001)	-.004 (.493)	.869 (.001)	-.084 (.358)	.534 (.007)
Coefficient of Correlation	.983 (.001)	.049 (.416)	.986 (.001)	.044 (.424)	.926 (.001)

Note: The correlations are between the industry rankings by rates of protection for the three countries in Table 6.3.

Spearman's rank correlation coefficients and coefficients of correlation between industry rankings by nominal and effective rates of protection in the United States, the European Community and Japan are presented in Table 6.4. Both the EC and Japan exhibit rankings by nominal and effective freight factor rates which closely correspond with the U. S. protection pattern. The similarity in freight factor protection rate levels across countries has been established from Table 6.3. These results suggest that freight charges in ad valorem terms do not bear more heavily on U. S. exports than on U. S. imports. The consistency in rankings and rate levels imply a uniformity of the rate-making behavior of liner conferences on inbound and outbound U. S. trade routes.

Substantial differences in industry rankings by nominal and effective tariff rates are observed between the U. S. and the EC, as well as between the U. S. and Japan. None of these correlations are statistically significant at the 5 percent level of confidence. When freight factors and tariff structures are combined, only the EC displays a ranking of industries by combined effective rates which is similar to the combined U. S. effective protection pattern. The Spearman's rank correlation coefficient between U. S. and EC combined effective protection rates is .893. Freight factor structure is observed to exert an extremely strong bias in the direction of aligning EC and U. S. combined effective protection rate rankings.

6.4 Tariff and Freight Factor Escalation: Empirical Evidence

Nominal and effective rates of protection stemming from United States tariffs and freight factors for twenty-seven commodity groups are presented in Table 6.5. Commodity groups are arranged in the order of their stage in each production process. A detailed examination of the results indicates that nominal tariffs tend to escalate by stage of processing for most manufacturing activities. Wool clothing, furniture and tobacco products do not exhibit this pattern of tariff escalation. Effective rates of tariff protection are found to be an increasing function of the stage of fabrication for activities producing cotton clothing, leather products, wood containers, paper products and nonferrous metal manufactures.

Nominal freight factors are found to escalate by stage of fabrication for wool clothing, leather products, and nonferrous metal manufacturing activities. The remaining production processes exhibit a substantial degree of freight factor de-escalation and effective freight factor protection rates are not observed to be an increasing function of the stage of manufacture. Only

TABLE 6.5.--United States Nominal and Effective Rates of Protection from Post-Kennedy Round Tariffs and Freight Factors by Stage of Fabrication

Commodity Group	Nominal Protection		Effective Protection		
	Tariffs	Freight Factors	Tariffs	Freight Factors	Total
Tobacco Manufactures					
Tobacco	21.1	9.6	175.4	-4.0	171.4
Cigarettes, cigars	16.6	5.8	19.8	5.0	24.8
Textiles and Products					
Wool yarn and thread	26.9	4.9	85.6	0.0	85.6
Wool fabrics	46.4	5.1	87.0	3.4	90.4
Wool clothing	27.0	6.9	30.1	11.7	41.8
Cotton yarn and thread	8.4	9.1	12.3	17.7	30.0
Cotton fabrics	12.2	5.4	25.1	6.9	32.0
Cotton clothing	20.0	5.7	27.1	12.4	39.5
Leather and Products					
Leather	6.0	6.1	11.5	8.2	19.7
Leather products, excluding shoes	15.7	8.2	36.1	12.9	49.0
Shoes	11.1	7.3	17.5	8.4	25.9
Lumber and Paper Products					
Sawnwood	0.0	37.0	-3.9	87.1	83.2
Plywood and veneer	12.1	20.0	38.9	29.5	68.4
Wood furniture	6.3	28.4	8.5	48.5	57.0
Wood containers	16.7	24.1	45.3	35.7	81.0
Woodpulp	0.0	17.9	-11.9	80.3	68.4
Paper and paperboard	3.6	12.0	6.1	10.1	16.2
Paperboard containers	6.2	6.4	7.6	6.1	13.7
Nonferrous Metals					
Primary copper	1.8	2.1	14.2	-3.8	10.4
Copper rolling and drawing	3.9	2.9	10.8	5.4	16.2
Copper castings	8.8	3.1	15.1	2.5	12.6
Primary aluminum	4.6	5.4	10.7	8.6	19.3
Aluminum rolling and drawing	6.9	4.3	18.0	3.4	21.4
Aluminum castings	11.0	7.1	23.0	11.3	34.3
Iron and Steel Products					
Pig iron	1.0	28.5	1.0	86.7	87.7
Steel ingots	6.1	24.7	18.1	64.8	82.9
Metal manufactures	8.1	13.1	13.1	19.3	32.4
Average, weighted by OECD imports from:					
Other OECD countries	9.6	12.9	18.0	25.0	43.0
LDC's	13.2	11.7	24.1	21.9	46.0

cotton clothing, leather goods, and aluminum processing activities display total effective protection rates that rise with the stage of fabrication. The inclusion of freight factor structure is found to partially offset the tariff escalation pattern of protection widely held to pose a significant barrier against attempts by low income nations to industrialize.

6.5 Recent Changes in Freight Factor Levels

The proceeding analysis is based on freight factor ratios calculated from liner conference rate schedules pertaining to 1974. Empirical findings will be altered to the extent that these rates have changed relative to United States import values. Recent movements in freight factor levels are evaluated by comparing post-1965 freight rate indices relative to import unit value indices for the United States. Freight charges have had the opportunity to adjust in response to recent advances in maritime technology, currency realignments and major petroleum price increases that occurred in late 1973 and early 1974. Evidence suggests that ad valorem liner freight charges have remained relatively constant over the 1974-1976 period. Ocean liner, tramp freight and unit value import indices are presented in Table 6.6.

The only indicator of liner freight rate charges currently available is complied by the Ministry of

TABLE 6.6.--Recent Trends in Freight Rate and U. S. Import Unit Value Indices

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Liner Freight Index[1]												
Jan-Mar	99.3	105.8	106.8	106.8	108.7	112.4	121.8	130.2	133.9	172.4	201.4	209.8
Apr-June	101.2	104.9	107.7	108.7	110.5	114.3	126.5	133.0	138.6	187.3	206.1	217.3
July-Sept	100.2	104.0	108.7	107.7	109.6	114.3	126.5	131.1	140.5	192.0	206.1	215.4
Oct-Dec	99.3	102.1	106.8	107.7	109.6	115.2	130.2	131.1	147.1	193.9	206.1	218.3
Yearly Average	100.0	104.2	107.5	107.7	109.6	114.0	126.2	131.3	140.0	186.8	204.9	215.2
U. S. Import Unit Value Index: Manufactured Goods												
Yearly Average	100.0	102.6	105.0	105.7	108.7	117.6	125.0	135.2	156.8	195.5	220.0	223.1

TABLE 6.6.--Continued

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Dry Cargo Voyage Charter Index[2]												
Jan-Mar	97.5	99.5	77.8	91.6	85.7	108.4	95.6	67.0	113.3	227.6	156.2	121.2
Apr-June	97.5	87.7	85.7	90.6	80.7	120.2	79.8	66.0	141.9	227.6	139.9	131.0
July-Sept.	102.5	78.8	102.5	91.6	80.7	123.1	71.9	70.9	157.6	201.0	128.1	136.0
Oct-Dec.	102.5	80.7	105.4	89.6	87.7	118.2	71.9	89.6	215.8	200.0	135.0	139.9
Yearly Average	100.0	86.7	92.8	90.7	83.7	117.5	79.8	73.4	157.1	214.0	139.0	132.2
U. S. Import Unit Value Index: Crude Materials												
Yearly Average	100.0	103.3	100.0	100.3	104.9	105.3	106.6	111.1	138.0	134.4	364.8	393.2

Sources: Freight Indices: Organization for Economic Co-operation and Development, Maritime Transport (Paris: 1976 and various issues); also, Import Unit Value Indices: United States Department of Commerce, Overseas Business Reports (Washington, D.C.: U. S. Government Printing Office, July 1973 and various issues)

[1]Based on voyage charter and liner rates on cargoes via north continental ports on German account, but not restricted to German Flag (1965 = 100).

[2]Based on tramp voyage rates on 28 routes, arranged in five bulk commodity groups (1965 = 100).

Transport of the Federal Republic of Germany. Since the 1974 base period of the present study, the liner rate index and the import unit value index both registered increases of about 28 percent. Recent indices are not available, but freight rate increases are widely publicized. Since 1977 cumulative rate increases of 28 percent have been announced by the North Atlantic Continental Freight Conference which operates between the U. S. North Atlantic ports and Germany.[2] The most recent rate adjustment will go into effect in July 1978. Rate increases are intended to offset the declining value of the U. S. dollar in relationship to European currencies.

Recent movements in dry cargo voyage charter (tramp) rates are also of interest. Rates are negotiated at the time of shipment and are, therefore, subject to wide fluctuations in response to changing demand and supply conditions. The tramp index presented in Table 6.6 pertains to major bulk commodity groups: iron ore, grain, coal, bauxite and alumina, and phosphate rock. Vigorous growth in the demand for shipping service bid up tramp rates over the years 1973-1974. During these years, ad valorem equivalents of these rates registered a 60 percent increase. Excess capacity resulting from the economic recession of 1975 depressed tramp rates to historically

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[2] "Steamship Groups Set 10% Rate Boosts to European Ports." <u>Wall Street Journal</u>, 12 April 1978, p. 8.

low levels. Recent movements in the dry cargo time charter and tanker voyage indices, not presented here, follow a pattern similar to the voyage charter index.

6.6 Conclusion

Three sets of empirical results support the conclusion that the overall level of effective protection afforded by freight factor structure is as large or larger than that afforded by post-Kennedy Round tariffs. Effective protection rates are frequently employed to indicate the direction of protection-induced interindustry resource flows. Combined effective rates are found to infer a pattern of industrial protection and concomitant pattern of resource flows quite distinct from that indicated by effective tariff rates alone. Productive activities operating under low rates of protection from tariffs are observed to enjoy substantial protection from freight factor structure. The exclusion of freight factors from the analysis understates the level of protection for these industries. Freight factors, unlike tariffs, are not observed to escalate by stage of fabrication.

Freight factor structure is found to erect a substantial barrier against U. S. exports to the European Community and to Japan. These nations also levy tariffs on a c.i.f. basis, which tends to equalize marginal cost among competing sources of supply in foreign markets. To remain competitive, U. S. producers must reduce operating costs in direct proportion to the added cost resulting from freight factors and tariffs. This penalty is severe in trade with the European Community, an intra-EC trade is not so protected. The existence of a secondary burden imposed against U. S. exporters from significantly higher outbound freight charges is not confirmed by empirical results.

CHAPTER VII

TARIFFS, FREIGHT FACTORS AND LABOR PROTECTION IN UNITED STATES INDUSTRIES

7.1 Introduction

This chapter tests empirically whether the structure of United States tariffs and freight factors protect labor in manufacturing industries. Empirical investigations of the relationship between U. S. protection rates and labor intensity have been conducted by Vaccara (69), Balassa (4), Basevi (9), and Cheh (16). Two features of the present study are unique. First, the analysis is expanded to include freight factor protection rates. Freight factors account for a large part of the total protection enjoyed by manufacturing activities. Their inclusion is a necessary step in attempts to assess propositions concerning a nation's total protective structure. Second, traditional measures of labor intensity based on direct labor requirements are discarded in favor of the theoretically preferred total labor requirements.

7.2 Rates of Protection, Labor Intensity and the Leontief Paradox

Empirical examinations of the relationship between rates of protection and industry labor use have produced mixed results. Vaccara (69) has provided evidence that a positive relationship exists between nominal tariff rates for United States industries and labor intensity, as measured by either the share of labor income in output value (direct labor cost) or by the ratio of employment to value of output (direct labor use). Studies by Balassa (4) and Basevi (9) did not confirm a significant positive correlation between effective rates of protection on total value added and labor intensity. However, for 1958, Basevi has found a significant negative correlation between labor intensiveness in U. S. industries and effective rates of protection on value added by labor. A statistically significant positive relationship between direct labor use and both nominal and effective tariff rates is confirmed by Cheh (16).

Vaccara's findings that U. S. nominal tariff rates vary positively with labor intensity is advanced by Travis (50) as one explanation for the Leontief Paradox. Since nominal tariffs restrict labor intensive imports, Travis argues that U. S. trade policy is responsible for Leontief's discovery that a representative bundle of U. S. exports embodied more labor relative to capital than did one of U. S. imports. In the absence of tariffs, labor intensive imports would increase relative to capital intensive imports, establishing the pattern of trade in accordance with the United States apparent comparative advantage in capital intensive manufactures.

According to Basevi, the true measure of protection is given by the effective protection rate, and not by nominal tariffs which ignore the tax influence of tariffs on intermediate inputs. Since no positive relationship has been found between labor intensity and effective tariff rates, Travis's hypothesis is refuted.

Cheh (16) has argued that the relevant test for Travis's hypothesis is whether a total measure of protection, including both tariff and nontariff barriers is positively correlated with labor intensity. The analysis is extended to include the restrictive effects of import quotas, the American Selling Price customs valuation system, federal highway subsidies and a variety of federal, state and local taxes.[1] Both nominal and effective total protection rates are examined as the former discourages domestic consumption of imports, while the latter encourages their domestic production. Although a positive

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[1]The analysis included nontariff distortions whose effects were previously quantified on an industry by industry basis by Baldwin (6).

relationship was established between industry labor use and both nominal and effective tariff rates, all statistical significance vanished in each case with the inclusion of nontariff trade barriers. Results did not support Travis's hypothesis.

7.3 Empirical Test of the Travis Hypothesis

Absent in all previous studies is an accountability of protection from freight factor structure. The purpose here is to test Travis's hypothesis by investigating whether the combined structure of U. S. tariffs and freight factors is positively related to labor intensity. Following Cheh (16), both nominal and effective protection rates will be used in the empirical analysis.

Data for protection rates are taken from Table 6.1 of the present study. Industry total labor requirements, obtained by combining immediate labor use coefficients with the total requirements matrix (Leontief inverse) of the 1970 United States input-output table, serve as the index for labor intensity.[2] Total labor coefficients are theoretically preferred over the simple

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[2]Total labor requirements were computed by Robert A. Brusca for use in an unpublished dissertation at Michigan State University. For a discussion on the estimating procedure, and on the similarity between these and immediate factor requirements (factors employed in the final stage of fabrication), see Brusca (13, pp. 25-88, 160-62). The use of total labor requirements was suggested by Travis (51).

ratio of employment to output value as a measure of labor content, since the former includes labor requirements of inputs into the process, inputs into the inputs, and so forth.

Results of this investigation are presented in Table 7.1. All coefficients on labor use are positive, but in only three cases are they significant. A positive relationship is confirmed between labor intensity and both nominal and effective tariff rates. Higher rates of nominal tariff protection afforded labor intensive industries are not offset with the introduction of freight factors. However, equation (6) reveals no significant relationship between combined effective protection measures and labor use. This finding is consistent with that of Cheh (16).

7.4 The Protection of Unskilled Labor

The belief that United States tariffs protect unskilled labor is based on a demonstration by Stolper and Samuelson (48) which shows that in a simple two-sector Heckscher-Ohlin model free trade would reduce absolutely the returns to the scarce factor of production. Leontief (38) has offered evidence that U. S. export production is skilled labor intensive relative to

TABLE 7.1.--Regression Results: Rates of Protection on Labor Intensity

Dependent Variable	Independent Variable		R^2	Number of Observations
	Constant	Labor Use		
1. Nominal tariffs	0.03	1.86* (0.54) (3.44)	.18	54
2. Nominal freight factors	0.08	1.20 (1.54) (0.77)	.01	54
3. Nominal Tariffs and freight factors	0.11	3.07** (1.66) (1.85)	.06	54
4. Effective tariffs	0.04	3.31* (1.47) (2.25)	.09	54
5. Effective freight factors	0.14	3.52 (5.87) (0.60)	.01	54
6. Effective tariffs and freight factors	0.18	6.83 (6.36) (1.07)	.02	54

SOURCE: Labor use equals total labor requirements per thousand dollars of value of domestic shipments in 1970 (constructed from U. S. Bureau of the Census, Census of Population, 1973, and 1970 BLS input-output table).

NOTE: Estimated coefficients, followed by standard errors and t-statistics, estimated by ordinary least squares.

*Significant at 5 percent level.

import replacement production, while the existence of a relatively higher wage level in U. S. export industries is confirmed by Kravis (32). These findings suggest that the United States is both capital abundant and skilled labor abundant relative to its trading partners. Unskilled labor, the relatively scarce factor, will have an incentive to secure tariff protection. If the structure of tariffs is found to protect unskilled labor in U. S. import competing industries and this protection is not offset by the presence of freight factors, the joint influence of both restrictions would contribute to our understanding of the Leontief paradox.

Ball's (7) attempt to isolate a positive relationship between protection rates and the proportion of unskilled labor in each industry has been severely criticized by Cheh (16). From Balassa's (4) study on effective tariff rates for United States industries in 1962, Ball chose thirty-one industries for which data on average wages were available. The rank correlation coefficient between effective tariff rates and the average wage of all employees was found to be -.568, while that between effective tariffs and the average wage of production workers was -.685. Next Ball compared the proportion of skilled workers (defined to include professional, technical and kindred workers, craftsmen and foremen) for 20 two-digit

S.I.C. industries in 1960 with the average wage for each industry. The rank correlation between average wage for all employees and the percentage of skilled labor was .94, while that between the average wage of production workers and percentage of skilled labor was .932. He concluded that the average wage is a reasonable index for skill intensity, and since a negative correlation was found between average wage and effective tariff rates, the United States tariff structure must afford greatest levels of protection to unskilled labor industries. The test drew criticism from Cheh (16) for its comparisons of rankings at widely different levels of aggregation. Cheh offered a direct test of the relationship between the proportion of unskilled labor and both nominal and effective tariff and total (tariff plus nontariff) protection rates. At the 10 percent level of confidence, only nominal tariff rates were found to be positively related to the percentage of unskilled labor. Cheh concluded that unskilled labor intensive industries were not protected by effective tariff rates or nontariff barriers.

Following Cheh, the present study examines the relationship between the percentage of unskilled labor (ratio of total unskilled labor requirements to total labor requirements) and rates of protection from tariffs and freight factors. As in previous studies, unskilled labor is defined to include services of operatives and laborers. Results are presented in Table 7.2. Coefficients for the percentage of unskilled labor are all positive and statistically significant. The positive relationship between rates of tariff protection and percentage of unskilled labor supports Ball's (7) finding but is contrary to that of Cheh. More important, a highly significant positive relationship is isolated between the percentage of unskilled labor and both combined nominal and effective rates of protection. The combined effect of both barriers is found to bear heavily on relatively unskilled labor intensive imports, and can be held partially responsible for Leontief's scarce-factor paradox.

7.5 Conclusion

Empirical results confirm Vaccara's finding that labor intensive industries are protected by United States nominal tariffs. Effective tariff rates are also found to be higher for labor intensive sectors, but the influence of other trade distorting measures are not taken into account. Cheh's analysis of tariff and nontariff barriers produce results which do not support Travis's argument that by protecting labor in manufacturing activities, U. S. trade policy is responsible for the

TABLE 7.2.--Regression Results: Rates of Protection on Percentage of Unskilled Labor

Dependent Variable	Independent Variable: Constant	Independent Variable: % Unskilled Labor	R^2	Number of Observations
1. Nominal tariffs	-0.01	0.18* (0.05) (3.62)	.20	54
2. Nominal freight factors	-0.02	0.26** (0.13) (1.96)	.07	54
3. Nominal tariffs and freight factors	-0.03	0.44* (0.14) (3.10)	.16	54
4. Effective tariffs	-0.09	0.43* (0.12) (3.48)	.19	54
5. Effective freight factors	-0.21	0.89* (0.51) (1.72)	.05	54
6. Effective tariffs and freight factors	-0.30	1.32* (0.55) (2.40)	.10	54

SOURCE: Ratio of unskilled labor requirements to total labor requirements: unskilled workers defined to include operatives and laborers (constructed from U. S. Bureau of the Census, Census of Population, 1973, and the 1970 BLS input-output table).

Note: Estimated coefficients, followed by standard errors and t-statistics, estimated by ordinary least squares.

*Significant at 5 percent level.

**Significant at 10 percent level.

Leontief paradox. In the present study, freight factor structure is found to offset the positive relationship between labor use and tariff protection measures.

When the assumption of homogeneous labor is relaxed, empirical findings differ substantially from that of Cheh. The present study establishes an extremely significant positive relationship between the percentage of unskilled labor and both nominal and effective combined rates of tariff and freight factor protection. By restricting imports intensive in unskilled labor, the relatively scarce U. S. factor, both barriers can be held responsible for the Leontief paradox.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

Unlike many nontariff barriers, freight factors can be quantified on an industry by industry basis so that the magnitude of the barrier imposed by freight factor structure in international trade can be assessed. Freight factors represent the ad valorem equivalents of liner conference freight rates. While tariffs are a commercial policy variable, the commodity structure of ocean liner freight rates derives largely from product characteristics. Results of Chapter III confirm earlier findings that liner conference rate schedules can be systematically explained by cost and demand factors. The most important single factor accounting for variations in freight rates on individual commodities is found to be the stowage factor, a measure of cost. Conferences are also found to act as discriminating monopolists in charging "what the traffic will bear," but the influence of product unit value as a demand factor in the rate determination process is of secondary importance. Competition from independent tramps and tankers does not appear to influence the level of liner rates. A comparison of the liner rate index relative to the import unit value index for the United States suggests that ad valorem equivalents of these charges remain relatively constant over time.

Three sets of effective protection calculations are presented in this study. First, rates of effective protection stemming from freight factors and post-Kennedy Round nominal tariffs are provided for fifty-four U. S. import competing industries. A second set of calculations compares rates of effective freight factor protection confronted by U. S. export industries with that afforded U. S. import industries in trade with the nine country European Community and with Japan. The different manner in which tariff and freight factor structures interact under alternative import valuation systems is examined. Lastly, nominal and effective protection rates are assessed for U. S. productive activities by stage of fabrication. Each investigation reveals that the overall degree of protection afforded by freight factor structure exceeds that afforded by post-Kennedy Round nominal tariffs.

Few productive sectors are afforded high rates of effective protection from both tariffs and freight factors. The ranking of industries in descending order by combined effective protection rates infers a different pattern of protection induced interindustry resource flows and comparative advantage implications than that suggested by an examination of effective tariff rates alone. A comparison of industry rankings by tariff, freight factor and combined rates of effective protection implies that freight factors exert a strong influence in determining the combined pattern of industrial protection in the U. S. (see Table 6.2). Industry rankings by combined nominal tariff and freight factor rates are found to afford a satisfactory indication of this combined effective protection pattern.

Whether measured in nominal or effective terms, freight factors are not found to bear more heavily on U. S. exports than on U. S. imports. Furthermore, the United States, Japan, and the European Community display remarkably similar industrial rankings by nominal and effective freight factor protection rates. When the geographical proximity of trading partners is taken into account, the combined structure of tariffs and freight factors places U. S. export industries at a comparative disadvantage in markets of the European Community nations. Trade among EC members is not so protected. These nations also calculate tariffs on total landed import value. This practice tends to equalize the marginal cost among competing sources of supply in each foreign market. To overcome the barrier imposed by distance as well as the common external tariff, each U. S. exporter must reduce production costs in direct proportion to the added costs resulting from freight factors and tariffs.

Freight factors, unlike tariffs, are observed to de-escalate by stage of processing for the majority of product groups under investigation (see Table 6.5). The tariff escalation pattern commonly held to pose a barrier against attempts by developing nations to industrialize is partially offset when freight factors are included in the analysis.

A significant positive relationship is established between the percentage of unskilled labor in U. S. manufacturing industries and both combined rates of nominal and effective protection from freight factors and tariffs. By restricting relatively unskilled labor intensive imports, the combined structure of tariffs and freight factors can be held partially responsible for the Leontief scarce factor paradox. In addition, a large barrier is imposed by freight factor and tariff structure against unskilled labor intensive products that developing nations might hope to export to the United States.

APPENDIX

APPENDIX

"Cutthroat" Competition: Refers to disasterous rate wars prevalent among shipping lines during the 19th Century. To secure additional cargo, shipping lines engaged in the unprincipled practice of cutting rates below the actual cost of handling and carriage of the particular items concerned.

Freight Factors: Freight rates expressed as a percent of commodity unit values.

Freight Rates: Freight rates are denominated in U. S. dollars and apply per ton of 2,240 pounds or 40 cubic feet, whichever produces the greatest revenue for the Member Line. Rates apply from the vessel loading terminal at the port of exportation to the vessel discharge terminal and do not include charges for clearing merchandise through customs.

Long Ton: 2,240 pounds.

"Measurement ton" basis: Commodities which occupy more than 40 cubic feet per long ton are assigned rates on a measurement ton (40 cubic feet) basis.

Stowage factor: Number of cubic feet of ship space occupied by one long ton of a commodity, including packaging.

"Weight ton" basis: Commodities which occupy less than 40 cubic feet per long ton are assigned rates on a weight ton (2,240 pound) basis.

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