

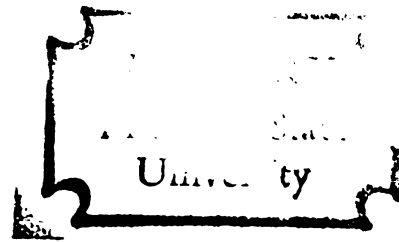
PRICE ELASTICITIES AND THE EFFECTS OF TRADE
LIBERALIZATION FOR THE UNITED STATES, THE
EUROPEAN ECONOMIC COMMUNITY AND JAPAN

Dissertation for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

JOE ALLAN STONE

1977



This is to certify that the

thesis entitled

PRICE ELASTICITIES AND THE EFFECTS OF
TRADE LIBERALIZATION FOR THE UNITED STATES,
THE EUROPEAN ECONOMIC COMMUNITY AND JAPAN

presented by

Joe Allan Stone

has been accepted towards fulfillment
of the requirements for

Ph. D. degree in Economics

Mordechai Klein

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Date February 3, 1977

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ABSTRACT

PRICE ELASTICITIES AND THE EFFECTS OF TRADE LIBERALIZATION FOR THE UNITED STATES, THE EUROPEAN ECONOMIC COMMUNITY AND JAPAN

By

Joe Allan Stone

The purpose of this study is two-fold--first, to develop improved estimates of price elasticities of import demand; and second, to use these estimates to predict, at "industry" levels, the potential effects of alternative trade liberalization schemes. The commodity categories included in the study are manufacturing categories for the United States, the expanded European Economic Community, and Japan.

Estimates of price elasticities of import demand are improved in four areas: comparability, applicability, consistency, and specification. First, comparability is improved because the elasticities are estimated for comparable categories using the same sample period and a generally similar methodology. Second, the elasticities presented are more applicable to the E.E.C. as one unit than are previous estimates, since the estimates are derived on that basis. Third, the statistical consistency of the estimates is improved by attempting to correct for errors in unit

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value trade data and for "simultaneity" bias. Fourth, the traditional use of relative price is reconsidered, and a more flexible specification is generally used.

The estimates of the effects of trade liberalization are presented for three modalities of liberalization: first, a sixty percent reduction in all tariffs and elimination of tariffs of five percent or less; second, percentage reductions equal to the original height of each tariff; and third, the elimination of quotas on textiles and steel. Rising supply prices are considered as an alternative to constant supply prices, and the traditional identities relating a trade elasticity to the domestic demand and supply elasticities are also reconsidered.

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PRICE ELASTICITIES AND THE EFFECTS OF TRADE LIBERALIZATION
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COMMUNITY AND JAPAN

By

Joe Allan Stone

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Economics

1977

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CHAPTER 1

INTRODUCTION

1.1 Background and Purpose

Meeting in Tokyo on 14 September 1973, the Ministers of the General Agreement on Tariffs and Trade (GATT) officially opened a new round of negotiations aimed at dismantling restrictions to international trade. The "Tokyo Round" begins with a legacy of success established by a series of trade negotiations held since World War II. These post-war rounds of international trade negotiations have contributed to three decades of economic growth among industrialized countries. Unlike its predecessors, however, the Tokyo Round is staged against a backdrop of world-wide recession, chronic inflation, and drastically higher petroleum prices.

The purpose of this study is two-fold--first, to develop improved estimates of the required price elasticities of import demand and, second, to use these estimates in a model designed to predict, at "industry" levels, the potential effects of alternative trade liberalization schemes. The focus is on trade in manufactures of the United States, the recently expanded European Economic Community, and Japan.

1.2 Previous Studies and Methodology

There have been many studies of trade flows and trade liberalization in the post-war period--too many to describe in detail here. Leamer and Stern (63) provide an extensive survey of this literature and Magee (68) provides a recent discussion of research issues in this field. Table 1-1 at the end of this chapter provides an annotated list of selected studies beginning with the benchmark Orcutt (81) article, tabulated by author, year, scope, disaggregation level, sample period, functional form, and lag technique. Specific studies will be singled out when pertinent to the development of a particular topic.

The distinguishing characteristics of this study are best discussed in relation to the dual purposes established above. In regard to the first objective, estimates of the required price elasticities of import demand are improved in four areas: comparability, applicability, consistency, and specification. First, comparability is improved because the elasticities for the U.S., the E.E.C., and Japan are directly estimated for comparable commodity categories based on the same sample period and on a generally similar methodology. Previous work has largely been on a piecemeal basis--estimating price elasticities for one country or for several countries but for noncomparable categories. The amalgamation of such disparate studies is a potential source of significant bias in policy studies such as this where one is concerned with one country's estimates relative to another's.

Second, the elasticity estimates presented here are more applicable to the E.E.C. as an entire unit. Previous research treating the E.E.C. as one unit has been at the aggregate level or has concentrated on only a few commodities. The remaining studies related to the E.E.C. have concentrated on individual member countries. Unfortunately, the price elasticities for one or more component countries may not provide adequate information about the price elasticities for the E.E.C. as one unit. The sample data for each category in this study are E.E.C. trade, net of intra-E.E.C. trade. Where both possible and essential, data for the three new E.E.C. entrants (the United Kingdom, Ireland, and Denmark) were included in the sample to assure the applicability of the results to the expanded E.E.C.

Third, the statistical consistency of the estimates is improved by giving due consideration to the potential bias resulting from the use of unit value trade data and from the simultaneity problem. Trade data are published only after some aggregation of commodities has taken place. Unit value and quantity statistics taken from this data are correct only if the composition of the category remains unchanged or if the changes within the category cancel one another. Otherwise, the statistics will be in error. In this case the ordinary least squares estimator of the price coefficient is biased toward minus one.¹ This potential bias and the procedures used to minimize it are discussed in more detail in

¹See Shinkai (97, p. 272).

Chapter 3. The simultaneity problem refers to the fact that quantity and price are usually determined simultaneously by the interaction of the forces of demand and supply. The ordinary least squares estimator in this case is biased toward the price coefficient of the corresponding demand or supply function. Like the unit value problem, this issue is discussed in more detail in Chapter 3.

Fourth, the traditional specification of trade functions using a relative price variable is used only when this approximation is required to obtain reliable estimates. Basic theory suggests that if all prices change proportionately and all real explanatory variables remain unchanged, then the quantity demanded or supplied remains unchanged. This absence of "money illusion" is the justification for using a relative price variable which imposes the assumption that the own price of the traded commodity and the price of the domestic substitute have equal but opposite effects on trade in the commodity. There are a variety of reasons for believing that in practice this assumption is a poor approximation. Chapter 2 discusses these reasons in detail, and Chapter 3 discusses the restrictions placed on the use of relative price in this study.

The second major objective is to build the analytical framework needed to predict the effects of trade liberalization. Fortunately, most of this framework has been constructed and used previously by others.² Three distinguishing characteristics of this particular

²For both theoretical and applied examples, see Johnson (45) and (46), Balassa and Kreinin (5), Leamer and Stern (63), and Magee (69).

study are worth mentioning, however. First, three methods or modalities of trade liberalization are considered. The first two involve explicit tariffs and the third concerns non-tariff restrictions.

There are two basic approaches to tariff reductions. One is across-the-board reductions in all tariffs, and the other is reductions in tariffs which are proportional to the original height of the tariff. The objective of the latter approach is the harmonization of tariffs across both countries and commodities. For the purposes of this study these two approaches are formulated as follows:

Scheme A: The maximum authority under the Trade Reform Act of 1974--a sixty per cent reduction in all tariffs and elimination of tariffs of five per cent or less.

Scheme B: Percentage reductions equal to the original height of the tariff.

There is an inherent scale problem in comparing across-the-board schemes with harmonization schemes. One objective, therefore, is to compare the relative effects of the two approaches given any arbitrary scale of average tariff reductions. The computed effects for Scheme B may be adjusted to any scale of trade liberalization by a simple multiplicative factor.³

Elimination of non-tariff barriers may be done separately or in conjunction with reductions in explicit tariffs. There is an almost infinite list of non-tariff barriers to trade. Work has been done recently on the American Selling Price system of evaluation

³This is true of all the effects except deadweight loss (gain) calculations which depend upon the square of the scale. See Chapter 2, Section 2.2.

in chemicals by Jadow (42), on the barriers to trade in iron and steel by MacPhee (67), and on a variety of quotas by Magee (69). Consequently, only the major quotas on steel and textiles will be considered here. The primary effects of these quotas will be summarized in light of the relevant price elasticities estimated in this study.

A second distinguishing characteristic of this study is that the possibility of rising supply prices is considered. Most studies examining the effects of eliminating or imposing trade barriers have claimed that the full burden of the barrier is borne on the import side by assuming that export supply is perfectly elastic. This study follows the precedent of Balassa and Kreinin (5) in considering the possibility of rising supply prices for large traders. Chapter 3 examines the estimation of price elasticities of export supply in detail.

A third distinguishing characteristic is a critique of the traditional use of elasticity identities which relate import (export) price elasticities to the domestic demand and supply elasticities. These identities have been used extensively for a variety of purposes. Unfortunately, the statistics available for use in these formulas are not the same as those dictated by the theory underlying the formulas. Chapter 2 discusses this issue in conjunction with the problem of allocating the domestic effects between producers and consumers.

1.3 The Format

Chapter 2 deals with the analytical framework required to predict the effects of trade liberalization on prices, trade volumes, employment, and welfare. Chapter 3 discusses the treatment of variables, the choice of estimators, and the use of relative price. Chapter 4 presents the econometric results, an explanation of the estimation process, and a summary of the results. Chapter 5 details the effects of the various liberalization schemes on tariffs, trade, and welfare and also includes a special section which estimates the domestic employment effects in the United States. Chapter 6 includes a summary of results and recommendations for future research.

TABLE 1-1.--Annotated List of Selected Trade Studies.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Orcutt	1950	--	--	--	--	--	Suggested that early estimates of price elasticities were biased downward by single equation estimation, errors of observation, price lags, and "index" problems for large categories.
deVries	1951	US	176 commodities	--	--	--	Estimates of implicit "tariff" elasticities of import demand based upon 1945 Tariff Commission projections of a 50% change in the 1939 U.S. Tariff levels.
Morgan & Corlett	1951	6 countries	From 2 to 12 commodities by 2 regions of origin. Several models at the commodity level dealing with wheat (Australia, N.Z., Argentina), steel plate (Sw), and butter (U.K.)	1890-1904 1890-1914 1920-1936 1920-1934 1920-1928	log-linear	unlagged and t-1	OLS applied to the six country import data with poor results. LIML applied to demand and supply equations for wheat, steel-plate, and butter, again with poor results. "Wrong" signs a problem in both studies.

TABLE 1-1.-- Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Horner	1952	Australia	3 commodities (wool, wheat, and butter)	1936-1938	log-linear	--	Estimated internal demand elasticities and arbitrary internal supply elasticities used to derive import demand and export supply elasticities.
Adler, Schlesinger, & Van Westerborg	1952	US	4 stage-of-process groups by 8 regions of origin	1923-1937	linear	--	Regional competition introduced along with new unit value and export quantity indices (used by Reimer, 1964).
Piquet	1953	US	226 commodity groups	--	--	--	Provided estimates (based upon "expert" opinion) of increases in 1951 imports due to a complete, unilateral suspension of tariffs and quotas.
Lovasy & Zassenhaus	1953	US	Raw materials	1928-1939 1947-1952	linear	one year	Provided estimates of import demand.
Neisser	1953	US	Raw materials, food, finished manufactures	1925-1937	linear	--	Estimates of import demand elasticities derived and post-war forecasting made.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Neisser & Modigliani	1953	3 groups overall, 11 for imports, 4 for exports	3 large categories (raw materials, food, and manufactures)	Inter-war	linear	--	36 structural equations (both imports and exports) estimated individually with prices exogenous. Trade "multiplier" effects included.
Polak	1953	25 countries	Aggregate exports and imports with two to five categories for the major countries	1945-1932	linear	t-1	A system of equations determining imports, exports, and income with supply conditions ignored. OLS justified by recursive nature of system. Statistically significant price coefficients found for only a few countries for either imports or exports.
Bergstrom	1955	New Zealand	Dairy products, lamb, mutton	1928-1938	log-linear	--	A 27 equation model of N.Z. exports explaining demand, supply, wages, and income. LIML was clearly superior to OLS. Low autocorrelation, but significance levels also low.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Malach	1957	Canada	Wheat, newsprint, woodpulp and iron ore exports	1920-1938 1919-1939	log-linear	--	Arbitrary domestic elasticities used to derive export elasticities. However, price and income elasticities are estimated for export demand.
Johnson	1958	UK	13 commodity groups	--	--	--	Used "institutional" projections made by the Economist Intelligence Unit study to estimate the gains from freer trade with Europe.
Cheng	1959	--	--	--	--	--	A survey and index of 42 books and articles published from 1937 to 1957 pertaining to trade elasticities and propensities.
Krause	1959	US	Aggregate (less food and raw materials), divided into "reduced" and "nonreduced"	1952-1956	--	--	Estimated effects (1949-51 base) of the Torquay tariff changes derived by comparing the "reduced" group to the "nonreduced" group. Cross-elast. essentially ignored.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Wemelsfelder	1960	Germany	Industrial end-products, semi-manufactures, textiles	1950-1958	linear	--	Estimated effects of the 1956-57 German tariff reductions by fitting "pre" and "post" reduction trend lines. Welfare gains measured <u>a la</u> Marshall at constant terms of trade.
Johnson	1960	--	--	--	--	--	A direct treatment of the welfare effects of tariffs along Marshallian lines using demand curves as "marginal valuation" curves and incorporating terms of trade effects. Results used in developing the notion of "scientific" tariff.
Klein, Ball, Hazelwood, & Vandome	1961	UK	Food, raw materials, and manufacturing imports. Aggregate, food, and engineering exports by 3 regions	1948-1957	linear	to t-2	Estimated as part of an integrated domestic model. Equations estimated individually.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Kreinin	1961	US	"Reduced" and "nonreduced" categories of manufactures	1955-1959	--	--	Effects of tariff changes on the "reduced" group derived from a "nonreduced" control group. Upper and lower bounds to cross-elasticity considered.
Prais	1962	--	--	--	--	--	An evaluative survey of trade studies and summary of early criticism by Orcutt and Harberger. Use of quarterly data and disaggregation suggested.
Krause	1962	US	2 groups of manufactures	1947-1958	linear	--	Cross-section data by product used to estimate import ratios with price and tariff as separate variables. Defense of unit value included.
Ferguson & Polasek	1962	US	Raw apparel wool	1954-1960 quarterly	linear	t-4 for price of substitute	Estimated import demand as a function of relative price, activity, and a price index of substitutes. "Shifting" considered.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Ball & Marwah	1962	US	Services and 5 categories by stage-of-processing	1948-1964 quarterly	linear	t-1	Stocks used as a variable for semi-manufactures. Only demand relations were estimated.
Stern	1964	US	22 SIC commodity groups	--	--	--	Two sets of estimates for the effects of tariff and quota suspension--one based upon Piquet's 1951 study, the other upon import demand as a function of arbitrary domestic demand and supply elasticities. difference between domestic and world prices used to derive quota results. Effect on Canadian exports also considered. Welfare effect measured at constant terms of trade and constant utility <u>a la Marshall</u> .
Reimer	1964	US	Material imports by six regions of origin	1923-1960	linear	--	Found significant shifting over time.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Rhomberg & Boissonneault	1964	US W. Europe Rest of world	Total merchandise imports and exports by region	1948-1962	Linear	--	OLS used to estimate exports and imports as part of a 29 equation model for the three regions. Projections made for 1964-1968.
Floyd	1965	US	Aggregate exports and imports	1957-1959 base	--	--	Elasticities of demand & supply of imports and exports constructed from "prior" estimates of internal elasticities of demand and supply. Results used to estimate overvaluation of the dollar.
Johnson	1965	--	--	--	--	--	An effort to measure the cost of protection directly from explicit utility and transformation functions. Consumption and production costs computed for various tariff levels. Cost of "self-sufficiency" considered.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Rhomberg & Boissonneault	1965	US	By 5 stages-of processing plus coffee, sugar, autos, and petroleum	1948-1961 quarterly	linear	Koyck	Designed for forecasting. Import time lags appear short.
Steuer, Ball, & Eaton	1966	UK	Machine tools	1956-1962 quarterly	linear log-linear	unlagged and t-1	Ratio of unfilled orders to current production used to explain foreign orders, Linear and log-linear forms performed similarly.
Johnston & Henderson	1967	UK	Aggregate imports of goods and services	1955-1964 quarterly	linear	unlagged and t-1	Estimated import functions entered into a general model to consider possible "secondary" effects.
Leser	1967	Ireland	Aggregate, 4 commodity categories, 55 SITC divisions	1953-1963 quarterly	linear single-log	t+2, t-1	Lead effect used for crude materials. Use of time trend reduced autocorrelation.
Kreinin	1967	US	Aggregate, manufactures and food stuffs by two stages-of processing	1954-1964 quarterly	log-linear	unlagged and t-1	Lagged and unlagged results similar. Estimates for 5 major regions derived from US results by assuming identical international elasticities.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Balassa & Kreinin	1967	6 industrial countries	3 stage-of-processing classes, industrial materials and manufactures	1960 base	--	--	Eclectic study using prior information and elasticity identities to derive the results. Export supply elasticity introduced arbitrarily. "Feedback" effects from LDCs considered. Welfare gains measured a la Marshall with terms of trade effect added.
Basevi	1968	US	Aggregate	1958-1962 base	--	--	Model designed to include terms of trade effects in the welfare effects of a unilateral reduction in US tariffs. Welfare gain and implicit devaluation computed from previously estimated trade elasticities.
Shinkai	1968	Japan	4 one-digit classes, 6 two-digit	1964-1965	log-linear	--	Cross-section study of demand for Japanese exports. Bias in OLS price elasticity toward -1 due to unit value errors indicated by results at different aggregations.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
McGeehan	1968	--	--	--	--	--	Survey of research bearing on "competitiveness" in trade, emphasizing the UK.
Branson	1968	US	10 end-use groups, exports by destination	1955-1966 quarterly	linear	Koyck	Ratios used as dependent variables. Supply functions omitted. Import and export demand lags appear short.
Prachowny	1969	US	Consumer goods, capital goods, raw materials	1953-1964 quarterly	linear	Koyck	Set up as a balance of payments model. Both OLS and TSLS used in estimation.
Houthakker & Magge	1969	Exports & imports for 15 countries, imports for 3 & exports for 11	Total US imports and exports by 17 countries, exports and imports by 5 stage-of-processing classes	1951-1966 annually 1947-1966	log-linear	--	Emphasis placed upon income elasticity of demand. Totals by country estimated annually, commodity classes quarterly. supply functions omitted from study.
Officer & Hurtubise	1969	Canada	8 end-use import classes 21 export groups to US	1953-1965 quarterly	linear	Almon	Both OLS and Hildreth-Lu techniques used to estimate price effects of the Kennedy Round for Canada. Actual price indices used in place of unit values.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Adams, Eguchi, & Meyer-zu- Schlochtern	1969	11 areas	Aggregate im- ports & exports	1955-1965 quarterly	linear	t-1	Both structural and forecasting equations are presented. Inventories, unfilled orders, price (without tariff), and activity measures among explanatory variables. OLS residuals serially correlated.
Adler	1970	US	Manufacturing exports to 13 countries	1953-1963	log- linear	--	Rank correlation of the regression results indicated the difference in income elasticity for US and competitor's goods is related to the difference in their price elasticities in each market--support for the product cycle theory of trade.
Leamer & Stern	1970	--	--	--	--	--	Book treating measurement of import and export relationships, elasticity of market substitution, and welfare effects.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Depler	1971	--	--	--	--	--	Comment that the Adler (1970) correlation results are invalid on clear theoretical grounds.
Kravis & Lipsey	1971	US OECD	Iron & steel, nonferrous metals, metal manufactures, electrical machinery, transport equipment, autos--usually by several regions of origin and destination	1953 1957 1961-1964	linear log-linear	--	Attempt to assess "price competitiveness" with emphasis on the US. Price indices based upon actual price surveys. Quality and other non-price factors also considered.
Gregory	1971	US	Aggregate imports, producer durables, consumer durables, consumer nondurables	1948-1968 quarterly	log-linear	t-1, t-2	Import demand functions derived from CES utility function. Waiting time, lagged inventory ratios, time, and price ratios used as explanatory variables.
Fortune	1971	US Canada	5 types of electrical appliances	1959-1967 monthly	log-linear	t-2, t-3 t-5	Analysis of US exports to Canada. Domestic demand and supply estimated in reduced

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Price & Thornblade	1972	US	26 categories by 11 regions	1964-1969 quarterly	log-linear	3 qtr. average for prices, 1 qtr. for income/activity	form for both US and Canada. Export and import elasticities derived from identities. Time lags appear very short. OLS and unit values used in estimation. Emphasis on manufactures and developed countries.
Kwack	1972	US	2 export groups 5 import groups	1960-1967 quarterly	linear	--	Estimated export and import demand. Non-farm business inventories and "weighted" WPI used. US grants and loans and international reserves important for export demand.
Magee	1962	US	Aggregate, petroleum, steel, textiles, sugar, meat and dairy products	--	--	--	Welfare effect of tariffs and quotas measured at constant terms of trade. Quota estimates based upon difference between US

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Mintz	1973	US	Sugar, textiles, dairy products, meat, petroleum, and steel	--	--	--	and world prices and proportion of implicit tariff revenue captured. effect of Burke-Hartke bill considered.
							Computation and classification of the costs of U.S. import quotas.
Krein	1973	10 countries	56 groups for the US, 4 to 8 for others	1964-1970 quarterly	log-linear	unlagged and t-1	Estimated simple import demand functions for each country. Rejected the hypothesis that domestic demand has a non-price mechanism effect on exports.
Wilson	1974	US	Aggregate imports, 8 end-use groups, 5 regions of origin	1958-1971 quarterly	log-linear	unlagged and Shiller	In estimation Shiller lag slightly better, in simulation slightly worse.
Bergsten	1974	--	--	--	--	--	Study of the different economic and political implications of import quotas versus voluntary export quotas. Emphasis on US experience.

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
MacPhee	1974	Major steel producing countries	Steel	--	--	--	Estimate of the magnitude of non-tariff barriers and the impact of their reduction.
Khan	1974	15 LDCs	Aggregate import and export demand	1951-1969	log-linear	unlagged & Koyck	2 SLS used. Equilibrium model generally superior. Impact of quotas measured by coefficient of autocorrelation. The results suggest that Marshall-Lerner condition is satisfied for most LDCs.
Khan	1975	Venezuela	Aggregate & 8 sectors	1953-1970	log-linear	--	Results show aggregation bias for elasticities due to "distribution elasticity."
Khan and Ross	1975	14 industrial countries	Aggregate imports	1960-1972 semi-annually	log-linear	--	Attempt to separate cyclical and secular effects of income. Results support thesis that US and UK trade balances would deteriorate with uniform growth in world income.
Goldstein and Khan	1976	12 industrial countries	Aggregate imports	1955-1973 quarterly	log-linear	unlagged Koyck Almon	Study found little evidence that price elasticity varies with the magnitude of a

TABLE 1-1.--Continued.

Author	Year	Scope	Disaggregation	Period	Function	Lags	Remarks
Murray and Ginman	1976	Canada & Aggregate US imports		1950-1964 1961-1968 quarterly	log- linear	--	price change. Price lag short (1 to 3 quarters). Two equations estimated for Canada--one with relative price and the other with separate prices. Difference in price coefficients sig- nificant. Zero Homo- geneity in price rejected for the US equation.
Jadlow	1976	US	39 four-digit SITC chemical groups & 4 three-digit	--	--	--	Examined the impact of reducing both tariff and non-tariff barriers on prices, trade volume, welfare, and employment. Previous elasticity estimates used to derive results.
Goldstein and Khan	1976	8 ind. countries	Total exports	1955-1970 quarterly	log- linear	none & Koyck	Full-information maximum likelihood used to esti- mate demand for and supply of exports. Price elasticities generally greater than previous estimates.

CHAPTER 2

ANALYTICAL FRAMEWORK

2.1 Import Demand and Export Supply

Importance and Derivation

Any attempt to predict changes in trade patterns must begin with the conditions of import demand and export supply. Relying upon traditional assumptions of consumer behavior,¹ one can derive the i^{th} consumer's demand for the j^{th} good as:

$$d_{ij} = d_{ij}(p_{ij}, p_{ik}, y_i)$$

where p is the money price, y is money income, and k is a vector exclusive of j . If consumer decisions are independent of decisions made by others, the market demand function is the sum of the individual demand functions. If in addition, consumers face the same prices and the distribution of income remains constant, the market demand function may be expressed as:

$$D_j = D_j(P_j, P_k, Y)$$

where Y is the sum of individual incomes.

¹For a general survey of consumption and production theory, see Quirk and Saposnik (89) and Ferguson (25), respectively.

In the absence of a domestically produced substitute, the market demand function is also the import demand function. Otherwise, import demand is the difference between domestic consumption and production at various prices. The existence of a domestically produced substitute is a difficult issue to resolve. This is especially true when dealing with a category of commodities rather than a more precisely defined commodity. The Lancaster approach to consumer theory, emphasizing characteristics rather than goods, would differentiate between almost identical goods; an aggregate approach would treat all goods alike.

In any case, the presence of domestic production means that the import demand function is now an excess demand function. Consequently, a theory of supply is necessary to explain import demand. Replying upon traditional assumptions of firm behavior, one obtains the firm supply function by substituting the profit-maximizing input demand functions into the firm's production function. If the output price is exogenous to the firm, the supply function of the g^{th} firm may be expressed implicitly as:

$$s_{gj} = s_{gj} (p_{gj}, p_{gk})$$

The aggregation of firm supply functions is subject to difficulty because of the possibility of non-price interdependence among the firms. These intra-industry externalities mean that the market supply function is not simply the sum of the individual firm supply functions. In the absence of external effects from outside the industry, however, the market supply function remains a function

of the output price and other prices. On the other hand, the presence of externalities from outside the industry means that market supply is also a function of the activity of other relevant industries. Consequently, the import demand function may be expressed in general as:

$$M_j = M_j (P_j, P_k, Y, A_j)$$

where A_j is a vector of activity variables relevant to the particular industry.

To extend the analysis to intermediate goods one need only begin with a firm's derived demand for an input rather than an individual's demand for a final good--no new assumptions are required, and import demand will remain a function of own price, other prices, and income-activity variables.

Now consider the derivation of export supply. Following the same procedure used in deriving an import demand function, one may express export supply as:

$$X_j = X_j (P_j, P_k, Y, A_j)$$

In the presence of domestic production and consumption, the assumptions required to establish import demand and export supply schedules are identical, and the functions themselves are contingent upon conditions of demand and supply.

Zero Homogeneity in Prices

Under competitive conditions traditional economic theory suggests that neither demand nor supply curves exhibit money illusion. In other words, a proportionate change in all prices would leave all real variables unchanged. In this case demand and supply functions are homogeneous of degree zero in prices. Most previous studies have interpreted this as a justification for using only one price variable (the ratio of own price to that of the closest domestic substitute) in the estimating equation.

There are at least three reasons for believing that the use of a relative price variable may significantly bias the estimated price coefficient. The most obvious objection is that the weights used in constructing domestic price indices are generally quite different from the trade weights. A second objection is that domestic indices usually include the prices of imported commodities. In this instance, the own price appears in both the numerator and denominator of a relative price variable. A third objection is related to the use of unit value trade data. The contracted price of traded goods when recorded at customs may refer to a completely different time period than the current domestic price index of that same category. Because of these objections, Murray and Ginman (76) recently tested the relative prize hypothesis at an aggregate level and rejected its general validity.

These objections, however, do not necessarily disqualify relative price as a useful approximation. Its power is limited

samples may exceed the bias it introduces. Chapter 3 discusses this issue and the use of relative price variables in the estimation process.

Functional Form

The traditional choice of the mathematical functional form for trade functions is the double-log form. Its advantages include the fact that the elasticities are themselves the estimated coefficients. There are more flexible alternatives (e.g., the transcendental-log function) which allow the functional form to be dependent upon the sample.² This approach, however, is best used when the other elements of the specification are relatively precise and the sample is fairly reliable. In light of the general volatility of trade functions and the uncertainty surrounding the sample data, the traditional choice of the double-log form appears to be the best alternative.

Tariffs and Quotas

The presence of a tariff means that the price paid by the consumer will differ from the price received by the supplier in a systematic fashion. This difference is easily accounted for in the case of ad valorem tariff rates. Assuming that t equals the import tariff rate, the system of equations for a particular commodity category becomes:

²See Sargan (94, pp. 145-204).

$$M_j = M_j (P_j, P_k, Y, A_j)$$

$$X_j = X'_j (P'_j, P'_k, Y', A'_j)$$

$$P_j = P'_j (1 + t)$$

$$M_j = X'_j$$

where primed variables refer to the rest of the world. Excluding transportation costs and other factors, the foreign and domestic prices are separated by an amount equal to tP'_j .

The introduction of quantitative restrictions in addition to tariffs requires further modifications. Under certain conditions quotas and tariffs may be treated as static equivalents in terms of the final demand price and the quantity traded.³ One sufficient set of assumptions is that foreign producers, quota holders, and domestic producers all be subject to competitive conditions. If the quota is filled, this either proves that quota holders are competitive or eliminates the need for the assumption, since the only power a quota holder can exert is to fail to fully exploit the quota share. The significance of the other two assumptions is less clear. The two major manufacturing categories presently affected on a wide scale by quantitative restrictions are textiles and iron and steel. The assumption of competition

³The development of this issue may be traced through Bhagwati (13) and (14), Shibata (96), Holzman (36), and Ophir (80). For a brief treatment of the dynamic non-equivalence of tariffs and quotas see Kreinin (60).

is more applicable to the former than to the latter. For this reason the estimates must be viewed as crude approximations--the degree determined largely by the lack of competitiveness. In the absence of monopoly or effective collusion, however, the estimates should provide a good first approximation.

The full tariff is the sum of the explicit tariff and the tariff implicit in the quota, measured in per cent by the divergence of the domestic and world prices (ignoring transportation and other factors). The position of the import price, net of explicit tariffs, between the domestic and foreign prices will determine the allocation of tariff revenues. If the import price is equal to the foreign price, all tariff revenues are captured by domestics. On the other hand, if the import price differs from the domestic price only by the explicit tariff, the tariff revenue implicit in the quota is captured by foreigners. Due to the manner in which quotas are typically enforced, the implicit revenue tends to be captured primarily by the country controlling the administration of the quota.⁴ If quota allocations are controlled domestically, the revenue largely accrues to domestic sources, whether private or governmental; if controlled by foreign agents, the revenue accrues largely to foreigners.

The system of equations for a commodity category restricted by a quota is:

⁴For a discussion of this assumption see Mintz (73) and Bergsten (11).

$$\begin{aligned}
 M_j &= M_j (P_j, P_k, Y, A_j) \\
 X'_j &= X'_j (P'_j, P'_k, Y', A'_j) \\
 P_j &= P'_j (1 + q) (1 + t) \\
 M_j &= X'_j = Q_0
 \end{aligned}$$

where q is the implicit tariff rate and Q_0 is the quota restriction.

Effects of Uncertainty

The analysis thus far has been based upon perfect knowledge and foresight. Because this is not actually the case, when unforeseen events occur complete adjustment of demand and supply to market conditions takes time. There are two fundamental approaches used to explain this delayed response. One approach draws upon the relationship between stocks and flows to account for the adjustment problems caused by uncertainty. One might, for example, draw upon the explanatory power of changes in the stocks of final goods and inputs. A variety of such variables have been used to explain trade flows.⁵ These include inventories of final goods and inputs, industry capacity utilization, and order backlogs.

The other method of explaining the adjustment process is the use of lagged variables. These have been entered in estimating equations separately or as weighted combinations of variables. Table 1-1 provides a survey of the use of various lag techniques such as the Koyck, Almon, and Shiller lags.

⁵See Kwack (62), Gregory (34), Steuer, et al. (100), and Adams, et al. (1).

As for the present study, there are three reasons why none of these disequilibrium approaches are used. First, unit values already contain a weighted average of present and past prices, since the value reported is the contracted price rather than the current price. The difference between the two is a function of the contracting horizon in the particular industry. Traditional lag techniques are not precisely applicable in this case. Second, most previous studies have indicated that price lags are relatively short.⁶ Since monthly or quarterly data are not used in this study, an equilibrium model does not appear unreasonable. Finally, an equilibrium model provides a conformity which simplifies comparisons of the relative results for the U.S., the E.E.C., and Japan.

Institutional Parameters

In addition to the primarily economic relationships discussed thus far, institutional parameters play a key role in affecting trade flows. The system of international exchange, for example, affects the volume and pattern of trade. Although greater flexibility is possible under current exchange conditions, this study will project estimates of the effects of trade liberalization based upon constant exchange rates. This is done for several reasons. One is that since the model is not all-inclusive, some approximating assumption is required in any case. A second is that since universal trade liberalization is being considered rather than unilateral, the exchange rate effects should not be as large.

⁶See for example Rhomberg and Boissenneault (93) and Branson (15).

In addition, there are many highly irregular exogenous variables which affect trade. Among these are changes in trade barriers, strikes, wars, changes in market structure, and the like. Where appropriate, these are noted and included as explanatory variables in dummy form. Often there are changes in the composition of a category which introduce errors in the computed quantity and unit value indices. This may be the result of changes within the population or changes within the indices. Where possible these changes are accounted for in the form of dummy variables.

2.2 Static Effects of Trade Liberalization

Nature of Analysis

It is important to note at the start of this section that the effects computed here are static price effects derived from partial equilibrium analysis. Dynamic elements such as technological growth, improved market structures, and changing tastes are not considered. With regard to partial equilibrium analysis, changes in the relative prices of non-tradables and the existence of non-zero cross-elasticities present innumerable unknowns. Johnson (45, p. 333) has indicated, however, that these may well be ignored for two major reasons. One is that the number of non-tradables is relatively small if one excludes services; the other is that the consequences of cross-price effects will tend to cancel. This is especially true in the case of multilateral trade liberalization where both imports and exports are expected to expand.

Prices and Trade Volumes

The conversion of a tariff change to a percentage change in price depends upon the relevant import demand and export supply elasticities. A variety of formulas have been used for this purpose, and none of them are completely satisfactory. The formulas employed in the recent study by Jadow (42) are used in this study. The percentage change in the import price in this case is:

$$\frac{\epsilon_m}{\eta_m + \epsilon_x (1 + t)} (\Delta t)$$

where ϵ_m and η_m are the price elasticities of export supply and import demand, respectively. The percentage change in the export price is:

$$\frac{\eta_m}{\eta_m + \epsilon_x (1 + t)} (\Delta t)$$

These formulas are used for three reasons. First, because the percentage change in import price is adjusted to account for the previous influence of a tariff on the price. Second, the percentage changes in the import price and the export price are equal if the elasticities are equal--a requirement of constant elasticities. Third, these formulas represent a compromise among other alternatives.⁷

⁷Starting at pre-tariff equilibrium the formulas would be $\epsilon_x/(\eta_m + \epsilon_x)$ and $\eta_m/(\eta_m + \epsilon_x)$, respectively. In the case of constant elasticities, the general formulas derived by partial differentiation are $\epsilon_x/(\epsilon_x + \eta_m) (1 + t)$ and $\eta_m/(\epsilon_x + \eta_m) (1 + t)$.

Once the relevant percentage change in price is computed, the change in trade may be computed by multiplying the percentage change in price by the corresponding price elasticity and the original volume of trade. The result, of course, is the same whether one uses the import or export side of the market.

Domestic Consumption and Production

A change in trade volume implies a change in both domestic consumption and domestic production. With income constant, for example, an increase in imports implies both an increase in domestic consumption and a decrease in domestic production. The problem of estimating these changes has traditionally been approached in terms of relative elasticities. It is easily proven that, by definition:⁸

$$\eta_m = \frac{D}{M} \eta + \frac{S}{M} \epsilon$$

where η_m , η , and ϵ , represent price elasticities of import demand, demand, and supply respectively, and where M, D, and S represent import demand, demand, and supply, respectively. Under the assumption that two countries share common domestic price elasticities, these domestic elasticities can be obtained by solving the set of two equations. Balassa and Kreinin (5), for example, used this approach in estimating the effects of the Kennedy Round.

$$\begin{aligned} {}^8 \eta_m &= - \frac{P}{D-S} (d[D-S]/dp) \\ &= \frac{D}{M} \eta + \frac{S}{M} \epsilon \end{aligned}$$

Unfortunately, the true D and S are unknown because composite categories inevitably include both imports and exports. Using the total D and S for the category or just netting out exports will lead to biased results. It is possible, however, to modify the traditional identity so that under certain assumptions the bias is eliminated.

First assume that all goods within a category are homogeneous. The identity in this case is:

$$\eta_m = - \frac{P}{(D-S+X)} (d[D-S+X]/dP)$$

$$= \frac{D}{M} \eta + \frac{S}{M} \epsilon - \frac{X}{M} \epsilon_x$$

Dropping the assumption of homogeneity, assume that goods within the category can be categorized (on the basis of cross-price elasticities) as either importables or exportables so that

$$D = D_m + D_x$$

$$S = S_m + S_x$$

where the subscripts m and x refer to importables and exportables, respectively. The true identity for the elasticity of import demand may now be expressed as

$$\eta_m = \frac{D_m}{M} \eta_m + \frac{S_m}{M} \epsilon_m$$

The difficulty, of course, is that D_m and S_m are unknown. The question now is under what assumptions is the modified identity equivalent to the true identity? This is the condition that

$$\frac{D_m}{M} \eta^m + \frac{S_m}{M} \epsilon^m = \frac{D}{M} \eta + \frac{D}{M} \epsilon + \frac{S}{M} - \frac{X}{M} \epsilon_X$$

If $\eta^m = \eta^X = \eta$ and $\epsilon^m = \epsilon^X = \epsilon$, the condition holds.⁹

The original, unmodified identity holds only if exports in the category equal zero. Subtracting exports from S , a correction sometimes made, will yield results equivalent to the true identity only if none of the exportables are consumed at home ($S_X = X$ and $D_X = 0$). In a recent study, for example, Magee (69, p. 665) complains that the domestic demand and supply elasticities derived from using the traditional identity are unrealistically low. This is precisely the point. To be consistent with a given import elasticity, the domestic elasticities must be unrealistically low because the consumption/import ratio and the production/import ratio are much higher than the true values. The modified identity presented here will help in removing this bias. This identity should, however, be viewed purely as an accounting relationship and not causal in any way.

⁹Subtract the true identity from both sides and divide through by M to obtain

$$D_X \eta^m + S_X \epsilon^m - X \epsilon_X = 0$$

Substituting and rearranging, one obtains

$$D_X \eta^X + S_X \epsilon^X = X \epsilon_X$$

which is the true identity for export supply.

Unfortunately, knowing the internal elasticities still does not enable one to allocate a change in imports or exports between domestic consumption and production. Traditionally, $\eta / (\eta + \epsilon)$ has been used as the domestic consumption share in the total change and $\epsilon / (\eta + \epsilon)$ as the domestic production share.¹⁰ These formulas are valid only if one begins the analysis at a no-trade equilibrium where $D = S$. In general the true formulas are $D\eta / (D\eta + S\epsilon)$ and $S\epsilon / (D\eta + S\epsilon)$, respectively.¹¹ Again, one must know the true values of D and S , which are unavailable.

In light of these difficulties, the simplest procedure appears to be the use of arbitrary shares. The upper limit to the value of the supply share is when the domestic supply is infinite and all adjustment takes place on the supply side. Wemelsfelder's study (110, pp. 94-104) in Germany found that liberalization in the late 1950's resulted in a greater contraction of production than in an increase in consumption. This implies a lower limit to the supply share of one-half. The mid-point of this range is three-fourths for the production share and one-fourth for the consumption share. This is compatible with Magee's (69, p. 665) assumptions in his recent study.

¹⁰ See, for example, MacPhee (67, p. 39).

¹¹ $\eta_m = \frac{D}{M}\eta + \frac{S}{M}\epsilon = \frac{D\eta + S\epsilon}{D\eta + S\epsilon} (\eta_m)$

$1 = D\eta / (D\eta + S\epsilon) + S\epsilon / (D\eta + S\epsilon)$

Domestic Employment

The change in domestic production caused by the net change in the trade sector implies a change for domestic employment in that industry. To estimate the magnitude of this change without specific information concerning the industry one must make some assumptions regarding the relationship between output and employment. If one assumes that production in the industry is subject to constant returns to scale and that wages move proportionately with the prices of competing inputs, the labor-output ratio will remain constant. The first assumption makes the factor-use ratio dependent only upon the factor-price ratio; the second assumption means that the factor-price ratio is constant. The change in production multiplied by the labor-output ratio will give the implied change in employment under these assumptions.

Welfare Gains

The basic framework of the Marshallian approach to measuring welfare changes, utilizing the net change in consumer and producer surplus and tariff revenues, is well defined and will not be presented in detail here.¹² However, it may be useful to underscore some of the major assumptions of this approach.

- i. The presence of some form of social utility structure must be assumed.
- ii. Production must take place on the production frontier.

¹²For a detailed presentation of this approach as it applies to international trade see Johnson (45).

- iii. The trade functions used must either be "income-compensated" or exhibit zero income elasticity.
- iv. No goods disappear from the market.¹³

The welfare change in an importing country caused by a tariff reduction is measured by subtracting the "importing" surplus¹⁴ before the tariff reduction from that after the reduction and adding the net change in tariff revenues. This clearly requires the assumption that dollar values have the same welfare weight in all sectors. This procedure is easily demonstrated below in Figure 2-1 where Q and P are quantity and price, respectively.

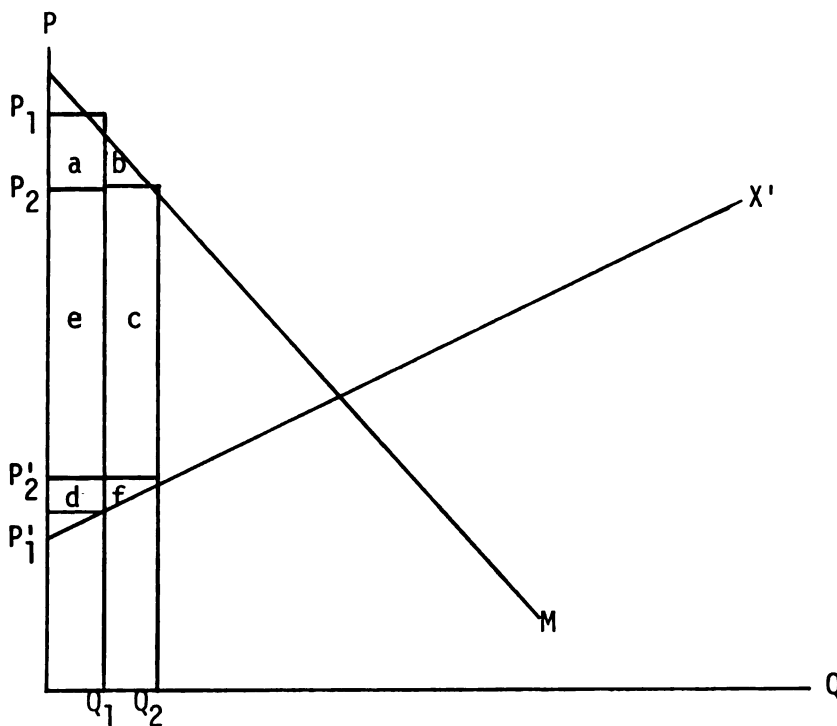


Figure 2-1.--Tariff-Induced Welfare Changes.

¹³See Leamer and Stern (63, pp. 196-197).

¹⁴"Importing surplus" is used for lack of a better term. Consumer surplus is misleading because an import function implies both consumption and production effects domestically.



X^1 and M refer to export supply and import demand, respectively. The subscript 1 refers to trade positions prior to the tariff reduction; subscript 2 refers to those after the tariff reduction. Based upon a linear approximation, the net change in importing surplus may be expressed as:

$$(P_1 - P_2) Q_1 + \frac{1}{2} (P_1 - P_2) (Q_2 - Q_1) = (a + b)$$

The second expression (b) is the familiar deadweight loss triangle.

The net change in tariff revenues is measured by:

$$\begin{aligned} (P_2 - P'_2) Q_2 - (P_1 - P'_1) Q_1 &= (e + c) - (a + e + d) \\ &= (c - a - d) \end{aligned}$$

The total change in welfare, therefore, is:

$$\begin{aligned} W &= (P_1 - P_2) Q_1 + \frac{1}{2} (P_1 - P_2) (Q_2 - Q_1) + (P_2 - P'_2) Q_2 - (P_1 - P'_1) Q_1 \\ &= (b + c - d) \end{aligned}$$

where W represents the welfare of the importing country.

The welfare changes for the exporting country are derived in like fashion except that no tariff revenues are involved. Based upon linear approximation, the change in welfare of the exporting country may be expressed as:

$$W' = (P'_2 - P'_1) Q_1 + \frac{1}{2} (P'_2 - P'_1) (Q_2 - Q_1) = (d + f)$$

It is important to note for future reference that calculations of the deadweight loss triangles involve the square of the change in price. More specifically,

$$\frac{1}{2}\Delta P\Delta Q = \frac{1}{2}(\% \Delta P)^2 \eta_m(P)(Q)$$

This is significant partly because the square of an average tariff is not necessarily equal to the average of the squared component tariffs. Chapter 3 discusses the factors used to correct for this aggregation bias.

Evaluating the overall gains over time is subject to difficulty. Ordinarily, the appropriate overall measure of welfare changes is their net present value. This is the measure used by Magee (69) in assessing the aggregate benefits of moving to free trade. Unfortunately, this measure may be more misleading than informative. The volatile nature of trade functions¹⁵ means that the calculation of present values through an infinite future may be subject to great error.

As a result, it may be fruitful to look at net present values for shorter time spans. The most appealing measure along this line is the per period welfare effect after adjustment is complete. This provides a meaningful measure which may be implicitly evaluated by the reader.

¹⁵As an example, see Wilson (112, pp. 50-1, 105, 109, 114).

CHAPTER 3

METHODOLOGY AND DATA

3.1 Treatment of Variables

Commodity Categories

International trade statistics are compiled and published by the United Nations (19) according to the Standard International Trade Classification (SITC). A recent GATT tariff study (9) has combined three and four digit SITC groups into "industry" level classifications and computed tariff averages for each. These industry classifications, with some modifications, form the basis for the categories used in this study. In general, categories for which the tariff is less than five per cent for all three principals were omitted. This is also true of the raw material portions of some categories.

The resulting categories are presented in Table 3-1 along with a category number and description, a convenient abbreviated description, and the SITC coverage. These thirty-seven categories account for almost all of the trade in manufactures that is significantly affected by tariffs or quotas. The most significant categories not covered are airplanes and ships. These were excluded because the data are inadequate and because the markets are so heavily influenced by government policies and purchases.

TABLE 3-1.--Commodity Categories.

Cat. #	Category Description	Abbreviation	S.I.T.C.
1	Leather articles and semi-manufactures	Leather mfgs	611-13, 841.3,842
2	Rubber articles and semi-manufactures	Rubber mfgs	621,629, 841.6
3	Wood and cork manufactures	Wood mfgs	631-33
4	Paper manufactures	Paper mfgs	641-42
5	Textile semi-manufactures	Tex semi-mfg	261-67, 651-53
6	Textile articles	Tex articles	654-57
7	Clothing and accessories	Clothing	841 excl 841.3 & 841.6
8	Mineral manufactures	Mineral mfgs	661-63, 666
9	Class and glassware	Glass mfgs	664-65
10	Iron, steel and ferro-alloys, unworked	I & S, unworked	671
11	Iron and steel semi-manufactures	I & S semi-mfgs	672-79
12	Aluminum and aluminum products	Aluminum	684
13	Other non-ferrous metals and products	Other metals	682-689
14	Metal manufactures	Metal mfgs	691-698
15	Petroleum manufactures	Petrol mfgs	332
16	Organic chemicals	Org chem	512
17	Inorganic chemicals	Inorg chem	513-15

TABLE 3-1.--Continued.

Cat. #	Category Description	Abbreviation	S.I.T.C.
18	Dyeing, tanning and coloring materials	DTC mat	531-33
19	Plastic materials and articles	Plastics	581,893
20	Essential oils, perfumes, toilet preparations, soaps, cleaning compounds	Oils, perf	551, 553-54
21	Other chemicals	Other chem	541,571, 599
22	Power-generating machinery, non-electric	Power mach	711
23	Agricultural machinery, non-electric	Ag mach	712
24	Office machines, non-electric	Office mach	714
25	Metalworking machinery, non-electric	Metal mach	715
26	Textile and leather machinery, non-electric	Tex mach	717
27	Other machinery, parts and accessories, non-electric	Other mach	718-19
28	Electrical machinery, tools and parts	Elect mach	722-23, 725,729
29	Telecommunications apparatus	Telecom	724

TABLE 3-1.--Continued.

Cat. #	Category Description	Abbreviation	S.I.T.C.
30	Motor vehicles and parts	Motor veh	732 excl Canadian trade for U.S.
31	Miscellaneous transport equipment and parts	Misc trans	731,733
32	Precision instruments-- professional, scientific and controlling instruments, photographic apparatus, clocks and watches	Prec instr	726,861, 864
33	Footwear, travel goods and handbags	Shoes, bags	831,851
34	Photographic and cinematographic supplies	Photo mfgs	862-63
35	Furniture	Furniture	821
36	Musical instruments, sound recording or reproduction apparatus, and sound recordings	Sound mfgs	891
37	Toys and sporting goods	Toy mfgs	894.2 & .4

Price and Quantity Variables

Published data according to the SITC begins at the beginning of the last decade. The first few years, however, are probably subject to errors of classification due to the adjustment to the SITC system. The sample period for this study begins in 1963 and ends in 1972, and the chosen observation period is semi-annual. This minimizes the problem of coordinating the data for the three principals.

The statistics actually published are value and quantity figures. In many cases, however, quantity figures are not reported. In a few cases this necessitated the use of partner trade data. Other countries' data for exports to the U.S., for example, was substituted for unavailable U.S. import data. Care was taken in these instances to include a representative sample of trading partners.

If one divides value by quantity, a unit value is obtained. For each category, price indices were constructed from component sub-categories using these unit values. Paasche price indices were used because of their computational simplicity and because they maintain a unique relationship to the "true" price index.¹ Laspeyres quantity indices were computed by dividing value by the corresponding Paasche price index. A Laspeyres quantity index was used because it maintains a unique relationship to the "true" quantity index. These indices were computed at the most disaggregate

¹For an excellent discussion of price indices and the unique quality of Paasche price indices and Laspeyres quantity indices, see Fisher and Shell (26).

level generally available throughout the sample period. For the U.S. this is the seven digit level of the Schedule A for imports (107) and the Schedule B for exports (106). For the E.E.C. and Japan, the most disaggregate level is generally the three or four digit level.

Data collection for the E.E.C. was particularly difficult because the data must generally be collected on an individual country basis. This was further complicated by the fact that intra-E.E.C. trade must be subtracted from the total to obtain E.E.C. trade with the rest of the world.

A special effort was made to include data for the three new entrants into the E.E.C. If one of these three accounted for ten per cent or more of E.E.C. trade in a category in 1972, data for that country was added to the E.E.C. total. When such data were unavailable in international sources, a special effort to collect the data from national sources was made if the country's share exceeded 25 percent in 1972. Reference to national sources was complicated by their use of different classification systems and national currencies.

In practice, these procedures resulted in the inclusion of U.K. data in most categories and exclusion of Danish and Irish data in almost all. These procedures, however, should make the resulting estimates fairly close approximations of the true elasticities for the total E.E.C. Unfortunately, it is too soon to account for any shifts in the structural parameters that may have been caused by the reduction of trade barriers among the original E.E.C. members and the new entrants.



Alternative Price Variables

The prices of domestic substitutes were collected for each category and principal. For the U.S., these prices are the wholesale price index for the appropriate category. In most instances, the domestic category is reasonably compatible with the trade category. For the E.E.C, alternative prices were computed from the intra-E.E.C. trade flows previously collected in the process of obtaining the extra-E.E.C. trade statistics. The Japanese alternative prices were collected from national sources and converted from yen into dollars. These prices generally refer to a slightly broader category than the trade category itself and are not as compatible as the U.S. and E.E.C. statistics.

The "rest of world" alternative prices present a more difficult problem. Since such statistics are not available for a sizeable number of countries, the "rest of world" price used in a particular function is a weighted average of the alternative prices of the other two principals. The weights in each category are equal to each principal's average relative share in the value of trade.²

²The price and income weights used here are the weights traditionally used: destination (buyer) weights for exports and origin (seller) weights for imports. In general these weights seem quite appropriate, but the weighting issues involved are far from settled. Clearly, an exporting country's share in the imports of another country is important to the weight its price and income variables should have, but its import share in total world exports may also be important. Take the extreme example of petroleum as a case in point. The traditional weights in this case would be each exporter's share in the imports of a particular country. Equally important, perhaps, are the import shares of other industrial countries in total world trade in petroleum.



Income-Activity Variables

Income-activity variables are available on an annual basis for a wide range of countries. However, these variables are not generally available for LDC's for periods shorter than a year. The one variable which is available on this basis for LDC's is industrial production. Therefore, this is the income-activity variable used in each equation. The weights for the "rest of world" variable in each category are the average relative shares in the value of trade.

Tariffs

The tariff rates used in this study are taken from the recent GATT tariff study (9). The tariff averages derived from world trade weights were used to avoid the bias inherent in using a country's own import weights. World weights are also biased to the extent that they do not reflect what the free trade composition of trade would be for the particular country. Recent changes however, in the composition of trade due to exchange rate realignments and higher petroleum prices make the world weights a preferred alternative to "own-import" weights, since the latter have probably changed since the 1970 base year in the GATT study.

The tariff rates for chemicals in the GATT study were computed on the assumption that the Kennedy Round ASP package would be implemented. Since this has not been the case, these rates were adjusted using U.S. Tariff Commission data (102). The rates presented for the U.S. do not account for the fact that the base for some tariffs is the "American Selling Price." This is likely to be a separate issue, and the recent study by Jadlow (42) examines this issue exclusively.

U.S. tariff rates are generally applied on free-on-board (f.o.b.) value, while E.E.C. and Japanese rates are applied on coast-insurance-freight (c.i.f.) value. 1974 U.S. data (35) on the ratios of these two values were used to adjust the potential U.S. tariff changes to a comparable c.i.f. basis.

The "world" tariff rates computed by the GATT study include all the major industrial market economies. For each principal, however, it was necessary to extract the impact of its own tariff on the world tariff to obtain the average tariff levied on its exports.

The computation of the tariff changes implied by Scheme A and Scheme B (p. 5) requires some knowledge of the individual tariff rates within each category. The change in tariff for each case is:

$$\text{Scheme A: } (.6 \sum w_i t_i + .4 \sum w_i t_z)$$

$$\text{Scheme B: } \sum w_i t_i^2$$

where t_i refers to all the component tariffs, t_z refers to all those equal to or less than five per cent, and w_i refers to the weight assigned to each tariff.

To avoid using the thousands of tariff lines in each principal's tariff schedules, this study employed the technique used recently by Magee (69). This technique requires only a summary of the distribution of tariffs within each category. The mid-point of a small range of tariffs was substituted for the t_i and t_z , and

the value share of that range of tariffs was substituted for the original w_i .

The tariff distribution data are furnished in a study by the U.S. Tariff Commission (102). With very few exceptions, the distribution tables are generally compatible with the categories used in this study. Where this was not the case, further research was undertaken in an attempt to modify the table.

The tariff data in the Tariff Commission report are weighted using own-trade weights. To make the results compatible with the GATT tariff averages, the following conversion factors were computed using the distribution data:

$$\text{Scheme A: } \frac{.6 \sum w_i t_i + .4 \sum w_i t_z}{.6 \sum w_i t_i}$$

$$\text{Scheme B: } \frac{\sum w_i t_i^2}{(\sum w_i t_i)^2}$$

The relevant change in tariff was obtained by multiplying these conversion factors by the expression in the demoninator as computed from the GATT data. In this way very good approximations to the Scheme A and Scheme B tariff changes were obtained without having to refer to the thousands of individual tariff lines. These conversion factors are also used in Chapter 4 to correct the aggregation bias in the welfare effects discussed in Chapter 2.

Trade Volumes

The base trade volumes used to compute the changes in trade were taken from 1974 U.N. data (19). It is important to use the most recent year available to minimize the distortion due to composition changes caused by currency realignments and the quadrupling of petroleum prices earlier in this decade. Since only E.E.C. imports and Japanese imports are expressed as c.i.f. value, these were converted to f.o.b. value to be compatible with the other trade values. The U.S. ratios mentioned earlier were used for this purpose, even though they are not exactly applicable. However, most of the variable factors such as composition of trade by distance and method of transportation tend to be offsetting. In summary, all value statistics are reported as f.o.b. value in 1974 U.S. dollars.

There are several issues relating to exclusions from the trade totals in each category. Trade with centrally planned economies was excluded because of their varying MFN status with the different principals and because of the government control over trade. E.E.C. trade with the remaining members of the European Free Trade Association (E.F.T.A.) was excluded because agreements eliminating tariffs on mutual trade have been made by the E.E.C. with most of the members of the E.F.T.A. and negotiations are underway with the remainder.

Trade with LDC's is a more difficult issue to resolve. On the import side the "Generalized System of Preference" (GSP) schemes provide preferential treatment to LDC exports into the

U.S., the E.E.C., and Japan. A reduction in the MFN tariff rate, therefore, may result in a reduction rather than an increase in imports from LDC's by reducing the preference margin. There are two reasons for believing that the LDC share in the imports of the U.S., the E.E.C., and Japan will remain relatively constant. First, the GSP schemes are not really effective in sensitive (i.e., high tariff, high price-elasticity) manufacturing categories.³ Second, LDC's have contended that an attempt should be made to maintain preference margins by reducing preferential rates to zero and liberalizing non-tariff barriers on products included in the GSP schemes.⁴ It is assumed here that some effort to maintain preference margins will be made on the part of industrialized countries. For these reasons, LDC exports were included in the import totals for each principal.

On the export side, LDC's are not required to make "fully reciprocal" reductions in their own tariffs in order to enjoy reduced MFN rates on their exports. However, there is reason to believe that LDC imports will expand roughly in proportion to the general expansion in the exports of industrialized countries. The fact that LDC's will not be held responsible for implementing a reduction formula generally applied by the industrialized countries does not mean that some reciprocity will not be expected and obtained. Because of the generally high tariff barriers among

³For a general survey of preference schemes, see Iqbal (41, pp. 34-39).

⁴See Anjaria (4, pp. 25-28).

LDC's, even a small degree of liberalization is likely to put the LDC reductions on a par with the general level of reductions. Even if this does not occur, however, an expansion in LDC exports to industrialized countries as a result of trade liberalization will eventually necessitate an expansion in imports of roughly the same total magnitude. The composition of this trade balance effect is difficult to determine, but the effect is clearly in the direction of expanding LDC imports from industrialized countries. Therefore, LDC imports were included in the export totals for each principal.

Labor-Output Coefficients

Chapter 2 described the procedure for obtaining the U.S. employment effects presented in Chapter 4. This procedure requires the use of a labor-output coefficient for each category. These coefficients were obtained from 1974 U.S. data (35). The number of employees per million dollars of output was adjusted by an average work week factor to derive a labor-output coefficient which expresses the number of "forty-hour-equivalent" workers per million dollars of output. All data refer to the 1974 period to make the coefficients compatible with the 1974 trade data.

These coefficients, of course, are only averages and will not be exact for imports or exports. However, there is little presumption as to the direction of any possible bias.⁵ In any case, the net industry effects are probably more reliable than the individual import and export effects.

⁵See TC Publication 473 (20, pp. 146-152).

3.2 Choice of Estimator

Import Demand Equations

Criteria for choosing an estimator are always a critical concern in empirical work. Johnston (47, pp. 408-420) presents a general survey in his text of the characteristics of the major estimators, and Mikhail (72) offers recent Monte Carlo comparisons of these estimators. In addition, Sawa (95) has developed criteria for choosing the optimal k-class estimator and for establishing the mean square error (MSE) dominance of ordinary least squares (OLS) over two-stage least squares (2SLS).

The limited sample (20 observations) constructed for this study and the importance of isolating possible specification errors in the export supply equations should eliminate full-information methods from consideration. The most promising of the remaining alternatives are OLS and 2SLS.

Were it not for two problems, OLS would be the clear choice between the two. First, there is the potential for a special sort of measurement error (p. 3) in which errors in the right hand unit value variable are correlated with errors in the left hand quantity variable. Second, there is also the possibility of simultaneity bias. In these two cases the OLS estimates are inconsistent.

The trade-off between the two estimators is between the expected smaller variance of the OLS estimator in small samples and the expected smaller bias of the 2SLS estimator. The Sawa criteria are indecisive under the special circumstances here, and

a test developed by Feldstein (23) is inapplicable because the test depends upon the true value of the parameter when the measurement errors on the left and right hand sides are correlated.

Since a more precise criterion for choosing between OLS and 2SLS is not available, a crude set of criteria is presented below. These are based on the trade-off between bias and standard error and on the expected directions of bias.

The first test is a simple sign test of the two price coefficients. The price elasticity of import demand for manufacturing categories is almost certainly negative for the three principals. Therefore, if the coefficient using one estimator is positive and the coefficient using the other is negative, the latter was selected. In most cases, however, both price coefficients are negative. In the few cases when both are positive, neither was selected.

The second test is a more complicated "counter-expectations" test. The unit value problem will tend to bias the OLS coefficient toward minus one, and the simultaneity problem will bias the coefficient toward the positive value of the export supply coefficient. When the OLS coefficient is separated from the direction of these biases by the 2SLS coefficient (i.e., $OLS < -1$ and $OLS < 2SLS$), one may reasonably conclude that the bias in the OLS coefficient is probably not greater than the bias in the 2SLS coefficient. OLS was chosen in this instance because of its smaller standard error.

The third test is an "absolute mean error" (AME) test to be used when the first two are inapplicable. Ordinarily, one might use a mean square error test of the bias and variance of the two estimated coefficients. This test, however, is severely biased in favor of OLS.

In such a small sample one cannot really assume that 2SLS has removed all of the bias in the price coefficient. Use of this coefficient as the true value in a relative mean square error test will bias the test in favor of OLS because the bias is squared. This is easily demonstrated by the fact that

$$(b - \beta)^2 > (b - \tilde{b})^2$$

when $\tilde{b}$ lies between b and β . b , $\tilde{b}$, and β refer to the OLS, 2SLS, and true coefficient, respectively. Since the OLS standard error is understated when unit value errors are present, the use of squared standard errors (variance) further biases the test in favor of OLS.

If one uses absolute differences rather than squared differences, the bias toward choosing OLS is reduced. When the first two tests are inapplicable, the OLS, 2SLS, and true coefficients will all be the same sign. If one also assumes that the 2SLS coefficient lies between the OLS coefficient and the true coefficient, the following relationship holds:

$$|b - \beta| - |\tilde{b} - \beta| = |b - \tilde{b}|$$

This means that:

$$\begin{aligned} \text{AME}(b) - \text{AME}(\tilde{b}) &= \\ |b - \beta| + \sigma_b - |\tilde{b} - \beta| + \sigma_{\tilde{b}} &= \\ |b - \tilde{b}| + \sigma_b - \sigma_{\tilde{b}} \end{aligned}$$

One chooses OLS when this difference is negative and 2SLS when it is positive. This test is less biased in favor of OLS because it is independent of the true value of the parameter and because the downward biased OLS standard error is not squared.⁶

The procedures above were followed in all but about four cases. In these exceptions the 2SLS estimator usually appeared superior on the basis of these criteria but was clearly outside the range of feasibility, given the estimates of the other equations. The estimate in each case was outside this range by a factor of about two to four.

Export Supply Equations

A representative sample of about a third of the export supply equations was estimated using a variety of estimators, variables, and specifications.⁷ Out of this sample of about 70

⁶No particular statistical properties are claimed for the AME other than its being a combined measure of bias and standard error which is less biased toward OLS than an MSE criterion. It is clearly not, for example, a measure of the second moment, the MSE.

⁷Among these are FIML, 3SLS, ML, 2SLS, IV, OLS, industry-specific activity variables, normalization on price, and linear functions.

equations only about two estimated equations could be taken seriously as true export supply functions. It appears that given the sample data and available variables, successful estimation of relatively disaggregate export supply functions is virtually impossible.

One positive aspect of these results is that the difficulty in identifying export supply equations probably means that the simultaneity bias is small in the import demand equations. This may be simply the result of the volatility of export supply relative to import demand or the result of a recursive system in which price is determined exogenously in the export supply function.

The consequence of these disappointing estimates of export supply is that arbitrary assumptions about the various price elasticities of export supply must be employed. The traditional assumption has been that export supply is infinitely elastic. While export supply is probably more elastic than import demand, there is some evidence that export supply is less than infinitely elastic whether one is concerned with export supply to or from each principal. The control group studies by Kreinin (58) and Krause (55), for instance, indicate that export supply for large traders is far from infinitely elastic. By comparing a tariff-reduced group with a non-reduced group, Kreinin concluded that:

It appears plausible that close to half of the benefit from tariff concessions granted by the United States accrued to foreign exporters in the form of increased prices (58, p. 317).

This short-run result probably represents a lower limit to the export supply elasticity to the U.S. The supply elasticity for U.S. exports is likely to be higher because exports comprise a smaller share of the U.S. market.

The two extremes above are used as the limits to the price elasticity of export supply in each instance. The upper limit is infinite elasticity, and the lower limit is an elasticity equal to the corresponding price elasticity of import demand. The mid-point of this range is consistent with the assumption made by Balassa and Kreinin (5, p. 130) in their study of the Kennedy Round.

3.3 Use of Relative Price

The objections to the use of relative price have already been discussed in Chapter 2. All equations are estimated using separate price variables as a result of these objections. In such a limited sample, however, the use of relative price as an approximation may reduce the variance of the price coefficient by more than the bias it introduces. Consequently, in cases where relative price might be critical, estimates have been made using relative price. Unless the choice is clear on the basis of sign, the decision to substitute these estimates for the original estimates requires the use of a non-central F test as developed by Wallace and Toro-Vizcarrondo (108).

The use of relative price implies that the two price coefficients are equal but opposite in sign. For the restricted estimator b' a test of the hypothesis

$$H_0: \text{MSE}(b') \leq \text{MSE}(b)$$

can be based on the critical points in the non-central distribution $F_{(m, T-K, \frac{1}{2})}$ where m equals one, T is the number of observations, and K is the number of variables. The hypothesis was tested at the five per cent level of significance. The test was used for both OLS and 2SLS, although it is not strictly appropriate to the latter.⁸

The two-step process of first estimating without relative price and then using relative price as an approximation is clearly a regression strategy. This affects the distribution of the sampling statistics in the cases in which relative price was actually used. This is not too serious in practical terms for two reasons: First, the use of relative price represents a return to the traditional method of estimation; and second, the instances in which relative price was used are clearly indicated so that the appropriate degree of skepticism about the test statistics can be shown.

⁸If OLS and 2SLS estimates are affected differently by the use of relative price, the choice between OLS and 2SLS may be affected. In practice, this possibility never occurred.

CHAPTER 4

ESTIMATES OF PRICE ELASTICITIES

4.1 Empirical Estimates

Empirical estimates of the price elasticities of demand for the imports and exports of the U.S., the E.E.C., and Japan are presented for each category in Tables 4-1 through 4-37.¹ A representative estimating equation is:

$$\ln M_j = a + b_1 \ln P_j + b_2 \ln P_k + b_3 \ln Y + b_4 S + e$$

where M_j = the import quantity index for the j th category

P_j = the import price index including tariff for the j th category

P_k = the alternative price index for the j th category

Y = the appropriate index of industrial production

S = the semi-annual dummy variable

e = the error term

¹Although price elasticities are the primary concern of this study, the income elasticity estimates are also presented. These are generally positive and significant, as expected. These elasticities, however, need not be positive because of the differing effects of activity on domestic demand and supply. Magee (68, pp. 188-192) provides an excellent survey of this issue. Also, any time trend effects will impact primarily upon the activity coefficient since activity is highly correlated with time. No attempt has been made to extract these possible trend effects because the price elasticities are the primary concern.

The estimator selected for each equation (OLS or 2SLS) is listed beside each set of estimates in the tables. The elasticity estimates are accompanied by their t-statistics. These t-values are in parentheses beneath the coefficient to which they pertain. The number in parentheses in the column headed "t P DIFF" is the t-statistic for the difference between the own price coefficient and the alternative price coefficient. This t-statistic is equal to:²

$$\frac{\hat{b}_1 + \hat{b}_2}{\sqrt{\sigma_{\hat{b}_1}^2 + \sigma_{\hat{b}_2}^2 + 2 \text{ Est. Cov. } (\hat{b}_1, \hat{b}_2)}}$$

If no statistic appears in this column, a relative price variable was used. In this case, the two price parameters are restricted to be equal but opposite in sign.

The $\bar{R}^2$ column presents the coefficient of determination after correction for the degrees of freedom. The computed value of the Durbin-Watson autocorrelation statistic and the degrees of freedom are reported in the next two columns. In a typical case where relative price was not used, where no special dummy variables were used, and where a Cochrane-Orcutt transformation was not made, there are fifteen degrees of freedom (20 observations less five explanatory variables).

²Kmenta (54, p. 372).

4.2 Arbitrary Estimates

Arbitrary estimates of price elasticities are also presented in the tables. When imports are less than ten per cent of the exports (or vice versa) in a category, no empirical estimates were obtained for that equation and an arbitrary price elasticity was assumed. Arbitrary elasticities were also assumed when a reliable estimate of the price coefficient was not obtained by empirical estimation.

These arbitrary elasticities were imposed on the basis of seven assumptions. These assumptions are:

1. An estimate from another source is applicable.
2. An estimate from another category is applicable.
3. An estimate from another category is applicable after scale adjustment using another principal's estimates.
4. An estimate using the average of a group of categories is applicable.
5. An estimate using the average of a group of categories is applicable after a scale adjustment based on another country's average.
6. The E.E.C. elasticity is the average of the U.S. and Japanese estimates.
7. The U.S. elasticity is the average of the E.E.C. and Japanese estimates.

These assumptions are referred to by number each time an arbitrary elasticity is used. The selection of the appropriate assumption depends on the circumstances of each case and is basically a subjective process. The logic behind each assumption is straightforward except, perhaps, for assumptions (6) and (7). One normally expects that, ceteris paribus, the U.S. import price elasticity will

TABLE 4-1.--Leather Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	OLS	-1.33 (1.81)	(1.93)	2.39 (9.77)	.944	2.23	15
USX	OLS	-1.57 (2.83)	(.34)	-.41 (.73)	.711	1.94	15
EM	OLS	-.29 ^a 1.09		2.05 (3.21)	.944	1.63	16
EX	2SLS	-1.23 (2.56)	(.75)	1.05 (8.87)	.966	1.20	15
JM	2SLS	-.94 (4.91)	(7.97)	1.00 (9.21)	.959	1.14	15
JX	OLS	-1.09 (2.14)	(2.61)	3.57 (6.49)	.953	1.15	15

^aSubstitute -1.14 based on assumption (6).

TABLE 4-2.--Rubber Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-2.22 (1.99)	(3.41)	2.40 (2.99)	.854	1.73	15
USX	OLS	-1.31 (4.13)	(1.74)	.84 (4.71)	.757	2.52	15
EM	OLS	-.70 (1.44)	(1.05)	1.64 (3.67)	.945	1.18	15
EX	OLS	-.03 ^a (.05)		1.01 (10.58)	.920	1.53	16
JM	b						
JX	2SLS	-1.44 (1.92)	(.78)	2.19 (4.83)	.930	2.21	15

^aSubstitute -1.38 based on assumption (6).

^bTotal is less than 10% of exports. Substitute -1.97 based on assumption (4) and categories 1, 3 and 4.

TABLE 4-3.--Wood Manufactures.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .05 ^a (.14)	(1.40)	.18 (.69)	.361	1.81	15
USX	OLS	-2.14 (4.13)	(.52)	.80 (1.60)	.881	1.79	15
EM	2SLS	-1.57 (1.94)	(.54)	1.43 (5.25)	.910	2.02	15
EX	OLS	- .05 ^b (.25)		.23 (5.56)	.585	1.91	16
JM	2SLS	-2.95 (3.18)	(.01)	3.15 (3.52)	.861	1.58	15
JX	2SLS	-1.53 (4.26)	(.14)	.36 (.99)	.501	1.85	15

^aSubstitute -2.26 based on assumption (7).

^bSubstitute -1.84 based on assumption (6).

TABLE 4-4.--Paper Manufactures.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .82 (1.55)		.53 (6.17)	.729	1.29	16
USX	2SLS	-4.01 (10.91)	(3.95)	.81 (.99)	.977	2.27	15
EM	2SLS	- .80 (.91)		.77 (1.40)	.963	2.32	16
EX	2SLS	-1.09 (3.41)	(8.44)	.31 (2.04)	.951	1.69	15
JM	OLS	-2.01 ^a (18.38)	(1.55)	.94 (4.81)	.976	1.39	14
JX	OLS	-1.50 (4.92)	(2.07)	.92 (2.50)	.967	1.34	15

^aTransformed variables (Cochrane-Orcutt).

TABLE 4-5.--Textile Semi-Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-1.51 (2.37)	(2.12)	.66	.422	1.79	15
USX	OLS	.97 ^a (1.82)	(3.36)	.45 (3.15)	.522	1.63	15
EM	OLS	-.84 ^b (1.35)		1.04 (3.68)	.830	1.24	16
EX	2SLS	-.61 (2.84)	(.57)	1.37 (10.63)	.960	2.01	15
JM	OLS	-1.50 (2.97)	(2.90)	1.75 (5.23)	.959	1.38	15
JX	2SLS	-2.30 (2.55)	(4.11)	3.40 (36.10)	.989	1.88	15

^aSubstitute -1.46 based on assumption (7).

^bSubstitute -1.51 based on assumption (6).

TABLE 4-6.--Textile Articles.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	OLS	-.73 (3.14)	(.22)	.85 (1.34)	.783	1.58	15
USX	OLS	-.79 (2.26)	(1.49)	.57 (1.26)	.944	1.50	15
EM	OLS	-.74 (2.33)	(1.25)	.77 (1.63)	.740	1.53	15
EX	OLS	-.61 (2.69)	(.55)	.75 (9.03)	.965	2.05	15
JM	2SLS	-1.06 (2.97)	(1.32)	1.44 (6.35)	.985	2.79	15
JX	2SLS	-.20 ^a (.62)		1.01 (7.25)	.906	1.48	15

^aTransformed variables (Cochrane-Orcutt). Substitute -.97 based on assumption (7).

TABLE 4-7.--Clothing.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-1.24 (3.34)	(7.94)	1.22 (1.46)	.978	1.75	15
USX	2SLS	-2.44 (3.66)	(.36)	.74 (1.20)	.954	2.19	15
EM	2SLS	.83 ^a (.78)	(2.31)	3.42 (4.42)	.957	1.98	15
EX	OLS	-.73 (1.99)	(2.13)	.05 (.16)	.871	1.32	15
JM	OLS	-1.25 (3.59)	(.97)	2.08 (4.28)	.946	1.07	15
JX	2SLS	-2.01 (2.55)		1.52 (3.60)	.506	1.83	16

^aSubstitute -1.25 based on assumption (6).

TABLE 4-8.--Mineral Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	OLS	2.05 (3.96)	(4.56)	.47 (1.70)	.852	1.43	15
USX	OLS	-.84 (3.15)	(4.17)	1.52 (3.72)	.625	1.22	14
EM	OLS	-1.27 ^a (8.01)	(4.16)	2.05 (5.78)	.961	2.37	14
EX	OLS	-.98 (3.85)	(2.36)	.68 (2.32)	.949	1.01	15
JM	b						
JX	2SLS	-1.52 (3.11)	(1.90)	.81 (3.08)	.894	1.88	15

^aTransformed variables (Cochrane-Orcutt).

^bTotal is less than 10% of exports. Substitute -1.22 based on assumption (2) and category 13.

TABLE 4-9.--Glass Manufactures.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	2SLS	-1.38 (2.14)	(.63)	.73 (2.14)	.862	1.14	15
USX	OLS	-1.06 (3.95)	(.46)	.14 (.66)	.776	1.31	15
EM	2SLS	-1.31 (3.96)	(1.42)	1.41 (3.28)	.877	1.29	15
EX	OLS	-1.19 (4.48)	(1.19)	.74 (3.14)	.899	2.27	15
JM	OLS	-1.22 (5.02)	(.53)	1.75 (13.12)	.976	1.45	15
JX	2SLS	-1.49 (6.53)	(.79)	3.92 (4.97)	.932	1.03	15

TABLE 4-10.--Iron and Steel, Unworked.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	-.51 ^a (.72)	(2.22)	.13 (.31)	.614	1.08	14
USX	b						
EM	2SLS	-.88 (3.97)	(1.58)	1.32 (4.55)	.765	1.85	15
EX	2SLS	-1.22 (4.06)	(.05)	.07 (.35)	.837	1.00	14
JM	OLS	-2.43 (5.51)	(3.25)	.72 (3.55)	.823	1.18	14
JX	2SLS	-4.90 (3.61)	(.24)	.21 (.30)	.597	1.17	15

^aSubstitute -2.83 based on assumption (2) for category 11.

^bTotal is less than 10% of imports. Substitute -1.20 based on assumption (2) for category 11.

TABLE 4-11.--Iron and Steel, Semi-Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-2.83 (1.99)	(1.58)	1.79 (3.13)	.767	1.55	15
USX	OLS	-1.20 (3.61)		- .14 (.54)	.458	1.50	16
EM	OLS	-1.66 ^a (5.90)	(1.64)	1.17 (4.65)	.945	1.83	14
EX	2SLS	- .63 (1.69)	(.59)	1.20 (5.47)	.866	1.62	15
JM	b						
JX	OLS	-1.72 (4.94)	(.55)	2.40 (16.05)	.988	.77	14

^aTransformed variables (Cochrane-Orcutt).

^bTotal is less than 10% of exports. Substitute -2.43 based on assumption (2) and category 10.

TABLE 4-12.--Aluminum Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	OLS	-2.51 (1.10)	(1.00)	1.11 (2.33)	.691	1.59	14
USX	OLS	4.09 ^a (3.89)	(1.08)	1.09 (2.24)	.605	1.03	15
EM	OLS	.52 ^b (.47)	(1.22)	.98 (2.13)	.787	.56	15
EX	OLS	-1.47 (3.87)	(4.33)	1.41 (8.04)	.881	1.75	15
JM	2SLS	3.67 ^c (1.18)	(.69)	2.40 (7.05)	.878	.95	15
JX	OLS	-1.70 (2.42)	(1.06)	1.29 (1.38)	.753	1.75	14

^aSubstitute -1.24 based on assumption (6).

^bSubstitute -1.21 based on assumption (2).

^cSubstitute -.91 based on assumption (2).

TABLE 4-13.--Other Metals.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	2SLS	-3.49 (4.53)	(3.76)	1.91 (3.25)	.869	2.19	14
USX	OLS	-1.63 (5.43)	(.36)	1.22 (2.89)	.828	1.49	15
EM	2SLS	-1.21 (1.54)	(1.16)	.48 (3.21)	.462	2.17	15
EX	2SLS	-1.82 (4.49)	(.25)	.64 (2.07)	.838	1.60	15
JM	OLS	-.91 (3.46)	(1.63)	.09 (.85)	.761	1.84	14
JX	2SLS	-2.47 (2.18)	(.54)	2.50 (5.29)	.942	1.08	14

TABLE 4-14.--Metal Manufactures.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	ols	.50 ^a (1.00)	(2.25)	.58 (2.70)	.927	1.28	15
USX	2SLS	-3.51 (6.76)	(7.07)	3.17 (8.78)	.894	2.11	15
EM	OLS	-.52 (2.27)	(1.85)	1.27 (7.64)	.973	1.31	15
EX	OLS	-1.21 (3.91)	(.52)	.99 (4.81)	.931	2.28	15
JM	b						
JX	2SLS	-1.65 (1.98)	(.80)	2.70 (2.30)	.942	1.79	14

^aSubstitute -1.35 based on assumption (5), categories 11, 12, 13 and the E.E.C.

^bTotal is less than 10% of exports. Substitute -.41 based on assumption (5), categories 11, 12, 13 and the E.E.C.

TABLE 4-15.--Petroleum Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	OLS	- .01 ^a (.01)	(2.40)	1.37 (4.87)	.914	.84	15
USX	OLS	-1.13 (2.85)	(5.41)	- .19 (1.81)	.626	1.52	15
EM	OLS	- .60 (1.90)		- .32 (3.82)	.781	1.77	15
EX	OLS	- .23 ^b (1.50)	(.95)	1.37 (4.86)	.967	1.33	15
JM	OLS	- .50 (1.08)	(1.09)	.57 (4.73)	.548	1.18	15
JX	c						

^aSubstitute -1.14 based on assumption (3), category 16, and the E.E.C.

^bSubstitute -.57 based on assumption (3), category 16, and the U.S.

^cTotal is less than 10% of imports. Substitute -1.69 based on assumption (7).

TABLE 4-16.--Organic Chemicals.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	OLS	- .02 ^a (.08)	(.26)	3.08	.958	1.65	14
USX	2SLS	-2.89 (3.16)	(4.59)	.72 (2.41)	.875	2.61	15
EM	OLS	-1.12 (6.46)	(5.91)	2.14 (14.15)	.985	2.09	15
EX	2SLS	-1.45 (5.59)	(.92)	1.53 (31.36)	.993	1.15	15
JM	OLS	-1.75 (8.14)	(2.00)	.95 (8.66)	.830	1.76	15
JX	OLS	- .56 ^b (1.61)	(1.84)	2.77 (5.81)	.954	2.73	15

^aSubstitute -2.13 based on assumption (4) and categories 17-21.

^bSubstitute -3.49 based on assumption (5), categories 17-21, and the E.E.C.

TABLE 4-17.--Inorganic Chemicals.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	2SLS	-3.40 (2.88)		2.14 (5.18)	.770	1.03	16
USX	OLS	-1.61 (8.49)	(1.53)	.99 (8.32)	.963	1.66	15
EM	OLS	-1.29 ^a (9.61)	(13.05)	1.94 (16.18)	.981	1.28	14
EX	OLS	- .58 (2.57)	(.28)	1.05 (6.14)	.971	1.63	15
JM	2SLS	- .79 (8.03)	(.72)	1.29 (13.84)	.972	1.70	15
JX	OLS	-1.16 ^a (3.75)	(2.31)	3.16 (8.86)	.958	1.94	14

^aTransformed variables (Cochrane-Orcutt).

TABLE 4-18.--DTC Materials.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	2SLS	-3.71 (4.54)	(.61)	.96 (1.64)	.929	2.31	14
USX	OLS	.21 ^a (.69)	(1.31)	.52 (2.92)	.946	1.40	15
EM	2SLS	- .36 ^b (.82)		.64 (2.76)	.933	.97	16
EX	2SLS	- .70 (1.15)	(1.29)	1.41 (10.33)	.989	2.29	15
JM	2SLS	-2.10 (4.91)		.65 (8.86)	.915	1.41	15
JX	OLS	-1.43 (4.11)	(1.41)	2.53 (6.97)	.991	1.70	15

^aSubstitute -1.07 based on assumption (7).

^bSubstitute -2.91 based on assumption (6).

TABLE 4-19.--Plastic Manufactures.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-2.32 (5.97)	(1.81)	2.67 (5.83)	.931	2.50	14
USX	OLS	-1.00 (2.12)	(.51)	.87 (5.35)	.890	1.57	15
EM	OLS	-.97 (4.00)	(2.24)	2.26 (15.22)	.989	2.64	15
EX	2SLS	-.74 (3.31)	(.68)	1.98 (24.84)	.996	2.20	15
JM	OLS	-1.94 (5.36)	(2.60)	.72 (9.63)	.899	1.15	15
JX	2SLS	-3.94 (3.34)	(2.17)	1.10 (.97)	.981	1.15	15

TABLE 4-20.--Oils, Perfumes.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-.67 (1.82)	(.19)	1.35 (4.39)	.889	1.68	15
USX	OLS	-1.06 (3.51)	(1.08)	.34 (2.20)	.329	1.58	15
EM	OLS	-.48 (4.11)		1.33 (28.44)	.978	2.28	16
EX	2SLS	-1.01 (2.01)	(1.51)	.97 (12.37)	.962	2.22	15
JM	OLS	-1.26 (5.49)	(.11)	.94 (19.53)	.963	1.22	15
JX	2SLS	-1.75 ^a (2.43)	(5.33)	-.44 (.32)	.752	1.43	15

^aSubstitute -1.11 based on assumption (7).

TABLE 4-21.--Other Chemical Products.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .55 (1.55)	(3.28)	1.38 (4.37)	.888	1.90	15
USX	2SLS	- .66 (1.34)	(.42)	.41 (3.01)	.354	1.45	14
EM	OLS	- .85 (4.54)	(2.64)	1.88 (9.09)	.887	1.81	15
EX	2SLS	- .69 (6.64)	(.36)	1.28 (32.27)	.992	2.41	15
JM	OLS	-1.42 (6.81)	(2.56)	.93 (17.85)	.963	2.60	15
JX	2SLS	-1.24 (4.75)	(1.13)	3.12 (18.52)	.977	2.73	15

TABLE 4-22.--Power Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .34 ^a (.61)	(2.86)	5.43 (7.84)	.949	1.03	15
USX	OLS	-1.94 (5.50)	(1.49)	2.33 (4.46)	.921	1.58	15
EM	OLS	.50 ^b (1.41)	(2.90)	.76 (1.63)	.875	1.83	15
EX	OLS	- .48 ^c (1.54)		1.48 (10.87)	.890	1.39	16
JM	OLS	-1.47 (3.64)	(1.01)	1.65 (4.85)	.819	1.55	15
JX	OLS	-1.15 ^d (1.55)		4.05 (10.87)	.873	2.25	16

^aSubstitute -2.17 based on assumption (5), categories 23-27, and Japan.

^bSubstitute -1.83 based on assumption (6).

^cSubstitute -1.65 based on assumption (5), categories 23-27, and the U.S.

^dSubstitute -2.66 based on assumption (5), categories 23-27, and the U.S.

TABLE 4-23.--Agricultural Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .94 (4.61)	(1.66)	1.08 (2.29)	.801	1.58	15
USX	2SLS	- .44 ^a (.26)	(.54)	.48 (.42)	.298	2.18	15
EM	OLS	- .87 (.82)		- .88 (2.07)	.639	1.11	16
EX	2SLS	- .88 (8.99)	(1.13)	.22 (.65)	.987	1.69	15
JM	2SLS	- .55 (3.50)	(1.17)	1.59 (8.33)	.935	2.21	15
JX	OLS	- .44 (3.94)	(.82)	6.33 (5.97)	.961	1.22	15

^aAn industry-specific activity variable was added in an attempt to improve the fit. Substitute -.66 based upon assumption (7).

TABLE 4-24.--Office Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	2SLS	-2.89 (5.68)		.30 (.38)	.948	1.12	15
USX	2SLS	-1.37 (3.11)	(1.70)	.26 (.42)	.839	1.67	15
EM	OLS	- .02 ^a (.06)	(.49)	1.98 (.88)	.927	1.88	15
EX	OLS	- .15 ^b (.76)	(.65)	1.36 (5.72)	.900	1.02	15
JM	OLS	-1.46 (4.96)	(1.56)	- .10 (.55)	.951	1.82	14
JX	OLS	- .96 (4.14)	(.03)	3.97 (3.73)	.725	1.11	14

^aSubstitute -2.18 based on assumption (6).

^bSubstitute -1.17 based on assumption (6).

TABLE 4-25.--Metalworking Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	2SLS	-1.29 (2.18)	(2.39)	1.13 (.69)	.665	1.10	14
USX	2SLS	-.70 (2.68)	(1.44)	.66 (2.67)	.526	1.72	14
EM	OLS	-2.01 ^a (4.46)	(2.80)	.96 (3.66)	.815	1.49	14
EX	OLS	-1.01 (4.54)	(.30)	.83 (3.24)	.938	1.28	15
JM	2SLS	-1.75 (5.21)	(2.83)	1.09 (4.70)	.854	2.33	14
JX	2SLS	-1.81 (7.32)	(2.41)	3.88 (10.23)	.965	1.98	14

^aTransformed variables (Cochrane-Orcutt).

TABLE 4-26.--Textile Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	.43 ^a (.90)	(2.39)	1.84 (4.31)	.913	1.91	15
USX	OLS	-1.37 (4.42)	(1.79)	-.51 (1.29)	.827	1.53	14
EM	OLS	-.03 ^b (.06)	(2.65)	1.36 (4.49)	.658	1.42	14
EX	OLS	-.67 (3.93)	(.78)	1.49 (13.64)	.983	1.48	15
JM	OLS	-.64 (1.93)	(1.31)	.75 (6.13)	.746	2.30	14
JX	OLS	-.40 ^c (1.37)	(.34)	1.05 (2.67)	.826	1.69	14

^aSubstitute -.90 based on assumption (5), categories 22-25 and 27, and Japan.

^bTransformed variables (Cochrane-Orcutt). Substitute -.77 based on assumption (6).

^cSubstitute -2.07 based on assumption (7).

TABLE 4-27.--Other Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .72 (3.53)	(4.68)	1.98 (7.94)	.982	1.58	15
USX	2SLS	-1.77 (1.33)	(2.15)	1.53 (5.83)	.815	2.67	15
EM	2SLS	-3.56 ^a (2.02)	(1.33)	1.51 (3.39)	.761	2.18	15
EX	OLS	- .29 ^b (1.64)	(.70)	1.31 (6.25)	.981	1.11	15
JM	2SLS	- .49 (1.42)	(1.55)	.54 (4.57)	.927	1.20	14
JX	2SLS	-2.48 (3.40)	(.27)	2.05 (3.98)	.985	1.91	15

^aSubstitute -.61 based on assumption (6).

^bSubstitute -2.13 based on assumption (6).

TABLE 4-28.--Electrical Machinery.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	-1.24 (2.41)	(4.49)	- .04 (.05)	.946	1.38	14
USX	OLS	-1.00 (7.09)	(.50)	.87 (11.60)	.970	2.15	15
EM	OLS	- .98 (9.98)	(1.51)	2.35 (19.87)	.985	2.20	15
EX	OLS	- .48 (3.53)	(1.52)	1.54 (9.43)	.972	2.07	15
JM	2SLS	-1.11 (7.29)	(1.90)	1.31 (11.20)	.987	2.72	14
JX	2SLS	-1.09 (5.34)	(.45)	2.66 (5.13)	.928	1.57	14

TABLE 4-29.--Telecommunications Apparatus.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	- .14 ^a (.45)	(4.08)	1.42 (2.14)	.965	2.18	15
USX	OLS	- .69 (4.16)	(5.41)	2.64 (15.36)	.976	2.35	15
EM	2SLS	-1.95 (6.97)		2.48 (7.82)	.923	1.25	16
EX	2SLS	-1.37 (3.06)	(3.33)	3.12 (6.38)	.958	2.35	15
JM	b						
JX	2SLS	-1.86 (2.99)	(1.12)	6.63 (5.66)	.956	1.84	14

^aSubstitute -2.47 based on assumption (3), category 28, and the E.E.C.

^bTotal is less than 10% of exports. Substitute -2.22 based on assumption (3), category 28, and the E.E.C.

TABLE 4-30.--Motor Vehicles.

EQN	EST	Price	t P DIFF	Income	$\bar{R}^2$	DW	DF
USM	2SLS	-2.66 (4.90)	(9.88)	2.54 (5.81)	.976	2.27	14
USX	2SLS	-2.93 (4.43)	(3.64)	.00 (.02)	.887	2.28	15
EM	2SLS	-2.49 (4.07)	(.77)	2.30 (2.76)	.893	2.30	15
EX	2SLS	- .74 (2.03)	(5.15)	1.14 (9.15)	.975	1.51	15
JM	a						
JX	OLS	-4.21 (2.04)	(1.98)	6.26 (5.46)	.868	2.45	14

^aTotal is less than 10% of exports. Substitute -2.32 based on assumption (6).

TABLE 4-31.--Miscellaneous Transportation Equipment.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	a						
USX	a						
EM	a						
EX	a						
JM	a						
JX	a						

^aThe data for this category are generally inadequate for direct empirical estimation. As an approximation, substitute the relevant values for category 30 based on assumption (2).

TABLE 4-32.--Precision Instruments.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	- .75 (3.45)	(3.73)	1.22 (2.77)	.966	1.47	15
USX	OLS	-1.36 (4.19)	(5.36)	2.40 (15.96)	.940	1.49	14
EM	2SLS	-1.20 (5.12)	(.23)	.39 (1.17)	.991	2.33	15
EX	OLS	- .33 ^a (1.72)		1.41 (8.63)	.980	2.17	15
JM	OLS	-1.17 (11.71)	(5.82)	1.57 (18.67)	.982	1.16	15
JX	2SLS	- .96 (1.15)	(.45)	1.34 (3.63)	.957	1.79	14

^aSubstitute -1.16 based on assumption (6).

TABLE 4-33.--Footwear, Travel Goods and Handbags.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	-.15 ^a (.53)	(1.06)	.55 (.89)	.961	1.03	15
USX	2SLS	-1.84 (1.75)	(1.48)	.73 (3.61)	.459	1.60	15
EM	2SLS	.40 ^b (1.25)	(3.95)	2.01 (15.54)	.963	1.22	15
EX	2SLS	-1.81 (2.67)	(1.69)	.81 (1.28)	.956	1.41	15
JM	c						
JX	2SLS	-.85 (5.53)		1.96 (4.90)	.754	1.68	16

^aSubstitute -1.33 based on assumption (2) and category 1.

^bSubstitute -1.14 based on assumption (2) and category 1.

^cTotal is less than 10% of exports. Substitute -.94 based on assumption (2) and category 1.

TABLE 4-34.--Photographic Manufactures.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	-2.40 ^a (6.34)		2.52 (7.60)	.933	1.33	15
USX	OLS	-.93 (2.60)	(2.25)	1.74 (14.59)	.981	1.33	14
EM	OLS	-1.95 (4.97)	(.03)	1.84 (5.42)	.988	1.76	14
EX	2SLS	-1.26 (2.26)		1.31 (16.99)	.945	.99	16
JM	OLS	-1.15 (4.99)	(3.02)	.98 (7.74)	.934	1.95	15
JX	OLS	-2.52 ^a (4.47)	(1.64)	.03 (.04)	.959	1.17	15

^aTransformed variables (Cochrane-Orcutt).

TABLE 4-35.--Furniture.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	.30 ^a (.76)	(6.02)	.30 (1.12)	.951	1.67	15
USX	OLS	-1.25 (6.14)	(2.72)	.99 (4.06)	.885	2.19	14
EM	2SLS	-.70 (1.72)	(3.37)	1.69 (7.16)	.962	1.51	15
EX	2SLS	-.15 ^b (.40)		2.15 (16.32)	.983	1.26	16
JM	c						
JX	d						

^aSubstitute -.81 based on assumption (1) and Kreinin, 1970 (Household Durables).

^bSubstitute -1.25 on the assumption that the U.S. and E.E.C. elasticities are the same.

^cTotal is very small. Substitute -.59 based on assumption (6).

^dTotal is very small. Substitute -1.25 on the assumption that the U.S., the E.E.C., and Japan share the same elasticity.

TABLE 4-36.--Sound Manufactures.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	-1.89 (1.45)		7.35 (5.71)	.906	1.38	16
USX	OLS	-.91 (3.89)	(.30)	1.57 (5.28)	.919	2.04	14
EM	2SLS	-1.48 (.80)	(.56)	2.82 (4.86)	.951	1.42	15
EX	2SLS	-1.94 (4.81)	(.01)	1.79 (7.67)	.977	1.52	15
JM	b						
JX	OLS	-.10 (.24)	(.08)	8.29 (7.30)	.981	1.32	14

^aTransformed variables (Cochrane-Orcutt).

^bTotal is less than 10% of exports. Substitute -1.07 based on assumption (6).

^cSubstitute -1.94 on the assumption that the E.E.C. and Japanese elasticities are the same.

TABLE 4-37.--Toys.

EQN	EST	Price	t P DIFF	Income	R ²	DW	DF
USM	OLS	-.12 ^a (.52)	(9.14)	.39 (1.48)	.968	2.64	15
USX	OLS	.27 ^b (.93)	(1.55)	.74 (3.98)	.800	1.96	15
EM	2SLS	1.12 ^a (1.92)	(1.14)	2.00 (8.46)	.946	1.18	15
EX	2SLS	-1.49 (3.69)	(2.63)	.99 (5.13)	.975	2.35	15
JM	OLS	-1.04 (5.00)	(1.47)	.63 (4.21)	.943	2.46	14
JX	OLS	-1.22 (6.91)	(.67)	1.50 (10.27)	.954	1.60	15

^aSubstitute -1.04 on the assumption that the U.S., E.E.C., and Japanese elasticities are equal.

^bSubstitute -1.36 based on assumption (7).

be the largest and the Japanese elasticity the smallest of the three elasticities. This is expected because imports compete with a larger volume of substitutes within the United States. This is one rationale behind assumption (6). On the export side one expects the opposite to be true for the demand for exports from the U.S. In this case, the price elasticity of demand for U.S. exports is expected to be the smallest due to its relatively large share of the market. Clearly, this is also a rationale for assumption (6).

In some cases, however, the price elasticity of demand for U.S. exports is greater than the Japanese (or the E.E.C.) elasticity. In some groups of industries the price elasticity of demand for E.E.C. exports is consistently less than both the U.S. and Japanese elasticities. This is particularly true in textiles, petroleum manufactures, chemicals, and motor vehicles. These results can only be explained by differences in the composition of commodities in the category and differences in the composition of trading partners. The near-monopoly trading position of some E.E.C. countries with former colonies may be part of the explanation in some categories. In any case, these results are the rationale for assumption (7).

4.3 Autocorrelation

If error terms are serially correlated, the standard errors of the estimated coefficients may be understated. Consequently, statistical tests based on these standard errors may not be valid.

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The Durbin-Watson statistic offers one method of testing for such autocorrelation. Many of the statistics computed for each estimating equation fall in the inconclusive region of the test because of the small sample size. There is evidence that when variables follow a trend without much fluctuation, the inconclusive region contracts toward the value of the upper boundary of the test.³ This is not as serious for trade variables because they are generally more volatile than comparable domestic variables. Moreover, indices of industrial production also tend to fluctuate more than income variables such as gross national product or gross domestic product.

In cases where the Durbin-Watson statistic clearly indicated the presence of autocorrelation,⁴ a two-stage Cochrane-Orcutt procedure was used.⁵ This procedure was also used if the statistic is near the rejection limit for the null hypothesis (i.e., within ten per cent of the rejection limit when tested against negative correlation and within twenty-five per cent when tested against positive correlation).⁶ This should further reduce the probability of serious autocorrelation.

³Kmenta (54, p. 297).

⁴A two-tailed test against the alternative of either positive or negative correlation is used at the five per cent level of significance.

⁵See Kmenta (54, pp. 287-288) for a brief explanation. In a few cases the second-stage estimation has not been carried out because the original estimates did not warrant the effort.

⁶The percentages differ because the scales of the limits differ greatly for 14-16 degrees of freedom.

When autocorrelation appeared to be a major problem, OLS was chosen over 2SLS. The Cochrane-Orcutt procedure was then applied to the OLS estimates. This procedure is simpler and consistent with Monte Carlo results by Hurd (39, p. 573). One of his major conclusions is that when there is modest autocorrelation, OLS is generally superior to 2SLS.

4.4 Evaluating the Results

Two hundred twenty-two estimates of price elasticities of import demand are required to estimate the effects of trade liberalization for the U.S., the E.E.C., and Japan in the thirty-seven categories. Of these two hundred twenty-two, empirical estimates are presented in Section 4.1 for two hundred four.⁷ One hundred sixty-two of these (seventy-nine per cent) are actually selected for use on the basis of reliability. Thus, a total of sixty arbitrary elasticities are presented along with the empirical estimates. Of the price elasticities estimated directly, twenty-eight per cent are either positive or insignificantly negative at the five per cent level, and nineteen per cent at the ten per cent level.

Many of the estimation difficulties are concentrated in "problem" industries. These categories appear to present an industry-wide pattern of poor results. These include Aluminum (12); Petroleum Manufactures (15); Dyeing, Tanning, and Coloring

⁷The remaining eighteen are not estimated because of their relative unimportance.

Materials (18); Power-Generating Machinery (22); Textile Machinery (26); Furniture (35); Sound Manufactures (36); and Toys (37). No characteristic common to all these categories which might offer an explanation is apparent. However, there are several concentrated industries among those in the list (e.g., Aluminum, Petroleum Manufactures, and Power-Generating Machinery). In these cases, the expected price responses may be distorted by market structures.

It is interesting to note that a dummy variable entered in the U.S. equations for Motor Vehicles (30) to account for the Canadian-U.S. Automotive Products Agreement in 1965 was very insignificant. This does not mean, however, that the elimination of tariffs between the U.S. and Canada had no effect on the bilateral trade flow,⁸ since Canadian trade is excluded from the category. It does mean that the Agreement may have had little or no effect on trade with others. This is not really surprising given that much of the trade between the U.S. and Canada is intra-firm trade in intermediate products.

The relative performances of OLS and 2SLS warrant special attention. Of the empirical estimates of price elasticities actually used, OLS was chosen as the "best" estimator in fifty-two per cent of the cases, and 2SLS was selected in the remaining forty-eight per cent. The two estimators, therefore, performed about equally well. Given the greater efficiency one expects of

⁸In fact, the Agreement has probably been a major factor in this bilateral trade. See, for example, Officer and Hurtubise (79, p. 325).

OLS in such small samples, the roughly equivalent performance of 2SLS indicates significant potential bias in using OLS estimates.

The importance of relative price in obtaining reliable results is also a primary concern. The two price coefficients are significantly different from each other in about a third of the cases at the five per cent level and in about one-half the cases at the ten per cent level. Estimates using relative price were made for many equations for which the original estimates were poor. Of these, relative price improved the mean square error of the estimate in twenty-four cases. However, the estimates in ten of these instances were still unreliable and were replaced by arbitrary estimates. Therefore, there are only fourteen equations in which the use of relative price appeared to be a critical factor in obtaining reliable results. This rather weak power overall, however, should not diminish the importance of relative price in the individual fourteen equations.

It is difficult to compare the elasticity estimates presented here with previous estimates because previous estimates either do not exist or they refer to categories that are not comparable to those used here. A limited comparison is possible, however, with Kreinin's study (61) of disaggregate import demand functions for the U.S. A careful comparison of the categories in that study and the present study indicates ten categories which are almost exactly comparable. The respective estimates of price elasticity of demand for these categories are presented in Table 4-38. The estimates from the Kreinin study are all OLS estimates taken from the period

TABLE 4-38.--Comparison of Estimated Price Elasticities.

U.S. Price Elasticities of Import Demand		
Category	Stone ^a	Kreinin ^b
1 Leather mfgs	-1.33 ^c	- .74
2 Rubber mfgs	-2.22	- .39
18 DTC mats	-3.71	-1.56
20 Oils, perfumes	- .67	- .46
23 Ag mach	- .94 ^c	- .67
25 Metal mach	-1.29	- .98
27 Other mach	- .72 ^c	- .92
28 Elect mach	-1.24 ^c	- .92
33 Shoes, bags	- .15 ^c	- .79
34 Photo mfgs	-2.40 ^d	-1.08

^aTaken from Tables 4-1 through 4-37, semi-annual data, 1963-1972. Unless otherwise indicated, estimates are for 2SLS and do not use relative price.

^bKreinin (61), quarterly data, 1963-1970. All estimates are for OLS and use relative price.

^cOLS.

^dRelative price variable and OLS.

1964 through the first quarter of 1970. Relative price and real gross national product were used as the price and income variables, respectively.

In all but two instances, the estimates from the present study are higher, most by a substantial margin. These higher elasticities are most likely the result of the frequent use of 2SLS and the relatively rare use of relative price. The implications of this study regarding the performance of 2SLS relative to OLS and the performance of relative price tend to support this conclusion. Such a conclusion must remain tentative, however, due to the possibility of intervening factors. The elasticity for Photographic Manufactures, for example, is higher than the Kreinin estimate, but both are OLS estimates based on relative price. The higher elasticities, therefore, might be a "quirk" in these ten categories, although the fact that eight of ten are higher make this an unlikely explanation.

The additional two and three-quarter years (1970I-1972) in this study's sample period and the drastic exchange rate realignments during these years may also be an important factor. Still, these years represent only about twenty per cent of the sample. The shift in the price elasticity would have to be quite large to have a substantial impact on the estimated elasticity.

Yet another possibility is that the use of semi-annual rather than quarterly data could explain the higher elasticities. This would be true, for example, if the "noise" from the unit value measurement problem has a greater tendency to "cancel" over

a six month period than over a three month period. It would also be true if the simultaneity bias were less in semi-annual data. This could be the case if export supply were substantially more elastic over a six month rather than a three month period. Some doubt is cast on this explanation, however, by Kreinin's rejection of preliminary estimates using a price variable lagged one quarter.

Finally, the use of different activity variables may be significant. An index of industrial production may be a better activity variable than real gross national product. On the other hand, it is difficult to believe that this could make such a consistent and substantial difference in the estimates.

CHAPTER 5

STATIC EFFECTS OF TRADE LIBERALIZATION

5.1 Introduction

This chapter presents estimates of the initial price effects of trade liberalization on tariffs, trade volumes, and welfare. A section estimating the employment effects in the U.S. labor market is also included. These results are presented primarily in tabular form. An attempt has been made to report the effects in each category in as much detail and from as many different perspectives as possible. The narrative, on the other hand, attempts to explain the origin of each table, the extraordinary elements of the detailed effects, and some of the implications of the results.

5.2 Tariffs and Tariff Changes

Computation of Tariff Changes

Table 5-1 presents the post-Kennedy Round MFN ad valorem tariff rates and the tariff changes implied by Schemes A and B, respectively. Scheme A calls for a reduction of all tariffs by sixty per cent and elimination of tariffs of five per cent or less; Scheme B calls for a reduction in tariffs equal to the initial height of each tariff. The U.S. import tariffs are based on f.o.b. value, but the computed tariff changes were converted to c.i.f.

TABLE 5-1.--Tariffs and Tariff Changes.

Category	Prin	Tariff	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
			A	B			A	B	A	B	
1 Leather mfgs	USM	8.01	1.17	1.41		1.04	5.40	.87	1.00	1.00	.98
	USX	8.01	1.21	1.42			5.88	.93	1.00	1.00	
	EM	6.7	1.26	1.49			5.07	.67	.94	.77	1.28
	EX	8.5	1.14	1.35			5.81	.98	.99	1.05	
2 Rubber mfgs	JM	11.7	1.00	1.14			7.02	1.56	1.30	1.79	.72
	JX	8.0	1.21	1.45			5.81	.93	.99	1.00	
	USM	5.3	1.42	1.49		1.09	4.14	.39	1.00	1.00	1.80
	USX	10.1	1.00	1.01			6.06	1.03	1.00	1.00	
	EM	8.3	1.00	1.01			4.98	.78	1.20	2.00	1.04
	EX	9.3	1.41	1.48			7.86	1.28	1.30	1.24	
3 Wood mfgs	JM	7.8	1.00	1.05			4.68	.64	1.13	1.64	1.14
	JX	9.1	1.23	1.27			6.72	1.05	1.11	1.02	
	USM	9.9	1.01	1.49		1.16	5.17	1.25	1.00	1.00	.71
	USX	9.5	1.00	1.08			5.70	.98	1.00	1.00	
	EM	10.8	1.00	1.08			6.48	1.25	1.25	1.00	.88
	EX	9.5	1.01	1.08			5.76	.98	1.01	1.00	
4 Paper mfgs	JM	10.2	1.00	1.05			6.12	1.10	1.18	.88	.95
	JX	9.6	1.00	1.08			5.76	.98	1.01	1.00	
	USM	1.4	1.26	7.81		1.05	1.01	.14	1.00	1.00	1.11
	USX	7.5	1.00	1.24			4.50	.69	1.00	1.00	
	EM	9.9	1.00	1.24			5.94	1.20	5.88	8.57	.32
	EX	4.1	1.25	1.24			3.08	.20	.68	.29	
	JM	7.3	1.01	1.14			4.42	.61	4.38	4.36	.74
	JX	5.5	1.09	1.24			3.60	.37	.80	.54	

TABLE 5-1.--Continued.

Category	Prin	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
		Tariff	A	B		A	B	A	B	
5 Tex semi-mfgs	USM	15.7	1.00	2.15	1.08	8.72	4.91	1.00	1.00	.38
	USX	6.9	1.07	1.98		4.43	.94	1.00	1.00	
	EM	5.7	1.12	1.78		3.83	.56	.44	.11	2.23
	EX	8.8	1.00	2.23		5.28	1.72	1.19	1.83	
6 Tex articles	JM	4.2	1.00	2.31		2.52	.39	.29	.08	1.50
	JX	8.1	1.08	1.84		5.25	1.22	1.19	1.30	
	USM	13.3	1.00	1.20	1.08	7.39	1.97	1.00	1.00	1.06
	USX	16.0	1.00	1.06		9.60	2.71	1.00	1.00	
7 Clothing	EM	15.2	1.00	1.06		9.12	2.45	1.23	1.24	1.16
	EX	15.6	1.00	1.20		9.36	2.92	.98	1.08	
	JM	10.8	1.00	1.04		6.48	1.21	.88	.61	1.61
	JX	15.5	1.00	1.16		9.30	2.79	.97	1.03	
8 Mineral mfgs	USM	25.5	1.00	1.20	1.08	14.17	7.22	1.00	1.00	.70
	USX	20.1	1.00	1.06		12.06	4.28	1.00	1.00	
	EM	16.5	1.00	1.06		9.90	2.89	.70	.40	1.56
	EX	22.8	1.00	1.20		13.68	6.24	1.13	1.46	
8 Mineral mfgs	JM	14.5	1.00	1.04		8.70	2.19	.61	.30	1.67
	JX	21.8	1.00	1.16		13.08	5.51	1.08	1.29	
	USM	13.2	1.01	1.86	1.12	7.14	2.89	1.00	1.00	.58
	USX	10.2	1.06	1.47		6.49	1.53	1.00	1.00	
8 Mineral mfgs	EM	9.7	1.06	1.67		6.17	1.57	.86	.54	1.20
	EX	11.3	1.02	1.66		6.92	2.12	1.07	1.39	
	JM	5.4	1.05	1.18		3.40	.34	.48	.12	3.04
	JX	10.6	1.03	1.77		6.55	1.99	1.01	1.30	

TABLE 5-1.--Continued.

Category	Prin	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
		Tariff	A	B		A	B	A	B	
9 Glass mfgs	USM	14.1	1.01	1.44	1.11	7.70	2.58	1.00	1.00	.70
	USX	11.7	1.01	1.21		7.09	1.66	1.00	1.00	
	EM	9.7	1.01	1.22		5.88	1.15	.76	.45	1.46
	EX	12.5	1.01	1.39		7.58	2.17	1.07	1.31	
	JM	8.7	1.01	1.12		5.27	.85	.68	.33	1.67
	JX	12.3	1.01	1.33		7.45	2.01	1.05	1.21	
	USM	2.6	1.08	1.24	1.08	1.56	.08	1.00	1.00	1.49
	USX	4.3	1.17	1.25		3.02	.23	1.00	1.00	
10 I&S, unworked	EM	4.4	1.09	1.20		2.88	.23	1.85	2.88	1.02
	EX	4.4	1.12	1.26		2.96	.24	.98	1.04	
	JM	4.6	1.29	1.33		3.56	.28	2.28	3.50	.98
	JX	4.0	1.08	1.23		2.59	.20	.86	.87	
11 I&S, semi-mfgs	USM	6.9	1.08	1.24	1.12	3.99	.53	1.00	1.00	.85
	USX	6.3	1.17	1.25		4.42	.50	1.00	1.00	
	EM	7.1	1.09	1.20		4.64	.60	1.16	1.13	.94
	EX	6.4	1.12	1.26		4.30	.52	.97	1.04	
	JM	6.6	1.29	1.33		5.11	.58	1.28	1.09	1.09
	JX	6.5	1.08	1.23		4.21	.52	.95	1.04	
12 Aluminum	USM	5.3	1.20	1.34	1.03	3.70	.38	1.00	1.00	1.16
	USX	6.6	1.12	1.21		4.44	.53	1.00	1.00	
	EM	7.8	1.12	1.20		5.24	.73	1.42	1.92	.82
	EX	6.0	1.19	1.34		4.28	.48	.96	.91	
	JM	8.9	1.06	1.37		5.66	1.09	1.53	2.87	.55
	JX	5.8	1.17	1.28		4.07	.43	.92	.81	

TABLE 5-1.--Continued.

Category	Prin	Distr		Index	CIF/FOB	Δ Tariff		Δ T REL US		REL M/X Bias
		Tariff	A	B		A	B	A	B	
13 Other metals	USM	2.0	1.29	1.33	1.02	1.52	.05	1.00	1.00	1.47
	USX	2.3	1.05	1.89		1.45	.07	1.00	1.00	
	EM	1.7	1.05	4.41		1.07	.13	.70	2.60	.37
	EX	2.4	1.22	1.34		1.76	.08	1.16	.62	
	JM	5.8	1.06	1.37		3.69	.46	2.43	9.20	.36
	JX	1.6	1.17	1.82		1.12	.05	.77	.71	
14 Metal mfgs	USM	7.9	1.08	1.81	1.07	4.78	1.13	1.00	1.00	.73
	USX	9.8	1.01	1.07		5.94	1.03	1.00	1.00	
	EM	8.0	1.01	1.07		4.85	.68	1.01	.60	1.89
	EX	9.7	1.07	1.75		6.23	1.65	1.05	1.63	
	JM	7.0	1.00	1.04		4.20	.51	.88	.45	1.85
	JX	9.4	1.05	1.51		5.92	1.33	1.00	1.29	
15 Petro1 mfgs	USM	4.5	1.30	2.07	1.07	3.28	.39	1.00	1.00	.76
	USX	4.9	1.21	1.35		3.56	.32	1.00	1.00	
	EM	5.2	1.30	1.45		4.06	.39	1.24	1.00	1.19
	EX	4.7	1.21	1.78		3.41	.39	.96	1.22	
	JM	9.6	1.01	1.11		5.82	1.02	1.77	2.62	.48
	JX	3.5	1.30	1.89		2.73	.23	.77	.72	
16 Org chem	USM	8.9	1.06	1.38	1.08	5.24	1.01	1.00	1.00	.83
	USX	7.2	1.01	1.35		4.36	.70	1.00	1.00	
	EM	10.6	1.01	1.38		6.42	1.55	1.23	1.53	.64
	EX	7.4	1.08	1.36		4.80	.74	1.10	1.06	
	JM	8.5	1.00	1.32		5.10	.95	.97	.94	.83
	JX	7.0	1.05	1.38		4.41	.68	1.01	.97	

TABLE 5-1.--Continued.

Category	Prin	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
		Tariff	A	B		A	B	A	B	
17 Inorg chem	USM	3.1	1.24	1.38	1.08	2.14	.12	1.00	1.00	1.85
	USX	4.6	1.01	1.38		2.79	.29	1.00	1.00	
	EM	7.5	1.04	1.38		4.68	.78	2.19	6.50	.52
	EX	4.1	1.08	1.36		2.66	.23	.95	.79	
	JM	5.5	1.02	1.32		3.37	.40	1.57	3.33	.77
	JX	4.2	1.05	1.38		2.64	.24	.95	.83	
	USM	17.7	1.03	1.50	1.08	10.13	4.35	1.00	1.00	.33
	USX	7.5	1.00	1.12		4.50	.63	1.00	1.00	
18 DTC mat	EM	9.7	1.00	1.12		5.82	1.05	.57	.24	.98
	EX	8.3	1.02	1.31		5.08	.90	1.13	1.43	
	JM	8.2	1.01	1.12		4.97	.75	.49	.17	1.13
	JX	8.4	1.01	1.23		5.09	.87	1.13	1.38	
19 Plastics	USM	8.6	1.01	1.20	1.08	4.83	.82	1.00	1.00	1.23
	USX	11.2	1.00	1.12		6.72	1.40	1.00	1.00	
	EM	15.6	1.00	1.12		9.36	2.73	1.94	3.33	.65
	EX	9.8	1.01	1.17		5.94	1.12	.88	.80	
	JM	9.7	1.00	1.11		5.82	1.04	1.20	1.27	1.16
	JX	10.8	1.00	1.15		6.48	1.34	.96	.96	
	USM	5.1	1.04	1.90	1.08	2.95	.46	1.00	1.00	1.17
	USX	7.6	1.00	1.44		4.56	.83	1.00	1.00	
20 Oils, perf	EM	8.2	1.00	1.46		4.92	.98	1.67	2.13	.95
	EX	6.9	1.03	1.70		4.26	.81	.93	.98	
	JM	10.5	1.01	1.40		6.36	1.54	2.16	3.35	.75
	JX	6.8	1.02	1.64		4.16	.76	.91	.92	

TABLE 5-1.--Continued.

Category	Prin	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
		Tariff	A	B		A	B	A	B	
21 Other chem	USM	5.1	1.26	2.63	1.08	3.57	.63	1.00	1.00	.85
	USX	7.7	1.02	1.21		4.71	.71	1.00	1.00	
	EM	9.6	1.02	1.20		5.87	1.11	1.64	1.76	.77
	EX	6.8	1.16	1.49		4.73	.69	1.00	.97	
	JM	7.7	1.01	1.22		4.67	.72	1.31	1.14	1.03
	JX	7.2	1.09	1.44		4.71	.75	1.00	1.06	
22 Power mach	USM	4.3	1.21	1.74	1.04	3.00	.31	1.00	1.00	.96
	USX	5.2	1.04	1.17		3.24	.32	1.00	1.00	
	EM	7.1	1.05	1.18		4.47	.59	1.49	1.90	.78
	EX	4.6	1.16	1.58		3.20	.33	.99	1.03	
	JM	9.9	1.00	1.11		5.94	1.09	1.98	3.52	.52
	JX	4.7	1.11	1.38		3.13	.30	.97	.94	
23 Ag mach	USM	.1	1.00	.195	1.12	.05	.02	1.00	1.00	.11
	USX	3.0	1.45	1.23		2.61	.11	1.00	1.00	
	EM	4.6	1.50	1.25		4.14	.26	82.80	13.00	.80
	EX	1.8	1.00	1.85		1.19	.06	.46	.55	
	JM	6.0	1.00	1.00		3.60	.36	72.00	18.00	.58
	JX	2.0	1.00	1.85		1.20	.07	.46	.64	
24 Office mach	USM	4.9	1.16	1.74	1.04	3.28	.40	1.00	1.00	1.45
	USX	8.5	1.02	1.27		5.20	.92	1.00	1.00	
	EM	7.1	1.02	1.10		4.35	.55	1.33	1.38	1.70
	EX	8.2	1.10	1.72		5.41	1.16	1.04	1.26	
	JM	12.6	1.00	1.68		7.56	2.67	2.30	6.68	.42
	JX	7.2	1.07	1.32		4.62	.68	.89	.74	

TABLE 5-1.--Continued.

Category	Prin	Tariff	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
			A	B			A	B	A	B	
25 Metal mach	USM	7.0	1.04	1.30		1.06	4.12	.64	1.00	1.00	.91
	USX	7.5	1.04	1.18			4.68	.66	1.00	1.00	
	EM	6.1	1.07	1.18			3.92	.44	.95	.69	1.40
	EX	7.7	1.03	1.27			4.76	.75	1.02	1.14	
	JM	6.8	1.00	1.19			4.08	.55	.99	.86	1.10
	JX	7.5	1.05	1.25			4.73	.70	1.01	1.06	
	USM	7.6	1.09	1.37		1.05	4.73	.75	1.00	1.00	.77
	USX	6.7	1.19	1.30			4.78	.58	1.00	1.00	
26 Tex mach	EM	5.7	1.24	1.37			4.24	.45	.90	.60	1.37
	EX	7.2	1.07	1.30			4.62	.67	.97	1.16	
	JM	6.6	1.00	1.01			3.96	.44	.84	.59	1.22
	JX	6.9	1.16	1.37			4.80	.65	1.00	1.12	
27 Other mach	USM	6.7	1.07	1.43		1.06	4.06	.61	1.00	1.00	.86
	USX	7.1	1.07	1.18			4.56	.59	1.00	1.00	
	EM	6.7	1.07	1.18			4.30	.53	1.06	.87	1.25
	EX	7.1	1.05	1.37			4.47	.69	.98	1.17	
	JM	8.0	1.00	1.19			4.80	.76	1.18	1.25	.87
	JX	6.9	1.07	1.29			4.43	.61	.97	1.03	
	USM	7.3	1.04	1.15		1.04	4.38	.59	1.00	1.00	1.21
	USX	9.0	1.02	1.11			5.51	.90	1.00	1.00	
28 Elect mach	EM	6.4	1.03	1.06			3.96	.43	.90	.73	1.68
	EX	9.4	1.03	1.20			5.81	1.06	1.05	1.18	
	JM	7.0	1.00	1.30			4.20	.64	.96	1.08	1.01
	JX	8.7	1.03	1.10			5.38	.83	.98	.92	

TABLE 5-1.--Continued.

Category	Prin	Tariff	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
			A	B			A	B	A	B	
29 Telecom	USM	7.3	1.07	1.27		1.06	4.42	.64	1.00	1.00	1.28
	USX	10.4	1.02	1.09			6.36	1.18	1.00	1.00	
	EM	11.0	1.00	1.08			6.60	1.31	1.49	2.05	.92
	EX	9.3	1.07	1.26			5.97	1.09	.94	.92	
30 Motor veh	JM	5.8	1.08	1.15			3.76	.39	.85	.61	1.77
	JX	9.5	1.06	1.23			6.04	1.11	.95	.94	
	USM	3.0	1.59	1.39		1.11	2.58	.11	1.00	1.00	2.56
	USX	5.3	1.01	1.24			3.21	.35	1.00	1.00	
31 Misc trans	EM	11.6	1.00	1.24			6.96	1.67	2.70	15.18	.27
	EX	4.4	1.56	1.38			4.12	.27	1.28	.77	
	JM	8.8	1.07	1.24			5.65	.96	2.19	8.73	.44
	JX	4.8	1.44	1.35			4.15	.31	1.29	.89	
32 Prec instr	USM	7.6	1.00	1.39		1.11	4.56	.72	1.00	1.00	1.59
	USX	12.2	1.01	1.24			7.39	1.85	1.00	1.00	
	EM	8.2	1.00	1.24			4.92	.83	1.08	1.15	1.55
	EX	12.2	1.01	1.38			7.39	2.05	1.00	1.11	
	JM	6.5	1.07	1.24			4.17	.52	.91	.72	2.05
	JX	11.6	1.00	1.32			6.96	1.78	.94	.96	
	USM	13.1	1.04	1.42		1.04	7.86	2.34	1.00	1.00	.52
	USX	8.8	1.01	1.06			5.33	.82	1.00	1.00	
	EM	8.9	1.00	1.05			5.34	.83	.68	.35	1.37
	EX	9.8	1.04	1.35			6.12	1.30	1.15	1.59	
	JM	8.3	1.05	1.09			5.23	.75	.67	.32	1.33
	JX	9.6	1.02	1.21			5.88	1.12	1.10	.73	

TABLE 5-1.--Continued.

Category	Prin	Distr		Index	CIF/FOB	Δ Tariff		ΔT REL US		REL M/X Bias
		Tariff	A	B		A	B	A	B	
33 Shoes, bags	USM	11.8	1.01	1.36	1.09	6.56	1.74	1.00	1.00	1.11
	USX	14.7	1.00	1.20		8.82	2.59	1.00	1.00	
	EM	12.7	1.00	1.18		7.62	1.90	1.16	1.09	1.24
	EX	13.8	1.01	1.36		8.36	2.59	.95	1.00	
34 Photo mfgs	JM	16.6	1.01	1.39		10.06	3.83	1.53	2.20	.78
	JX	13.6	1.01	1.33		8.24	2.46	.93	.95	
	USM	4.5	1.63	1.20	1.05	4.19	.23	1.00	1.00	2.60
	USX	7.8	1.02	1.11		4.77	.68	1.00	1.00	
35 Furniture	EM	7.7	1.02	1.06		4.71	.63	1.12	2.74	.80
	EX	7.2	1.38	1.23		5.96	.64	1.25	.94	
	JM	17.8	1.01	1.27		10.79	4.02	2.58	17.48	.25
	JX	6.3	1.26	1.12		4.76	.44	1.00	.65	
36 Sound mfgs	USM	7.6	1.10	1.33	1.04	4.82	.74	1.00	1.00	1.24
	USX	11.4	1.00	1.00		6.84	1.30	1.00	1.00	
	EM	8.4	1.00	1.00		5.04	.71	1.05	.96	1.60
	EX	11.2	1.10	1.33		7.39	1.67	1.08	1.28	
36 Sound mfgs	JM	8.5	1.04	1.12		5.30	.81	1.10	1.09	1.28
	JX	10.6	1.05	1.17		6.68	1.31	.98	1.01	
	USM	6.5	1.01	1.11	1.05	3.75	.45	1.00	1.00	1.18
	USX	8.5	1.01	1.06		5.15	.73	1.00	1.00	
36 Sound mfgs	EM	8.4	1.01	1.04		5.09	.73	1.36	1.62	1.00
	EX	7.9	1.01	1.11		4.79	.69	.93	.95	
	JM	8.2	1.03	1.13		5.07	.76	1.35	1.69	.96
	JX	8.0	1.01	1.09		4.85	.70	.94	.96	

value using the CIF/FOB index.¹ In addition, the Japanese tariffs were adjusted to reflect the unilateral reductions made by Japan late in 1972.² These reductions averaged twenty per cent in most industrial categories.

The "Distribution Index" columns contain the adjustment indices required to compute the Scheme A and Scheme B tariff changes.³ The Distribution Index (DI) for Scheme A is

$$\frac{.6 \sum w_i t_i + .4 \sum w_i t_z}{.6 \sum w_i t_i}$$

This index represents the average tariff change attributable to reducing all tariffs by sixty per cent and eliminating tariffs of five per cent or less expressed as a fraction of the average tariff change from just reducing them by sixty per cent. In most cases, this difference is not large. In a sizeable minority of cases, however, the five per cent elimination factor is very appreciable.

Alternatively, the DI for Scheme B is

$$\frac{\sum w_i t_i^2}{(\sum w_i t_i)^2}$$

¹From Bureau of the Census Report FT 990 (35).

²The data for these adjustments are provided by the U.S. Tariff Commission (102).

³See Chapter 3, pp. 56-57, for an explanation of these adjustment factors.

This index compensates for the difference between "squaring the average and averaging the squares." In almost every instance there is a significant difference between the two. When a very low tariff average is caused primarily by a high proportion of duty-free imports, this index can be quite large. In the case of U.S. import tariffs on Agricultural Machinery (23), for example, the $DI(B)$ is approximately one hundred ninety-five.

The computation of the tariff changes implied by Schemes A and B is straightforward. The Scheme A tariff change is $.6t$ ($DI[A]$), and the Scheme B tariff change is t^2 ($DI[B]$). As indicated earlier these tariff changes are reported in Table 5-1. To facilitate comparison of the relative tariff changes among the principals, these changes are also expressed as a function of the U.S. tariff change. Changes in the tariffs on imports are expressed relative to the change in the U.S. import tariff, and changes in the tariffs on exports are expressed relative to the change in the tariffs on U.S. exports. A figure greater than one, for example, indicates that the change in tariff is greater than the corresponding change for the U.S. tariff. These ratios provide a convenient guide to the relative tariff changes among the principals.

Scheme A Versus Scheme B

The final column of Table 5-1 contains a very useful index. As indicated earlier, across-the-board and harmonization tariff formulas should be compared independently of the scale of their respective reductions because these are completely arbitrary. It

is the relative effects, regardless of scale, which make them different. Scheme B, for example, will result in one of three things: (1) no change in the Scheme A ratio of import change to export change; (2) an increase in imports relative to the Scheme A ratio; or (3) an increase in exports relative to the Scheme A ratio. One can determine the relative import or export-bias of Scheme B versus Scheme A in two steps: First, compute the change in the tariff on imports relative to the change in the tariff on exports for Schemes A and B; and second, divide the former by the latter. This is the index reported in the final column. It indicates whether a move to Scheme B would be import- or export-biased relative to Scheme A. If the index is less than one, for example, the use of a harmonization formula such as Scheme B will result in an import-biased change in tariffs relative to Scheme A. If the index is greater than one, Scheme B will result in an export-biased change in tariffs relative to Scheme A.

This index will also approximate the relative import- or export-bias of the change in trade volumes and the relative gain or loss in employment. This is true in these instances because the numerator and denominator of the index will be multiplied by the same variables. Hence, this index represents a widely applicable guide to the relative effects of Scheme A versus Scheme B.

The thirty-seven categories for each principal were divided into three groups: the twelve most import-sensitive to Scheme B, the twelve most export-sensitive to Scheme B, and the remaining thirteen. The two extreme groups for each principal are presented

in tabulated form in Table 5-2. As one might expect, the U.S. and Japanese patterns of trade bias differ more from each other than they do from the E.E.C. pattern.

5.3 Changes in Trade Volumes

Percentage Changes

The changes in tariffs presented in Table 5-1 are converted into percentage changes in price using the formulas discussed in Chapter 2. In the case of infinitely elastic export supply, the change in tariff is multiplied by $1/(1 + t)$ to obtain the percentage change in price. The percentage change in trade is derived by multiplying this change in price by the price elasticity of import demand. Alternatively, if the price elasticities of export supply and demand are equal, the tariff change is multiplied by $1/(2 + t)$. Table 5-3 lists the percentage changes in trade volumes derived from this procedure for both Schemes A and B. The assumption of an infinitely elastic export supply is noted as case 1, and the assumption of equal elasticities as case 2.

In addition to the percentage changes in trade, Table 5-3 contains two columns relating each percentage change in trade to the corresponding change for the U.S. One column is for the Scheme A changes, and the other for Scheme B.

In these, E.E.C. and Japanese import changes are expressed as a fraction of the percentage change in U.S. imports, and export changes as a fraction of the percentage change in U.S. exports.

TABLE 5-2.--Import- or Export-Bias of Scheme B Relative to Scheme A.

Category		US	EEC	J
1	Leather mfgs		X	M
2	Rubber mfgs	X		
3	Wood mfgs	M		
4	Paper mfgs		M	M
5	Tex semi-mfgs	M	X	X
6	Tex articles			X
7	Clothing	M	X	X
8	Mineral mfgs	M		X
9	Glass mfgs	M	X	X
10	I & S, unworked	X		
11	I & S, semi-mfgs			
12	Aluminum		M	M
13	Other metals	X	M	M
14	Metal mfgs	M	X	X
15	Petrol mfgs	M		M
16	Org chem	M	M	
17	Inorg chem	X	M	M
18	DTC, mat	M		
19	Plastics	X	M	
20	Oils, perfumes			M
21	Other chem		M	
22	Power mach		M	M
23	Ag mach	M	M	M
24	Office mach	X	X	M
25	Metal mach		X	
26	Tex mach	M	X	X
27	Other mach			
28	Elect mach	X	X	
29	Telecom	X	M	X
30	Motor veh	X	M	M
31	Misc trans	X	X	X
32	Prec instr	M	X	X
33	Shoes, bags			
34	Photo mfgs	X	M	M
35	Furniture	X	X	X
36	Sound mfgs			
37	Toys mfgs			X

Note: M = among twelve most import-biased categories.
 X = among twelve most export-biased categories.

TABLE 5-3.--Percentage Changes In Trade Volumes.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
1 Leather mfgs	USM	6.68	3.46	1.08	.57	1.00	1.00
	USX	8.59	4.44	1.35	.71	1.00	1.00
	EM	5.40	2.79	.72	.36	.81	.67
	EX	6.64	3.42	1.12	.58	.77	.83
2 Rubber mfgs	JM	5.90	3.12	.71	.36	.88	.66
	JX	5.89	3.04	.94	.49	.69	.70
	USM	8.77	4.48	.82	.42	1.00	1.00
	USX	7.21	3.77	1.23	.64	1.00	1.00
3 Wood mfgs	EM	3.24	1.67	.52	.26	.37	.62
	EX	9.98	5.01	1.63	.84	1.38	1.33
	JM	8.57	4.43	1.18	.61	.98	1.44
	JX	8.90	4.62	1.40	.72	1.23	1.14
4 Paper mfgs	USM	10.76	5.60	2.60	1.36	1.00	1.00
	USX	11.17	5.82	1.75	1.01	1.00	1.00
	EM	9.17	4.82	1.77	.93	.85	.68
	EX	9.70	5.06	1.66	.86	.87	.95
4 Paper mfgs	JM	16.37	8.58	2.95	1.53	1.52	1.13
	JX	8.06	4.21	1.38	.72	.72	.79
	USM	.82	.41	.11	.06	1.00	1.00
	USX	16.80	8.70	2.57	1.32	1.00	1.00
4 Paper mfgs	EM	4.33	2.26	.87	.46	5.28	6.36
	EX	3.23	1.65	.21	.11	.19	.08
	JM	8.28	4.28	1.15	.58	10.10	10.45
	JX	5.13	2.63	.53	.27	.31	.21

TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
5 Tex semi-mfgs	USM	11.51	6.18	6.48	3.49	1.00	1.00
	USX	6.04	3.12	1.28	.66	1.00	1.00
	EM	5.59	2.42	.80	.41	.49	.12
	EX	2.98	1.54	.97	.54	.49	.76
6 Tex articles	JM	3.63	1.86	.56	.29	.32	.09
	JX	11.22	5.80	2.60	1.36	1.86	2.03
	USM	4.80	2.54	1.28	.68	1.00	1.00
	USX	6.54	3.51	1.85	.99	1.00	1.00
7 Clothing	EM	5.86	3.14	1.58	.84	1.22	1.23
	EX	4.94	2.65	1.54	.82	.76	.83
	JM	6.21	3.25	1.17	.60	1.29	.91
	JX	7.81	4.19	2.35	1.25	1.19	1.27
8 Mineral mfgs	USM	14.21	7.86	7.24	4.01	1.00	1.00
	USX	24.50	13.37	8.69	4.73	1.00	1.00
	EM	10.63	5.71	3.10	1.66	.75	.43
	EX	8.13	4.50	3.71	2.05	.33	.43
9 Mineral mfgs	JM	9.50	5.08	2.39	1.28	.67	.33
	JX	21.59	11.86	9.09	4.98	.88	1.05
	USM	13.10	6.91	5.29	2.81	1.00	1.00
	USX	4.96	2.60	1.17	.61	1.00	1.00
10 Mineral mfgs	EM	7.14	3.73	1.82	.95	.55	.34
	EX	6.11	3.20	1.87	.98	1.23	1.60
	JM	3.94	2.03	.39	.21	.30	.07
	JX	9.01	4.73	2.74	1.43	1.82	2.34

TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
9 Glass mfgs	USM	9.43	5.00	3.16	1.67	1.00	1.00
	USX	6.66	3.55	1.56	.83	1.00	1.00
	EM	7.05	3.67	1.38	.72	.75	.44
	EX	8.02	4.25	2.30	1.21	1.20	1.47
10 I&S, unworked	JM	5.94	3.07	.96	.49	.63	.30
	JX	9.88	5.23	2.67	1.42	1.48	1.71
	USM	4.30	2.18	.23	.11	1.00	1.00
	USX	3.47	1.78	.26	.13	1.00	1.00
11 I&S, semi-jfgs	EM	2.42	1.24	.19	.10	.56	.83
	EX	3.45	1.77	.28	.15	.99	1.08
	JM	8.26	4.23	.66	.34	1.92	2.87
	JX	12.20	6.22	.93	.49	3.52	3.58
12 Aluminum	USM	10.84	5.46	1.42	.74	1.00	1.00
	USX	4.98	2.57	.56	.29	1.00	1.00
	EM	7.19	3.72	.93	.48	.66	.65
	EX	2.55	1.31	.31	.16	.51	.55
	JM	11.64	6.00	1.31	.68	1.07	.92
	JX	6.79	3.51	.84	.45	1.36	1.50
	USM	8.84	4.52	.90	.48	1.00	1.00
	USX	5.15	2.67	.62	.32	1.00	1.00
	EM	5.89	3.05	.82	.42	.67	.91
	EX	5.91	3.06	.68	.34	1.15	1.10
	JM	4.74	2.47	.91	.47	.54	1.01
	JX	6.53	3.37	.70	.36	1.27	1.13

TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
13 Other metals	USM	5.23	2.62	.17	.10	1.00	1.00
	USX	2.31	1.17	.11	.05	1.00	1.00
	EM	1.27	.64	.16	.08	.24	.94
	EX	3.13	1.58	.15	.07	1.35	1.36
14 Metal mfgs	JM	3.16	1.63	.39	.20	.60	2.29
	JX	2.72	1.36	.12	.07	1.18	1.09
	USM	6.01	3.11	1.42	.73	1.00	1.00
	USX	18.99	9.93	3.30	1.72	1.00	1.00
15 Petrol mfgs	EM	2.35	1.21	.33	.17	.39	.23
	EX	6.90	3.59	1.83	.96	.36	.55
	JM	1.61	.83	.20	.10	.27	.14
	JX	8.94	4.67	2.01	1.06	.47	.61
16 Org chem	USM	3.59	1.84	.42	.22	1.00	1.00
	USX	3.82	1.97	.34	.18	1.00	1.00
	EM	2.32	1.19	.22	.11	.65	.52
	EX	1.86	.95	.21	.11	.49	.62
16 Org chem	JM	2.67	1.39	.47	.25	.74	1.12
	JX	4.44	2.26	.37	.20	1.16	1.09
	USM	10.31	5.37	1.98	1.04	1.00	1.00
	USX	11.73	6.10	1.88	.98	1.00	1.00
16 Org chem	EM	6.51	3.42	1.57	.83	.63	.79
	EX	6.58	3.35	1.00	.52	.56	.53
	JM	8.26	4.27	1.54	.79	.80	.78
	JX	14.38	7.43	2.20	1.15	1.23	1.17

TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
17 Inorg chem	USM	7.07	3.57	.41	.20	1.00	1.00
	USX	4.28	2.19	.45	.23	1.00	1.00
	EM	5.64	2.92	.94	.48	.80	2.29
	EX	1.48	.75	.13	.06	.35	.29
	JM	2.51	1.30	.30	.16	.36	.73
	JX	2.93	1.50	.27	.14	.68	.60
18 DTC mat	USM	32.28	17.36	13.88	7.46	1.00	1.00
	USX	4.48	2.32	.63	.43	1.00	1.00
	EM	15.51	8.09	2.79	1.46	.48	.20
	EX	3.30	1.71	.60	.30	.74	.95
	JM	9.70	5.02	1.47	.76	.30	.11
	JX	6.74	3.49	1.16	.60	1.50	1.84
19 Plastics	USM	10.42	5.38	1.76	.90	1.00	1.00
	USX	5.98	3.18	1.25	.66	1.00	1.00
	EM	7.86	4.21	2.29	1.23	.75	1.30
	EX	4.02	2.05	.75	.39	.67	.60
	JM	10.32	5.37	1.84	.97	.99	1.05
	JX	23.09	12.10	4.77	2.52	3.86	3.82
20 Oils, perf	USM	1.88	.96	.29	.15	1.00	1.00
	USX	4.49	2.33	.82	.42	1.00	1.00
	EM	2.19	1.84	.40	.23	1.16	1.38
	EX	4.02	2.08	.77	.39	.90	.94
	JM	7.26	3.81	1.75	.92	3.86	6.03
	JX	4.32	2.23	.79	.41	.96	.96

TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
21 Other chem	USM	1.88	.96	.33	.17	1.00	1.00
	USX	2.88	1.50	.44	.22	1.00	1.00
	EM	4.56	2.38	.86	.45	2.43	2.61
	EX	3.06	1.58	.65	.23	1.06	1.48
22 Power mach	JM	6.16	3.20	1.73	.50	3.28	5.24
	JX	5.44	2.81	.87	.45	1.89	1.98
	USM	6.31	3.22	.66	.33	1.00	1.00
	USX	5.98	3.07	.58	.31	1.00	1.00
23 Ag mach	EM	7.63	3.95	1.01	.51	1.21	1.53
	EX	5.05	2.57	.53	.26	.84	.91
	JM	7.94	3.38	1.46	.76	1.26	2.21
	JX	7.95	4.07	.77	.40	1.33	1.33
24 Office mach	USM	.05	.03	.02	.01	1.00	1.00
	USX	1.67	.85	.07	.03	1.00	1.00
	EM	3.45	1.76	.22	.11	69.00	11.00
	EX	1.04	.52	.05	.03	.62	.71
	JM	1.87	.96	.19	.09	37.40	9.50
	JX	.52	.26	.03	.01	.31	.43
	USM	9.05	4.62	1.10	.58	1.00	1.00
	USX	6.56	3.41	1.16	.60	1.00	1.00
	EM	8.85	4.58	1.11	.59	.98	1.01
	EX	5.85	3.14	1.25	.67	.89	1.08
	JM	9.80	5.20	3.46	1.84	1.08	3.15
	JX	4.14	2.14	.54	.28	.63	.47

TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
25 Metal mach	USM	4.94	2.57	.77	.40	1.00	1.00
	USX	3.05	1.58	.43	.22	1.00	1.00
	EM	7.40	3.82	.82	.42	1.50	1.06
	EX	4.47	2.31	.72	.36	1.47	1.67
26 Tex mach	JM	6.70	3.45	.89	.47	1.36	1.16
	JX	7.96	4.13	1.18	.62	2.61	2.74
	USM	3.96	2.05	.63	.33	1.00	1.00
	USX	3.01	1.55	.36	.19	1.00	1.00
27 Other mach	EM	3.07	1.59	.32	.17	.78	.51
	EX	2.88	1.49	.42	.21	.96	1.17
	JM	2.38	1.23	.26	.13	.60	.41
	JX	9.29	4.80	1.26	.64	3.09	3.50
28 Elect mach	USM	2.75	1.42	.41	.22	1.00	1.00
	USX	7.54	3.89	.97	.51	1.00	1.00
	EM	2.45	1.27	.31	.16	.89	.76
	EX	8.88	4.60	1.36	.70	1.18	1.40
	JM	2.19	1.13	.35	.18	.80	.85
	JX	10.27	5.31	1.41	.74	1.36	1.45
	USM	5.05	2.63	.68	.36	1.00	1.00
	USX	5.07	2.64	.83	.43	1.00	1.00
	EM	3.65	1.88	.39	.21	.72	.57
	EX	2.55	1.33	.47	.24	.50	.57
	JM	4.36	2.25	.67	.34	.86	.99
	JX	5.45	2.81	.84	.43	1.07	1.01

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TABLE 5-3.--Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
29 Telecom	USM	10.15	5.29	1.48	.77	1.00	1.00
	USX	3.97	2.08	.74	.39	1.00	1.00
	EM	11.60	6.10	2.30	1.21	1.14	1.55
	EX	7.52	3.92	1.37	.71	1.89	1.85
30 Motor veh	JM	7.84	4.06	.82	.42	.77	1.11
	JX	10.29	5.36	1.90	.99	2.59	2.57
	USM	6.65	3.38	.29	.13	1.00	1.00
	USX	8.94	4.60	.97	.50	1.00	1.00
31 Misc trans	EM	15.54	8.19	3.74	1.97	2.34	12.90
	EX	2.93	1.49	.19	.10	.33	.20
	JM	12.13	6.29	2.06	1.07	1.82	7.10
	JX	16.59	8.55	1.22	.63	1.86	1.26
32 Prec instr	USM	11.36	5.83	1.81	.93	1.00	1.00
	USX	19.31	10.20	4.83	2.55	1.00	1.00
	EM	11.40	5.90	1.92	1.00	1.00	1.06
	EX	4.88	2.58	1.35	.72	.25	.28
	JM	9.09	4.69	1.14	.58	.80	.63
	JX	26.27	13.85	6.69	3.54	1.36	1.39
	USM	5.24	2.78	1.56	.83	1.00	1.00
	USX	6.70	3.47	1.03	.53	1.00	1.00
	EM	5.89	3.06	.91	.47	1.12	.58
	EX	6.46	3.39	1.37	.72	.96	1.33
	JM	5.69	4.27	.82	.42	1.09	.53
	JX	5.16	2.70	.98	.51	.77	.95

TABLE 5-3.---Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
33 Shoes, bags	USM	7.87	4.16	2.10	1.10	1.00	1.00
	USX	14.15	7.56	4.16	2.23	1.00	1.00
	EM	7.71	4.08	1.93	1.01	.98	.92
	EX	13.30	7.08	4.13	2.19	.94	.99
34 Photo mfgs	JM	8.11	4.36	3.08	1.66	1.03	1.47
	JX	6.16	3.28	1.84	.98	.44	.44
	USM	9.62	4.92	.53	.26	1.00	1.00
	USX	4.13	2.13	.59	.31	1.00	1.00
35 Furniture	EM	8.54	4.43	1.15	.59	.89	2.17
	EX	7.02	3.63	.76	.39	1.70	1.29
	JM	10.53	5.69	3.92	2.13	1.09	7.40
	JX	11.26	5.82	1.03	.53	2.73	1.75
36 Sound mfgs	USM	3.64	1.87	.56	.28	1.00	1.00
	USX	7.68	4.05	1.46	.76	1.00	1.00
	EM	3.28	1.69	.46	.24	.90	.82
	EX	8.23	4.38	1.86	.99	1.07	1.27
36 Sound mfgs	JM	2.89	1.50	.44	.23	.79	.79
	JX	7.55	3.96	1.48	.78	.98	1.01
	USM	6.67	3.44	.79	.42	1.00	1.00
	USX	4.36	2.25	.62	.33	1.00	1.00
36 Sound mfgs	EM	7.00	3.61	1.01	.53	1.05	1.28
	EX	8.63	4.46	1.24	.64	1.98	2.00
	JM	5.05	2.61	.76	.40	.76	.96
	JX	8.75	4.52	1.26	.66	2.01	2.03

TABLE 5-3.---Continued.

Category	Prin	% Δ Trade				Δ REL US	
		A		B		A	B
		1	2	1	2		
37 Toys	USM USX	6.66	3.79	1.92	1.03	1.00	1.00
		9.52	5.05	2.37	1.25	1.00	1.00
	EM EX	7.08	3.75	1.73	.92	1.06	.90
		10.64	5.65	2.76	1.46	1.12	1.17
	JM JX	5.01	2.59	.77	.40	.75	.40
		8.76	4.66	2.29	1.22	.92	.97

Because of quantitative restrictions on textiles (5-7) and iron and steel (10-11), a change in the explicit tariff in these categories will have little impact on trade unless the quota is liberalized. Since explicit tariff revenues will be converted into implicit revenues to foreigners, explicit tariff reductions make little sense without accompanying quota liberalization. Section 5.5 addresses this issue.

The most remarkable increase in U.S. imports occurs in Dyeing, Tanning and Coloring Materials (18). The most remarkable increases in U.S. exports occur in Paper Manufactures (4), Clothing (7), Metal Manufactures (14), and Miscellaneous Transport Equipment (31). The most responsive E.E.C. import categories appear to be Dyeing, Tanning and Coloring Materials (18) and Road Motor Vehicles (30). The only truly outstanding E.E.C. export categories are Shoes and Bags (33) and Toys (37), while the only outstanding Japanese import category is Wood Manufactures (3). The most responsive Japanese export categories include Clothing (7), Plastics (19), Road Motor Vehicles (30), and Miscellaneous Transport Equipment (31).

There are also several surprises in these results. U.S. exports of Clothing (7), for example, expand proportionately more than imports under both Scheme A and Scheme B. This is primarily the result of the small U.S. share in the export market and the resulting high price elasticity of demand for U.S. exports. Exports also tend to expand proportionately more than imports in Organic Chemicals (16) and Motor Vehicles (30). The controversy in recent

years regarding imports in these two categories makes this result particularly interesting.

Absolute Changes

By multiplying the percentage changes in trade by a base trade volume, the absolute change in trade is obtained. Table 5-4 presents these absolute changes for each category. As indicated earlier, 1974 is the base year for all value figures, and the changes reported in Table 5-4 are expressed in millions of 1974 U.S. dollars (f.o.b.). These changes represent the initial price effects of Scheme A and Scheme B.

In addition to the totals, the LDC constant market share of the changes is reported. This is useful for two reasons: First, it indicates the role of LDC's in the expansion of trade; and second, it provides a reference point for considering a non-constant market share of the change. The latter may be significant due to the unique role of LDC's in the multi-lateral negotiations.

Again, the results for the textile (5-7) and iron and steel categories (10-11) are contingent upon liberalization of the relevant quotas. It is interesting to note, however, that only in textile category (7), Clothing, does the increase in imports exceed the increase in exports for the U.S.

The greatest increases in U.S. imports under both Scheme A and Scheme B occur in Road Motor Vehicles (30); Iron and Steel, Semi-Manufactures (11); Clothing (7); Petroleum Manufactures (15); Telecommunications Apparatus (29); Textile Semi-Manufactures (5);

TABLE 5-4.--Absolute Changes in Trade Volumes (millions of dollars).

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
1 Leather mfgs	USM	27.5	16.7	14.2	8.6	4.4	2.7	2.3	1.4
	USX	16.1	4.1	8.3	2.1	2.5	.6	1.3	.3
	EM	41.8	25.7	21.6	13.3	5.6	3.4	2.8	1.7
	EX	25.4	4.0	13.1	2.1	4.3	.7	2.2	.4
	JM	5.8	3.2	3.1	1.7	.7	.4	.4	.2
	JX	6.0	3.9	3.1	2.0	1.0	.7	.5	.3
2 Rubber mfgs	USM	52.2	2.8	26.7	1.4	4.9	.3	2.5	.1
	USX	39.6	9.8	20.7	5.1	6.8	1.7	3.5	.9
	EM	9.1	.5	4.7	.3	1.4	.1	.7	.0
	EX	93.9	37.8	48.0	19.3	15.6	6.3	8.0	3.2
	JM	5.4	1.3	2.8	.7	.7	.2	.4	.1
	JX	45.6	26.0	23.7	13.5	7.2	4.1	3.7	2.1
3 Wood mfgs	USM	73.4	40.9	38.4	21.4	17.8	9.9	9.3	5.2
	USX	46.8	4.6	24.4	2.4	7.3	.7	4.2	.4
	EM	41.2	19.6	21.6	10.3	7.9	3.8	4.2	2.0
	EX	18.1	7.9	9.5	4.2	3.1	1.4	1.6	.7
	JM	78.0	26.9	40.9	14.1	14.0	4.8	7.3	2.5
	JX	9.7	2.1	5.1	1.1	1.7	.4	.9	.2
4 Paper mfgs	USM	15.0	.4	7.5	.2	2.0	.1	1.1	.0
	USX	253.9	87.5	131.5	45.3	38.8	13.4	20.0	6.9
	EM	36.7	.8	19.1	.4	7.4	.2	3.9	.1
	EX	30.2	16.3	15.4	8.3	2.0	1.1	1.0	.5
	JM	24.8	3.5	12.8	1.8	3.4	.5	1.7	.2
	JX	22.9	14.5	11.7	7.4	2.4	1.5	1.2	.8

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
5 Tex semi-mfgs	USM	150.8	66.6	81.0	35.8	84.9	37.5	45.7	20.2
	USX	161.6	62.7	83.5	32.4	34.2	13.3	17.7	6.9
	EM	178.8	91.5	77.4	39.6	25.6	13.1	13.1	6.7
	EX	102.7	35.8	53.1	18.5	33.4	11.6	18.6	6.5
6 Tex articles	JM	74.1	33.1	38.0	17.0	11.4	5.1	5.9	2.6
	JX	332.2	260.4	171.7	134.6	77.0	60.4	40.3	31.6
	USM	26.1	11.7	13.8	6.2	7.0	3.1	3.7	1.7
	USX	38.6	8.6	20.7	4.6	10.9	2.4	5.8	1.3
7 Clothing	EM	34.0	24.3	18.2	13.0	9.2	6.6	4.9	3.5
	EX	41.4	16.6	22.2	8.9	12.9	5.2	6.9	2.8
	JM	12.1	5.8	6.3	3.0	2.3	1.1	1.2	.6
	JX	23.5	12.8	12.6	6.9	7.1	3.9	3.8	2.1
8 Mineral mfgs	USM	298.0	223.0	164.8	123.3	151.8	113.6	86.0	64.3
	USX	91.8	57.6	50.1	31.4	32.6	20.5	17.7	11.1
	EM	204.4	142.6	109.8	76.6	59.6	41.6	31.9	22.3
	EX	67.9	22.5	37.6	12.5	31.0	10.3	17.1	5.7
8 Mineral mfgs	JM	60.2	49.2	32.2	26.3	15.1	12.3	8.1	6.6
	JX	63.8	14.8	35.0	8.1	29.9	6.2	14.7	3.4
	USM	76.9	9.7	40.6	5.1	31.1	3.9	16.5	2.1
	USX	16.4	4.2	8.6	2.2	3.9	1.0	2.0	.5
8 Mineral mfgs	EM	13.3	1.6	6.9	.8	3.4	.4	1.8	.2
	EX	55.4	24.4	29.0	12.8	17.0	7.5	8.9	3.9
	JM	2.8	.8	1.5	.4	.3	.1	.2	.1
	JX	46.3	17.3	24.3	9.1	14.1	5.3	7.3	2.7

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
9 Glass mfgs	USM	25.5	2.6	13.5	1.4	8.5	.9	4.5	.5
	USX	22.2	4.7	11.9	2.5	5.2	1.1	2.8	.6
	EM	9.2	.9	4.8	.5	1.8	.2	.9	.1
	EX	43.5	18.2	23.1	9.7	12.5	5.2	6.6	2.8
10 I&S, unworked	JM	2.9	.4	1.5	.2	.5	.1	.2	.0
	JX	8.2	4.7	4.3	2.4	2.2	1.3	1.2	.7
	USM	16.7	4.9	8.5	2.5	.9	.3	.4	.1
	USX	2.1	.5	1.1	.3	.2	.0	.1	.0
11 I&S, semi-mfgs	EM	11.4	4.2	5.9	2.2	.9	.3	.5	.2
	EX	5.0	1.6	2.6	.8	.4	.1	.2	.1
	JM	18.7	6.9	9.6	3.5	1.5	.6	.8	.3
	JX	17.1	2.5	8.7	1.3	1.3	.2	.7	.1
12 Aluminum	USM	536.4	45.7	270.2	23.0	70.3	6.0	36.6	3.1
	USX	123.2	67.3	63.6	34.7	13.8	7.5	7.2	3.9
	EM	60.3	3.8	31.2	2.0	7.8	.5	4.0	.3
	EX	182.8	93.0	93.9	47.8	22.2	11.3	11.5	5.8
12 Aluminum	JM	34.2	11.2	17.6	5.8	3.8	1.2	2.0	.7
	JX	626.9	370.0	324.1	191.3	77.6	45.8	41.5	24.5
	USM	33.8	3.5	17.3	1.8	3.4	.3	1.8	.2
	USX	24.6	7.2	12.8	3.8	3.0	.9	1.5	.4
12 Aluminum	EM	23.3	3.7	12.0	1.9	3.2	.5	1.7	.3
	EX	24.7	13.6	12.8	7.1	2.8	1.5	1.4	.8
	JM	16.6	5.4	8.6	2.8	3.2	1.0	1.6	.5
	JX	5.7	3.6	2.9	1.8	.6	.4	.3	.2

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
13 Other metals	USM	95.6	35.4	47.9	17.7	3.1	1.1	1.8	.7
	USX	14.4	4.0	7.3	2.0	.7	.2	.3	.1
	EM	59.6	30.9	30.0	15.6	7.5	3.9	3.8	2.0
	EX	31.5	12.4	15.9	6.3	1.5	.6	.7	.3
14 Metal mfgs	JM	24.6	21.0	12.7	10.8	3.0	2.6	1.6	1.4
	JX	22.2	7.4	11.1	3.7	1.0	.3	.6	.2
	USM	122.0	14.3	63.2	7.4	28.8	3.4	14.8	1.7
	USX	312.3	109.2	163.3	57.1	54.2	19.0	28.3	9.9
15 Petrol mfgs	EM	16.1	2.3	8.3	1.2	2.3	.3	1.2	.2
	EX	189.0	105.7	98.3	55.0	50.1	28.0	26.3	14.7
	JM	3.4	.8	1.7	.4	.4	.1	.2	.0
	JX	153.8	52.5	80.3	27.4	34.6	11.8	18.2	6.2
16 Org chem	USM	272.9	223.2	139.9	114.4	31.9	26.1	16.7	13.7
	USX	29.6	10.3	15.3	5.3	2.6	.9	1.4	.5
	EM	39.7	23.1	20.4	11.9	3.8	2.2	1.9	1.1
	EX	54.3	12.0	27.7	6.1	6.1	1.4	3.2	.7
	JM	67.0	.1	34.9	.1	11.8	.0	6.3	.0
	JX	9.4	6.5	4.8	3.4	.8	.5	.4	.3
	USM	141.4	11.9	73.6	6.2	27.1	2.3	14.3	1.2
	USX	298.5	105.9	155.2	55.1	46.8	17.0	24.9	8.8
	EM	84.2	6.7	44.2	3.5	20.3	1.6	10.7	.9
	EX	180.5	72.4	91.9	36.8	27.4	11.0	14.3	5.7
	JM	52.7	5.6	27.2	2.9	9.8	1.0	5.0	.5
	JX	193.3	80.5	99.8	41.6	29.6	12.3	15.5	6.5

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
17 Inorg chem	USM	60.5	11.5	30.5	5.8	3.5	.7	1.7	.3
	USX	44.3	18.3	22.7	9.4	4.7	1.9	2.4	1.0
	EM	39.1	11.0	20.2	5.7	6.5	1.8	3.3	.9
	EX	18.0	7.9	9.1	4.0	1.6	.7	.7	.3
	JM	6.5	.4	3.4	.2	.8	.0	.4	.0
	JX	10.2	5.3	5.2	2.7	.9	.5	.5	.3
18 DTC mat	USM	45.1	2.1	24.2	1.1	19.4	.9	10.4	.5
	USX	13.6	4.4	7.0	2.3	1.9	.6	1.3	.4
	EM	20.3	2.0	10.6	1.1	3.7	.4	1.9	.2
	EX	34.8	14.2	18.0	7.3	6.3	2.6	3.2	1.3
	JM	14.0	.4	7.2	.2	2.1	.1	1.1	.0
	JX	11.8	8.1	6.1	4.2	2.0	1.4	1.1	.8
19 Plastics	USM	78.6	22.9	40.6	11.8	13.3	3.9	6.8	2.0
	USX	115.7	39.5	61.5	21.0	24.2	8.3	12.8	4.4
	EM	56.9	4.0	30.5	2.2	16.6	1.2	8.9	.6
	EX	104.4	40.6	53.2	20.7	19.5	7.6	10.1	3.9
	JM	39.4	17.6	20.5	9.1	7.0	3.1	3.7	1.6
	JX	248.7	151.2	130.3	79.3	51.4	31.3	27.1	16.5
20 Oils, perf	USM	3.8	1.4	1.9	.7	.6	.2	.3	.1
	USX	16.6	6.4	8.6	3.3	3.0	1.2	1.6	.6
	EM	4.0	1.9	3.4	1.6	.7	.3	.4	.2
	EX	28.2	15.7	14.0	7.8	5.2	2.9	2.6	1.4
	JM	18.9	1.2	9.9	.6	4.6	.3	2.4	.2
	JX	2.4	1.9	1.3	1.0	.4	.3	.2	.2

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
21 Other chem	USM	8.7	1.8	4.5	.9	1.5	.3	.8	.2
	USX	57.6	21.5	30.0	11.2	8.8	3.3	4.4	1.6
	EM	40.0	4.5	20.9	2.3	7.5	.8	3.9	.4
	EX	97.3	55.2	50.2	28.5	20.7	11.8	7.3	4.1
22 Power mach	JM	45.5	4.8	23.7	2.5	12.8	1.3	3.7	.4
	JX	17.0	8.7	8.8	4.5	2.7	1.4	1.4	.7
	USM	96.6	2.5	49.3	1.3	10.1	.3	5.1	.1
	USX	170.4	44.0	87.5	22.6	16.5	4.3	8.8	2.3
23 Ag mach	EM	81.5	6.8	42.2	3.5	10.8	.9	5.5	.5
	EX	126.9	59.5	64.6	30.3	13.3	6.2	6.5	3.1
	JM	20.1	.1	8.6	.1	3.7	.0	1.9	.0
	JX	54.2	32.5	27.7	16.6	5.2	3.1	2.7	1.6
24 Office mach	USM	.4	.0	.2	.0	.1	.0	.1	.0
	USX	23.1	7.6	11.8	2.3	1.0	.3	.4	.1
	EM	5.2	.1	2.7	.0	.3	.0	.2	.0
	EX	12.6	5.1	6.3	2.6	.6	.2	.4	.2
24 Office mach	JM	1.5	.0	.8	.0	.2	.0	.1	.0
	JX	1.8	1.0	.9	.5	.1	.6	.0	.0
	USM	92.3	19.7	47.1	10.1	11.2	2.4	5.9	1.3
	USX	176.1	26.3	91.5	13.7	31.1	4.6	16.1	2.4
24 Office mach	EM	140.4	7.1	72.6	3.7	17.6	.9	9.4	.5
	EX	67.6	18.3	36.3	9.8	14.4	3.9	7.7	2.1
	JM	55.6	7.1	29.5	3.8	19.6	2.5	10.4	1.3
	JX	29.5	6.8	15.2	3.5	3.8	.9	2.0	.5

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
9 Glass mfgs	USM	25.5	2.6	13.5	1.4	8.5	.9	4.5	.5
	USX	22.2	4.7	11.9	2.5	5.2	1.1	2.8	.6
	EM	9.2	.9	4.8	.5	1.8	.2	.9	.1
	EX	43.5	18.2	23.1	9.7	12.5	5.2	6.6	2.8
10 I&S, unworked	JM	2.9	.4	1.5	.2	.5	.1	.2	.0
	JX	8.2	4.7	4.3	2.4	2.2	1.3	1.2	.7
	USM	16.7	4.9	8.5	2.5	.9	.3	.4	.1
	USX	2.1	.5	1.1	.3	.2	.0	.1	.0
11 I&S, semi-mfgs	EM	11.4	4.2	5.9	2.2	.9	.3	.5	.2
	EX	5.0	1.6	2.6	.8	.4	.1	.2	.1
	JM	18.7	6.9	9.6	3.5	1.5	.6	.8	.3
	JX	17.1	2.5	8.7	1.3	1.3	.2	.7	.1
12 Aluminum	USM	536.4	45.7	270.2	23.0	70.3	6.0	36.6	3.1
	USX	123.2	67.3	63.6	34.7	13.8	7.5	7.2	3.9
	EM	60.3	3.8	31.2	2.0	7.8	.5	4.0	.3
	EX	182.8	93.0	93.9	47.8	22.2	11.3	11.5	5.8
12 Aluminum	JM	34.2	11.2	17.6	5.8	3.8	1.2	2.0	.7
	JX	626.9	370.0	324.1	191.3	77.6	45.8	41.5	24.5
	USM	33.8	3.5	17.3	1.8	3.4	.3	1.8	.2
	USX	24.6	7.2	12.8	3.8	3.0	.9	1.5	.4
12 Aluminum	EM	23.3	3.7	12.0	1.9	3.2	.5	1.7	.3
	EX	24.7	13.6	12.8	7.1	2.8	1.5	1.4	.8
	JM	16.6	5.4	8.6	2.8	3.2	1.0	1.6	.5
	JX	5.7	3.6	2.9	1.8	.6	.4	.3	.2

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
13 Other metals	USM	95.6	35.4	47.9	17.7	3.1	1.1	1.8	.7
	USX	14.4	4.0	7.3	2.0	.7	.2	.3	.1
	EM	59.6	30.9	30.0	15.6	7.5	3.9	3.8	2.0
	EX	31.5	12.4	15.9	6.3	1.5	.6	.7	.3
14 Metal mfgs	JM	24.6	21.0	12.7	10.8	3.0	2.6	1.6	1.4
	JX	22.2	7.4	11.1	3.7	1.0	.3	.6	.2
	USM	122.0	14.3	63.2	7.4	28.8	3.4	14.8	1.7
	USX	312.3	109.2	163.3	57.1	54.2	19.0	28.3	9.9
15 Petrol mfgs	EM	16.1	2.3	8.3	1.2	2.3	.3	1.2	.2
	EX	189.0	105.7	98.3	55.0	50.1	28.0	26.3	14.7
	JM	3.4	.8	1.7	.4	.4	.1	.2	.0
	JX	153.8	52.5	80.3	27.4	34.6	11.8	18.2	6.2
16 Org chem	USM	272.9	223.2	139.9	114.4	31.9	26.1	16.7	13.7
	USX	29.6	10.3	15.3	5.3	2.6	.9	1.4	.5
	EM	39.7	23.1	20.4	11.9	3.8	2.2	1.9	1.1
	EX	54.3	12.0	27.7	6.1	6.1	1.4	3.2	.7
16 Org chem	JM	67.0	.1	34.9	.1	11.8	.0	6.3	.0
	JX	9.4	6.5	4.8	3.4	.8	.5	.4	.3
	USM	141.4	11.9	73.6	6.2	27.1	2.3	14.3	1.2
	USX	298.5	105.9	155.2	55.1	46.8	17.0	24.9	8.8
16 Org chem	EM	84.2	6.7	44.2	3.5	20.3	1.6	10.7	.9
	EX	180.5	72.4	91.9	36.8	27.4	11.0	14.3	5.7
	JM	52.7	5.6	27.2	2.9	9.8	1.0	5.0	.5
	JX	193.3	80.5	99.8	41.6	29.6	12.3	15.5	6.5

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
17 Inorg chem	USM	60.5	11.5	30.5	5.8	3.5	.7	1.7	.3
	USX	44.3	18.3	22.7	9.4	4.7	1.9	2.4	1.0
	EM	39.1	11.0	20.2	5.7	6.5	1.8	3.3	.9
	EX	18.0	7.9	9.1	4.0	1.6	.7	.7	.3
	JM	6.5	.4	3.4	.2	.8	.0	.4	.0
	JX	10.2	5.3	5.2	2.7	.9	.5	.5	.3
18 DTC mat	USM	45.1	2.1	24.2	1.1	19.4	.9	10.4	.5
	USX	13.6	4.4	7.0	2.3	1.9	.6	1.3	.4
	EM	20.3	2.0	10.6	1.1	3.7	.4	1.9	.2
	EX	34.8	14.2	18.0	7.3	6.3	2.6	3.2	1.3
	JM	14.0	.4	7.2	.2	2.1	.1	1.1	.0
	JX	11.8	8.1	6.1	4.2	2.0	1.4	1.1	.8
19 Plastics	USM	78.6	22.9	40.6	11.8	13.3	3.9	6.8	2.0
	USX	115.7	39.5	61.5	21.0	24.2	8.3	12.8	4.4
	EM	56.9	4.0	30.5	2.2	16.6	1.2	8.9	.6
	EX	104.4	40.6	53.2	20.7	19.5	7.6	10.1	3.9
	JM	39.4	17.6	20.5	9.1	7.0	3.1	3.7	1.6
	JX	248.7	151.2	130.3	79.3	51.4	31.3	27.1	16.5
20 Oils, perf	USM	3.8	1.4	1.9	.7	.6	.2	.3	.1
	USX	16.6	6.4	8.6	3.3	3.0	1.2	1.6	.6
	EM	4.0	1.9	3.4	1.6	.7	.3	.4	.2
	EX	28.2	15.7	14.0	7.8	5.2	2.9	2.6	1.4
	JM	18.9	1.2	9.9	.6	4.6	.3	2.4	.2
	JX	2.4	1.9	1.3	1.0	.4	.3	.2	.2

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
21 Other chem	USM	8.7	1.8	4.5	.9	1.5	.3	.8	.2
	USX	57.6	21.5	30.0	11.2	8.8	3.3	4.4	1.6
	EM	40.0	4.5	20.9	2.3	7.5	.8	3.9	.4
	EX	97.3	55.2	50.2	28.5	20.7	11.8	7.3	4.1
22 Power mach	JM	45.5	4.8	23.7	2.5	12.8	1.3	3.7	.4
	JX	17.0	8.7	8.8	4.5	2.7	1.4	1.4	.7
	USM	96.6	2.5	49.3	1.3	10.1	.3	5.1	.1
	USX	170.4	44.0	87.5	22.6	16.5	4.3	8.8	2.3
23 Ag mach	EM	81.5	6.8	42.2	3.5	10.8	.9	5.5	.5
	EX	126.9	59.5	64.6	30.3	13.3	6.2	6.5	3.1
	JM	20.1	.1	8.6	.1	3.7	.0	1.9	.0
	JX	54.2	32.5	27.7	16.6	5.2	3.1	2.7	1.6
24 Office mach	USM	.4	.0	.2	.0	.1	.0	.1	.0
	USX	23.1	7.6	11.8	2.3	1.0	.3	.4	.1
	EM	5.2	.1	2.7	.0	.3	.0	.2	.0
	EX	12.6	5.1	6.3	2.6	.6	.2	.4	.2
24 Office mach	JM	1.5	.0	.8	.0	.2	.0	.1	.0
	JX	1.8	1.0	.9	.5	.1	.6	.0	.0
	USM	92.3	19.7	47.1	10.1	11.2	2.4	5.9	1.3
	USX	176.1	26.3	91.5	13.7	31.1	4.6	16.1	2.4
24 Office mach	EM	140.4	7.1	72.6	3.7	17.6	.9	9.4	.5
	EX	67.6	18.3	36.3	9.8	14.4	3.9	7.7	2.1
	JM	55.6	7.1	29.5	3.8	19.6	2.5	10.4	1.3
	JX	29.5	6.8	15.2	3.5	3.8	.9	2.0	.5

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
25 Metal mach	USM	14.6	.2	7.6	.1	2.3	.0	1.2	.0
	USX	17.0	5.2	8.8	2.7	2.4	.7	1.2	.4
	EM	13.5	1.1	7.0	.6	1.5	.1	.8	.1
	EX	52.6	23.3	27.2	12.0	8.5	3.8	4.2	1.9
26 Tex mach	JM	11.0	.2	5.7	.1	1.5	.0	.8	.0
	JX	27.1	15.9	14.1	8.3	4.0	2.3	2.1	1.2
	USM	24.1	.7	12.5	.4	3.8	.1	2.0	.1
	USX	15.5	7.8	8.0	4.0	1.9	1.0	1.0	.5
27 Other mach	EM	6.5	.4	3.4	.2	.7	.0	.4	.0
	EX	59.1	32.5	30.6	16.9	8.6	4.7	4.3	2.4
	JM	3.6	.1	1.9	.1	.4	.0	.2	.0
	JX	79.1	54.2	40.9	28.0	10.7	7.3	5.5	3.8
28 Elect mach	USM	60.9	1.9	31.5	1.0	9.1	.3	4.9	.2
	USX	628.6	252.6	324.3	130.3	80.9	32.5	42.5	17.1
	EM	50.4	1.2	26.1	.6	6.4	.1	3.3	.1
	EX	797.6	426.8	413.2	221.1	122.2	65.4	62.9	33.7
	JM	21.1	1.0	10.9	.5	3.4	.2	1.7	.1
	JX	251.6	120.3	130.1	62.2	34.5	16.5	18.1	8.7
	USM	156.5	71.4	81.5	37.2	21.1	9.6	11.2	5.1
	USX	284.3	107.5	148.1	56.0	46.5	17.6	24.1	9.1
	EM	95.5	9.0	49.2	4.6	10.2	1.0	5.5	.5
	EX	117.4	59.5	61.2	31.0	21.6	10.9	11.1	5.6
	JM	38.8	7.6	20.0	3.9	6.0	1.2	3.0	.6
	JX	141.5	71.5	73.0	36.9	21.8	11.0	11.2	5.7

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
29 Telecom	USM	234.9	106.0	122.4	55.2	34.3	15.5	17.8	8.0
	USX	53.7	21.6	28.2	11.3	10.0	4.0	5.3	2.1
	EM	108.2	23.6	56.9	12.4	21.4	4.7	11.3	2.5
	EX	121.4	71.1	63.3	37.1	22.1	12.9	11.5	6.7
30 Motor veh	JM	11.9	3.3	6.1	1.7	1.2	.3	.6	.2
	JX	316.8	93.5	165.0	48.7	58.5	17.3	30.5	9.0
	USM	786.2	7.6	400.0	3.9	34.3	.3	15.4	.1
	USX	702.5	155.2	361.5	79.9	76.2	16.8	39.3	8.7
31 Misc trans	EM	156.0	5.2	82.2	2.7	37.5	1.2	19.8	.7
	EX	312.0	121.9	158.7	62.0	20.2	7.9	10.6	4.1
	JM	27.8	.5	14.4	.2	4.7	.1	2.4	.0
	JX	1190.4	310.8	613.5	160.2	87.5	22.8	45.2	11.8
32 Prec instr	USM	46.4	5.4	23.8	2.8	7.4	.9	3.8	.4
	USX	87.9	48.8	46.5	25.8	22.0	12.2	11.6	6.4
	EM	6.4	.3	3.3	.1	1.1	.0	.6	.0
	EX	32.4	18.9	17.2	10.0	9.0	5.3	4.8	2.8
32 Prec instr	JM	2.2	.7	1.1	.3	.3	.1	.1	.0
	JX	125.3	38.8	66.1	20.5	31.9	9.9	16.9	5.2
	USM	66.2	5.4	35.1	2.8	19.7	1.6	10.5	.8
	USX	125.8	28.5	65.1	14.7	19.3	4.4	9.9	2.2
32 Prec instr	EM	68.1	5.8	35.4	3.0	10.5	.9	5.4	.5
	EX	119.8	41.7	62.9	21.9	25.4	8.8	13.4	4.7
	JM	24.4	1.8	18.3	1.4	3.5	.3	1.8	.1
	JX	90.7	28.4	47.4	14.8	17.2	5.4	9.0	2.8

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
33 Shoes, bags	USM	105.3	46.2	55.6	24.4	28.0	12.3	14.7	6.4
	USX	8.9	4.5	4.7	2.4	2.6	1.3	1.4	.7
	EM	28.0	15.7	14.8	8.3	7.0	3.9	3.7	2.1
	EX	89.7	15.1	47.7	8.1	27.8	4.7	14.8	2.5
34 Photo mfgs	JM	10.9	6.8	5.9	3.7	4.1	2.6	2.2	1.4
	JX	4.7	.9	2.5	.5	1.4	.3	.7	.1
	USM	16.8	.5	8.6	.3	.9	.0	.5	.0
	USX	24.0	4.8	12.4	2.5	3.4	.7	1.8	.4
35 Furniture	EM	25.1	.6	13.0	.3	3.4	.1	1.7	.0
	EX	29.8	10.8	15.4	5.6	3.2	1.2	1.7	.6
	JM	11.2	.1	6.1	.1	4.2	.0	2.3	.0
	JX	14.8	4.9	7.6	2.5	1.4	.5	.7	.2
36 Sound mfgs	USM	16.0	2.8	8.2	1.4	2.5	.4	1.2	.2
	USX	11.7	3.3	6.2	1.8	2.2	.6	1.2	.3
	EM	3.8	.5	1.9	.3	.5	.1	.3	.0
	EX	33.0	12.7	17.6	6.8	7.5	2.9	4.0	1.5
36 Sound mfgs	JM	2.3	1.2	1.2	.6	.3	.2	.2	.1
	JX	3.1	1.4	1.6	.7	.6	.3	.3	.1
	USM	63.0	9.6	32.5	5.0	7.5	1.1	4.0	.6
	USX	21.4	4.7	11.1	2.4	3.0	.7	1.6	.4
36 Sound mfgs	EM	41.0	3.6	21.1	1.9	5.9	.5	3.1	.3
	EX	38.5	9.9	19.9	5.1	5.5	1.4	2.9	.7
	JM	4.8	1.1	2.5	.6	.7	.2	.4	.1
	JX	98.1	21.7	50.7	11.2	14.1	3.1	7.4	1.6

TABLE 5-4.--Continued.

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
37 Toys	USM	43.9	22.4	25.0	12.8	12.7	6.5	6.8	3.5
	USX	33.4	7.7	17.7	4.1	8.3	1.9	4.4	1.0
	EM	25.7	11.9	13.6	6.3	6.3	2.9	3.3	1.5
	EX	32.0	5.6	17.0	3.0	8.3	1.5	4.4	.8
	JM	8.7	1.6	4.5	.8	1.3	.2	.7	.1
	JX	21.5	3.4	11.4	1.8	5.6	.9	3.0	.5

Organic Chemicals (16); Metal Manufactures (14); and Electrical Machinery (28). The greatest increases in exports, on the other hand, are in Road Motor Vehicles (30); Other Machinery (27); Metal Manufactures (14); Organic Chemicals (16); Electrical Machinery (28); Paper Manufactures (4); Office Machinery (24); Textile Semi-Manufactures (5); and Power Machinery (22). There is clearly intra-industry specialization in some categories, since some industries excel in both imports and exports.

E.E.C. imports increase most substantially in Clothing (7); Textile Semi-Manufactures (5); Road Motor Vehicles (30); Office Machinery (24); Telecommunications Apparatus (29); Electrical Machinery (28); Power Machinery (22); Precision Instruments (32); and Plastics (19). E.E.C. categories exhibiting extraordinary export expansion include Other Machinery (27); Metal Manufactures (14); Iron and Steel, Semi-Manufactures (11); Organic Chemicals (16); Road Motor Vehicles (3); Precision Instruments (32); Telecommunications Apparatus (29); and Textile Semi-Manufactures (5).

The greatest increases in Japanese imports tend to be in Wood Manufactures (3); Textile Semi-Manufactures (5); Petroleum Manufactures (15); Office Machinery (24); Clothing (7); Other Chemicals (21); Organic Chemicals (16); and Plastics (19). Increased Japanese exports of Road Motor Vehicles (30) outstrip increases in all other categories by far under Scheme A and by a smaller margin under Scheme B. Other categories experiencing extraordinary export growth are Iron and Steel, Semi-Manufactures (11); Textile Semi-Manufactures (5); Telecommunications Apparatus

(29); Other Machinery (27); Plastics (19); Metal Manufactures (14); Organic Chemicals (16); and Miscellaneous Transport Equipment (31).

The general pattern of these results for the three principals is consistent with what one might have expected beforehand. The ranking of Road Motor Vehicles, Iron and Steel, and Clothing in U.S. imports, for example, will not surprise those who have lobbied intensively in recent years for greater protection in these industries. What is something of a surprise is the roughly equivalent expansion of exports in the Road Motor Vehicle category. This is due in part to the relatively high price elasticity of demand for U.S. exports (Table 4-30).

Aggregate Changes

The aggregate effects of Schemes A and B have been computed by summing the effects of the individual categories. Table 5-5 contains these effects. The total effects are subdivided, however, into textiles (5-7), iron and steel (10-11), and the other categories as a whole to separate the impact of the quota-affected categories.

The total effects for Scheme A suggest that imports in the thirty-seven categories will increase between 3.5 and 6.9 per cent for the U.S., between 2.8 and 5.4 per cent for the E.E.C., and between 3.0 and 5.8 per cent for Japan. The respective mid-range estimates are 5.2, 4.1, and 4.4. Alternatively, the total effects suggest that exports will increase between 3.8 and 7.3 per cent for the U.S., between 2.4 and 4.7 per cent for the E.E.C., and between 3.0 and 5.8 per cent for Japan. The respective mid-range estimates for exports are 5.6, 3.6, and 4.4.

TABLE 5-5.--Summary of the Absolute Changes in Trade Volumes (millions of dollars).

Category	Prin	A				B			
		1		2		1		2	
		Total	LDC	Total	LDC	Total	LDC	Total	LDC
Textiles	USM	475	302	260	165	244	155	136	86
	USX	293	130	155	69	78	36	42	19
	EM	417	259	205	127	95	62	50	33
	EX	212	76	113	41	77	27	43	15
Iron & Steel	JM	146	88	76	46	28	18	15	10
	JX	420	288	220	151	111	70	59	37
	USM	553	51	279	26	71	6	37	3
	USX	125	68	65	35	14	8	7	4
Other	EM	72	8	37	4	9	1	5	1
	EX	188	95	97	49	23	11	12	7
	JM	53	18	27	9	5	2	3	1
	JX	644	373	333	193	79	46	42	25
Total	USM	2957	705	1523	363	407	107	210	55
	USX	3709	1175	1910	605	544	160	280	82
	EM	1310	236	681	123	220	38	114	20
	EX	3073	1426	1589	737	516	234	267	121
	JM	667	127	347	66	132	22	69	12
	JX	3265	1203	1691	623	453	174	234	90
	USM	3985	1058	2062	554	722	268	383	144
	USX	4127	1373	2130	709	636	204	329	105
	EM	1799	503	923	254	324	101	169	54
	EX	3473	1597	1799	827	616	272	322	142
	JM	866	233	450	121	165	42	87	11
	JX	4329	1864	2244	966	643	290	335	152

The Scheme B effects represent only one "round" of reductions by the height of the individual tariffs. To achieve the same aggregate import increase as Scheme A, the Scheme B reductions would have to be multiplied by approximately 5.5 for the U.S., 5.6 for the E.E.C., and 5.2 for Japan. If textiles and steel are excluded, however, the factor increases to 7.3 for the U.S. and 6.0 for the E.E.C., but decreases to 5.1 for Japan. This reflects the height of the textile and iron and steel tariffs relative to other tariffs on manufactures. To achieve the same aggregate increase in exports as Scheme A, the Scheme B reductions would have to be multiplied by 6.5 for the U.S., 5.6 for the E.E.C., and 6.7 for Japan. Excluding the quota-affected categories, the factors are 6.8 for the U.S., 6.0 for the E.E.C., and 7.2 for Japan. Clearly, reductions of these magnitudes would require modification in many categories of the U.S. statutory limit to reductions of sixty per cent. Although the factors above would put the aggregate Scheme A and Scheme B effects on the same scale, the composition of the effects would be far different.

At first inspection, the total figures for both Scheme A and Scheme B might suggest that the E.E.C. and Japan are likely to experience a significant trend toward an improved trade balance (upward pressure on the value of their currencies). This is not likely, however, because the relative expansion of total imports and exports in each case is in rough accordance with their original proportions in the thirty-seven categories. In other words, the implied trade balance effects will largely be mitigated by an

expansion in imports in categories other than these thirty-seven (e.g., petroleum and other raw materials). Suppliers in these other categories, therefore, should expect an expansion in the demand for their commodities roughly in proportion to the general expansion in trade for the principals.

To the extent that this is not true, however, feedback price and income effects will tend to ameliorate the imbalance, and the final figures must be adjusted accordingly. The United States, for example, may experience a very slight positive trade balance effect under Scheme A, and the E.E.C. may experience a slight negative trade balance effect under both Scheme A and Scheme B. There is little indication that the Japanese trade balance will tend to move in either direction.

An index of the import- or export-bias of Scheme B relative to Scheme A can be constructed at the aggregate level. This is the same index used at the category level in Table 5-4. For the United States this index is .85, indicating as expected the relative import-bias of Scheme B for the U.S. If the quota-affected categories are excluded, however, the index is 1.07, indicating that Scheme B has a relative export-bias for the remaining categories. Interestingly enough, this export-bias is due in large part to an expansion in exports of Road Motor Vehicles (30). The total index for the E.E.C. is .98, and the excluding textiles and steel is 1.00. These figures mean that Scheme A and Scheme B have little import- or export-bias relative to each other. The Japanese total index, however, is .78, and the

index excluding the quota-affected categories is .70. Scheme B, therefore, is strongly import-biased relative to Scheme A for Japan. This result means that relatively high tariffs occur more frequently among the individual tariffs levied by Japan than among the tariffs levied by its major trading partners.

Looking at this issue from the LDC perspective, one finds that the total index is 1.45, and the other index is 1.05. Hence, the export-bias of Scheme B for LDC's is primarily the result of the relatively greater tariff reductions on textiles implicit in Scheme B. This potential export-bias is constrained, however, by existing restrictions on textile imports.

5.4 Welfare Changes

The generally low level of tariffs among the principals means that deadweight loss (gain) effects will be small and dominated by even the slightest terms of trade effect. The computation of these figures, however, does serve an important purpose in identifying those import-competing and export industries associated with the greatest welfare changes. Such information can be an important element in considering alternative trade policies affecting a particular industry. The ranking of the welfare effect in a particular category is probably more significant than the actual numerical magnitude.

The computation of these welfare effects was discussed in Chapters 2 and 3. As an indication of the general magnitude of welfare changes in each industry, estimates for Scheme A are

presented in Table 5-6. These are mid-range estimates, based on the assumption that export supply is twice as price-elastic as import demand. Obviously, this assumption may be more appropriate in some instances than in others, but it does offer approximate points of comparison.

The calculation of the deadweight loss effect (DWL) requires that each individual price change be squared. As an example, this means that the Scheme A computation formula for the import DWL effect is:

$$\frac{1}{2}k (.36 \sum w_i t_i^2 + .64 \sum w_i t_z^2)$$

where k is the import share of the tariff change.⁴ The first term in parentheses is easily computed using the DI(B) adjustment factor from Table 5-1. The second term, which refers to tariffs five per cent or below, is approximated by the square of .025. This results in little error, however, because the tariffs are so small.

The NR column represents the net loss or gain of tariff revenues to the country as a whole. For imports this equals the revenues from the new tariff times the change in trade less the loss in revenues to foreign suppliers through the terms of trade effort. For exports this equals the transfer of previously collected tariff revenues to the exporting countries. The sum of the DWL and NR columns equals the total welfare effect.

⁴Theoretically, the k is also a function of the individual tariff rates, but this is ignored since k is imposed by arbitrary assumption.

TABLE 5-6.--Mid-Range Estimates of Scheme A Welfare Effects
(millions of dollars).

Category	Prin	DWL	NR	Total
1 Leather mfgs	USM	.5	- 4.7	- 4.2
	USX	.1	2.6	2.7
	EM	.7	- 8.7	- 8.0
	EX	.2	5.2	5.4
	JM	.1	- 1.4	- 1.3
	JX	.0	1.4	1.4
2 Rubber mfgs	USM	.6	- 5.6	- 5.0
	USX	.2	7.6	7.8
	EM	.1	- 3.0	- 2.9
	EX	.7	17.2	17.9
	JM	.1	- .6	- .5
	JX	.3	7.9	8.2
3 Wood mfgs	USM	1.5	- 5.2	- 3.7
	USX	.3	5.5	5.8
	EM	.8	- 5.2	- 4.4
	EX	.1	2.5	2.6
	JM	1.3	- 4.7	- 3.4
	JX	.1	1.6	1.7
4 Paper mfgs	USM	.3	- 4.5	- 4.2
	USX	1.3	15.9	17.2
	EM	.7	-10.4	- 9.7
	EX	.1	6.9	7.0
	JM	.3	- 2.5	- 2.2
	JX	.1	3.8	3.9
5 Tex semi-mfgs	USM	7.3	-18.6	-11.3
	USX	1.2	27.7	28.9
	EM	2.7	-25.6	-22.9
	EX	1.1	39.4	40.5
	JM	1.2	-11.4	-10.2
	JX	3.1	36.2	39.2

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
6 Tex articles	usm	.6	- 8.0	- 7.4
	USX	.3	12.4	12.7
	EM	.8	-10.1	- 9.3
	EX	.4	17.2	17.6
	JM	.2	- 2.5	- 2.3
	JX	.2	6.1	6.3
7 Clothing	USM	12.4	-39.7	-27.3
	USX	1.0	9.6	10.6
	EM	6.0	-30.0	-24.0
	EX	.9	23.9	24.8
	JM	1.4	- 9.5	- 8.1
	JX	.8	7.8	8.6
8 Mineral mfgs	USM	2.7	- 6.8	- 4.1
	USX	.1	4.5	4.6
	EM	.3	- 2.3	- 2.0
	EX	.5	14.2	14.7
	JM	.0	- .5	- .5
	JX	.5	7.6	8.1
9 Glass mfgs	USM	.7	- 3.7	- 3.0
	USX	.2	5.3	5.5
	EM	.2	- 1.5	- 1.3
	EX	.4	9.2	9.6
	JM	.0	- .5	- .5
	JX	.1	1.4	1.5
10 I&S, unworked	USM	.1	- 1.4	- 1.3
	USX	.0	.4	.4
	EM	.1	- 3.4	- 3.3
	EX	.0	1.0	1.0
	JM	.2	- 1.8	- 1.6
	JX	.0	.9	.9

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
11 I&S, semi-mfgs	USM	6.7	-38.7	-31.6
	USX	.5	25.7	26.2
	EM	.9	- 8.4	- 7.5
	EX	.8	72.1	72.9
	JM	.5	- 3.2	- 2.7
	JX	2.7	91.4	94.1
12 Aluminum	USM	.4	- 3.0	- 2.6
	USX	.1	5.0	5.1
	EM	.3	- 4.4	- 4.1
	EX	.1	4.2	4.3
	JM	.3	- 4.1	- 3.8
	JX	.0	.8	.8
13 Other metals	USM	.4	- 6.5	- 6.1
	USX	.0	2.2	2.2
	EM	.8	-12.1	-11.3
	EX	.1	4.3	4.4
	JM	.2	- 3.9	- 3.7
	JX	.0	2.2	2.2
14 Metal mfgs	USM	2.6	-20.2	-17.6
	USX	1.7	22.4	24.1
	EM	.2	- 7.4	- 7.2
	EX	1.7	39.3	41.0
	JM	.0	- 2.0	- 2.0
	JX	.7	14.7	14.7
15 Petrol mfgs	USM	4.7	-57.9	-53.2
	USX	.1	6.6	6.7
	EM	.5	-16.1	-15.6
	EX	.2	23.7	23.9
	JM	1.1	-31.7	-30.6
	JX	.0	4.2	4.2

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
16 Org chem	USM	2.6	-13.4	-10.8
	USX	1.5	25.9	27.4
	EM	1.8	-14.7	-12.9
	EX	1.0	31.0	32.0
	JM	.9	- 6.2	- 5.3
	JX	1.0	13.9	14.9
17 Inorg chem	USM	.4	- 4.1	- 3.7
	USX	.2	6.9	7.1
	EM	.7	- 6.7	- 6.0
	EX	.0	7.7	7.7
	JM	.1	- 2.0	- 1.9
	JX	.0	2.2	2.2
18 DTC mat	USM	1.0	- .9	.1
	USX	.1	3.2	3.3
	EM	.4	- 1.1	- .7
	EX	.2	12.5	12.7
	JM	.2	- 1.4	- 1.2
	JX	.1	2.1	2.2
19 Plastics	USM	1.2	- 6.6	- 5.4
	USX	.8	29.3	31.1
	EM	1.5	-12.1	-10.6
	EX	.6	35.1	35.7
	JM	.7	- 3.8	- 3.1
	JX	1.6	15.9	17.5
20 Oils, perf	USM	.1	- 1.3	- 1.2
	USX	.1	3.9	4.0
	EM	.1	- 2.4	- 2.3
	EX	.2	6.7	6.9
	JM	.4	- 3.2	- 2.8
	JX	.0	.5	.5

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
21 Other chem	USM	.2	- 3.9	- 3.7
	USX	.3	21.9	22.2
	EM	.7	-10.7	-10.0
	EX	.5	35.2	35.7
	JM	.7	- 7.0	- 6.3
	JX	.1	3.4	3.5
	USM	.5	-10.7	-10.2
	USX	.6	21.9	22.5
22 Power mach	EM	1.1	- 9.5	- 8.4
	EX	.5	19.2	19.7
	JM	.3	- 2.9	- 2.6
	JX	.2	5.1	5.3
	USM	.0	- .1	- .1
	USX	.0	8.7	8.7
	EM	.0	- 1.4	- 1.4
	EX	.0	3.5	3.5
23 Ag mach	JM	.0	- .7	- .7
	JX	.0	1.0	1.0
	USM	1.2	- 7.0	- 5.8
	USX	1.0	32.3	33.3
	EM	1.8	-13.2	-11.4
	EX	.5	14.6	15.1
	JM	1.8	- 7.5	- 5.7
	JX	.2	7.8	8.0
24 Office mach	USM	.2	- 2.6	- 2.4
	USX	.1	6.1	6.2
	EM	.2	- 1.5	- 1.3
	EX	.3	13.0	13.3
	JM	.1	- 1.3	- 1.2
	JX	.1	3.8	3.9
	USM	.2	- 2.6	- 2.4
	USX	.1	6.1	6.2
25 Metal mach	EM	.2	- 1.5	- 1.3
	EX	.3	13.0	13.3
	JM	.1	- 1.3	- 1.2
	JX	.1	3.8	3.9

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
26 Tex mach	USM	.4	- 6.2	- 5.8
	USX	.1	5.8	5.9
	EM	.1	- 2.1	- 2.0
	EX	.3	22.1	22.4
	JM	.0	- 1.3	- 1.3
	JX	.4	9.6	10.0
27 Other mach	USM	.9	-20.0	-19.1
	USX	3.3	88.9	92.2
	EM	.6	-19.7	-19.1
	EX	4.1	93.8	97.9
	JM	.3	-10.2	- 9.9
	JX	1.2	25.4	26.6
28 Elect mach	USM	2.0	-28.5	-26.5
	USX	1.5	71.3	72.8
	EM	1.0	-22.6	-21.6
	EX	.7	61.5	62.2
	JM	.6	- 7.9	- 7.3
	JX	.7	32.5	33.2
29 Telecom	USM	3.3	-19.5	-16.2
	USX	.3	19.6	19.9
	EM	2.0	-10.3	- 8.3
	EX	.8	22.3	23.1
	JM	.1	- 1.2	- 1.1
	JX	1.9	42.7	44.6
30 Motor veh	USM	4.9	-72.8	-67.9
	USX	2.5	59.3	61.8
	EM	3.5	-10.3	- 6.8
	EX	1.0	105.0	106.0
	JM	.5	- 2.3	- 1.8
	JX	4.2	70.7	74.9

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
31 Misc trans	USM	.8	- 3.5	- 2.7
	USX	.7	7.6	8.3
	EM	.1	- .5	- .4
	EX	.3	11.0	11.3
	JM	.0	- .2	- .2
	JX	1.0	7.5	8.5
	USM	1.8	-19.8	-18.0
	USX	.6	23.2	23.8
	EM	1.0	-12.4	-11.4
32 Prec instr	EX	.8	26.0	26.8
	JM	.5	- 5.4	- 4.9
	JX	.6	23.7	33.3
	USM	2.5	-16.5	-14.0
	USX	.1	1.2	1.3
	EM	.7	- 5.1	- 4.3
	EX	.9	12.5	13.4
	JM	.4	- 2.4	- 2.0
	JX	.0	1.4	1.4
33 Shoes, bags	USM	.1	- 1.7	- 1.6
	USX	.1	6.5	6.6
	EM	.3	- 2.7	- 2.4
	EX	.1	5.9	6.0
	JM	.4	- 1.9	- 1.5
	JX	.1	1.5	1.6
	USM	.2	- 4.6	- 4.4
	USX	.1	2.4	2.5
	EM	.1	- 1.3	- 1.2
34 Photo mfgs	EX	.3	6.7	7.0
	JM	.0	- .9	- .9
	JX	.0	.6	.6
35 Furniture	USM	.2	- 4.6	- 4.4
	USX	.1	2.4	2.5
	EM	.1	- 1.3	- 1.2
	EX	.3	6.7	7.0
	JM	.0	- .9	- .9
	JX	.0	.6	.6

TABLE 5-6.--Continued.

Category	Prin	DWL	NR	Total
36 Sound mfgs	USM	.7	- 7.2	- 6.5
	USX	.1	5.9	6.0
	EM	.6	- 5.9	- 5.3
	EX	.2	5.0	5.2
	JM	.1	- 1.0	- .9
	JX	1.4	12.7	14.1
	USM	1.0	- 9.6	- 8.6
	USX	.2	3.8	4.0
37 Toy mfgs	EM	.6	- 5.2	- 4.6
	EX	.3	5.4	5.7
	JM	.1	- 1.9	- 1.8
	JX	.2	4.5	4.7

On the import side, the greatest DWL effects for the U.S. occur in Textile Semi-Manufactures (5); Clothing (7); Iron and Steel, Semi-Manufactures (11); Petroleum Manufactures (15); Telecommunications Apparatus (29); and Road Motor Vehicles (30). On the export side they occur in Metal Manufactures (14); Organic Chemicals (16); Other Machinery (27); and Road Motor Vehicles (30).

The net effect in each industry can be calculated by summing the total effect for imports and exports. Those U.S. industries associated with the greatest net increase in welfare are Textile Semi-Manufactures (5); Organic Chemicals (16); Plastics (19); Other Chemicals (21); Office Machinery (24); Other Machinery (27); and Electrical Machinery (28). Those associated with the greatest decrease in welfare are Clothing (7); Iron and Steel, Semi-Manufactures (11); Petroleum Manufactures (15); Road Motor Vehicles (30); Shoes and Bags (33); and Toys (37).

For imports, the greatest DWL effects for the E.E.C. occur in Textile Semi-Manufactures (5); Clothing (7); Organic Chemicals (16); Plastics (19); Office Machinery (24); Telecommunications Apparatus (29); and Road Motor Vehicles (30). For exports, the greatest DWL effects are in Textile Semi-Manufactures (5); Metal Manufactures (14); Organic Chemicals (16); Other Machinery (27); and Road Motor Vehicles (30). The most interesting feature of these two lists is their similarity.

E.E.C. categories associated with the greatest net decreases in welfare are Leather Manufactures (1); Paper Manufactures (4); Iron and Steel, Unworked (10); Other Metals (13); and Petroleum

Manufactures (15). The greatest net increases are in Iron and Steel, Semi-Manufactures (11); Metal Manufactures (14); Plastics (19); Other Chemicals (21); Other Machinery (27); Electrical Machinery (28); Road Motor Vehicles (30); Precision Instruments (32); and Sound Manufactures (36).

For Japan the greatest DWL effects on the import side are in Wood Manufactures (3); Textile Semi-Manufactures (5); Clothing (7); Petroleum Manufactures (15); and Office Machinery (24). On the export side the most substantial changes are in Textile Semi-Manufactures (5); Iron and Steel, Semi-Manufactures (11); Plastics (19); Telecommunications (29); Road Motor Vehicles (30); and Sound Manufactures (36).

Japanese categories associated with the greatest net decreases in welfare are Wood Manufactures (3); Aluminum (12); Petroleum Manufactures (15); Oils, Perfumes (20); and Other Chemicals (21). Alternatively, the most substantial increases are in Textile Semi-Manufactures (5); Iron and Steel, Semi-Manufactures (11); Other Machinery (27); Electrical Machinery (28); Telecommunications Apparatus (29); Road Motor Vehicles (30); Precision Instruments (32); and Sound Manufactures (36).

Given tariff reductions of the same average scale for Schemes A and B, the values in Table 5-6 will generally be lower bounds for the Scheme B welfare effects. This is because the Scheme B DWL formulas involve the percentage change in price raised to the fourth power. This formula for imports is:

$$\frac{1}{2} k_1 k_2^2 (\sum w_i t_i^4)$$

where k_1 is the import share of the tariff change and k_2 is the scale factor required to equate the average tariff reductions of Schemes A and B.⁵ The Scheme B DWL effects are greater in magnitude because high tariffs are reduced more than low tariffs. Because the DWL cost of protection rises with the square of a tariff, reductions based on the height of the tariff will reduce this cost more than across-the-board reductions.

Table 5-7 presents a summary of the detailed effects in Table 5-6. Textiles (5-7) and iron and steel (10-11) are again listed separately. The total DWL effect is 88.9 million dollars for the U.S., 54.9 million for the E.E.C., and 38.6 million for Japan. The DWL for textiles accounts for about a third of the total DWL effects for the U.S. and the E.E.C. This proportion would be even greater using the Scheme B DWL formula.

The large positive NR effect for the E.E.C. and Japan can be misleading. The general equilibrium aspect of these changes cannot be ignored. As indicated in Section 5.3, E.E.C. and Japanese imports in categories other than the thirty-seven considered here will increase substantially. This means that the large positive NR effects for the E.E.C. and Japan will largely be dissipated in the form of higher payments for increased imports

⁵The average tariff change is $\sum w_i t_i^2$. Each tariff change is multiplied by the scale factor k_2 , and $k_2 t_i^2$ is then squared as part of the basic DWL computation formula.

TABLE 5-7.--Summary of Mid-Range Estimates of Scheme A Welfare Effects (millions of dollars)

Category	Prin	DWL	NR	Total
Textiles	USM	20.3	- 66.3	- 46.0
	USX	2.5	49.7	52.2
	EM	9.5	- 65.7	- 56.2
	EX	2.4	80.5	82.9
	JM	2.8	- 23.4	- 20.6
	JX	4.1	50.1	54.2
Iron & Steel	USM	6.8	- 40.1	- 33.3
	USX	.6	26.9	27.5
	EM	1.0	- 11.8	- 10.8
	EX	.8	73.1	81.9
	JM	.7	- 5.0	- 4.3
	JX	2.7	92.3	95.0
Other	USM	40.4	-378.6	-338.2
	USX	18.4	532.4	550.8
	EM	23.5	-225.6	-202.1
	EX	17.7	673.9	691.6
	JM	11.6	-122.6	-111.0
	JX	16.7	336.6	353.3
Total	USM	67.5	-485.0	-417.5
	USX	21.4	608.2	629.6
	EM	34.0	-303.1	-269.1
	EX	20.9	827.5	848.4
	JM	15.1	-151.0	-135.9
	JX	23.5	479.0	502.5

of raw materials and other commodities. It is true, however, that these effects hold for the thirty-seven categories in this study.

A final point is that the total effects for the U.S. in textiles and iron and steel are minimal. Moreover, the E.E.C. makes substantial gains in the textile categories. This, of course, ignores the effects of quantitative restrictions.

5.5 Employment Effects in the U.S.

Changes in employment are a primary concern in evaluating the effects of trade liberalization. Based on the procedures developed in Chapters 2 and 3, this section estimates the direct employment changes in the U.S. for each category. Table 5-8 presents these estimates for Scheme A and Scheme B. This table also includes the labor-output coefficient used in deriving the results. This coefficient expresses the number of "forty-hour-equivalent" workers per million dollars of 1974 output. The estimates themselves are mid-range estimates in two senses: First, the change in trade was computed on the assumption that export supply is twice as elastic as import demand; and second, changes in employment were derived on the assumption that production changes will account for three-fourths of the change in trade and consumption changes for one-fourth.

The greatest net losses in employment occur in Wood Manufactures (3); Clothing (7); Iron and Steel, Semi-Manufactures (11); Petroleum Manufactures (15); Telecommunications Apparatus (29); Road Motor Vehicles (30); Shoes and Bags (33); and Sound Manufactures

TABLE 5-8.--Mid-Range Estimates of the Employment Effects in the United States.

Category	Jobs Per Mill \$	M/X	Δ Jobs	
			A	B
1 Leather mfgs	38.5	M X	- 602 353	- 97 55
2 Rubber mfgs	23.1	M x	- 684 523	- 64 89
3 Wood mfgs	25.2	M x	-1057 673	- 256 109
4 Paper mfgs	16.3	M X	- 138 2356	- 19 359
5 Tex semi-mfgs	28.8	M X	-2505 2647	-1411 561
6 Tex articles	19.7	M X	- 295 438	- 79 123
7 Clothing	37.8	M X	-6560 2011	-3371 713
8 Mineral mfgs	24.3	M X	-1071 228	- 434 54
9 Glass mfgs	28.5	M X	- 417 365	- 139 86
10 I&S, unworked	29.2	M X	- 276 35	- 14 3
11 I&S, semi-mfgs	12.8	M X	-3872 897	- 513 101
12 Aluminum	12.4	M X	- 238 174	- 24 21
13 Other metals	10.2	M X	- 549 83	- 19 4
14 Metal mfgs	23.8	M X	-1653 4245	- 389 737
15 Petrol mfgs	5.3	M X	- 820 90	- 97 8

TABLE 5-8.--Continued.

Category	Jobs Per Mill \$	M/X	Δ Jobs	
			A	B
16 Org chem	7.3	M X	- 589 1242	- 113 199
17 Inorg chem	12.5	M X	- 427 314	- 25 33
18 DTC mat	13.5	M X	- 351 105	- 151 17
19 Plastics	19.1	M X	- 854 1269	- 144 265
20 Oils, perf	9.5	M X	- 20 90	- 3 17
21 Other chem	14.8	M X	- 73 486	- 13 73
22 Power mach	18.6	M X	-1018 1799	- 106 177
23 Ag mach	19.3	M X	- 5 253	- 2 10
24 Office mach	21.4	M X	-1119 2148	- 137 379
25 Metal mach	30.6	M X	- 255 296	- 40 41
26 Tex mach	34.3	M X	- 471 302	- 75 39
27 Other mach	25.2	M X	- 873 9005	- 132 1166
28 Elect mach	25.1	M X	-2240 4070	- 304 665
29 Telecom	28.5	M X	-3819 875	- 557 164
30 Motor veh	11.7	M X	-5205 4669	- 218 507

TABLE 5-8.--Continued.

Category	Jobs Per Mill \$	M/X	Δ Jobs	
			A	B
31 Misc trans	17.7	M X	- 466 892	- 74 223
32 Prec instr	31.2	M X	-1185 2234	- 353 342
33 Shoes, bags	43.3	M X	-2613 221	- 693 65
34 Photo mfgs	14.6	M X	- 139 199	- 8 29
35 Furniture	33.9	M X	- 308 228	- 47 43
36 Sound mfgs	34.5	M X	-1236 420	- 149 60
37 Toy mfgs	30.9	M X	- 799 592	- 226 147

(36). The largest net gains, on the other hand, are posted by Paper Manufactures (4); Metal Manufactures (14); Organic Chemicals (16); Power Machinery (22); Other Machinery (27); Electrical Machinery (28); and Precision Instruments (32).

Net gains or losses, however, can be misleading. An industry can experience significant labor turnover without a large net effect due to composition changes in the work force. Industries in which this appears to be the case include Leather Manufactures (1); Rubber Manufactures (2); Textile Semi-Manufactures (5); Plastics (19); Miscellaneous Transport Equipment (31); and Toy Manufactures (37).

To compare the relative employment effects of Schemes A and B independent of the scale of reductions, one can return to the index used for this purpose in Table 5-1. This index is a good approximation of whether Scheme B is import- (unemployment) or export- (employment) biased relative to Scheme A.

Table 5-9 contains the aggregate employment effects implied by the changes in each industry. These results indicate that under Scheme A the mid-range employment losses will be 44,795 and the employment gains will be 47,173. Hence, a net gain of about 2,378 jobs can be expected under Scheme A if the limitations on textiles and steel are ignored. If these categories are excluded, however, the employment loss is 31,289; the employment gain is 41,144; and the net gain is 9,855. These changes are miniscule in relation to the total U.S. work force, but they are not insubstantial in many of the component industries.

TABLE 5-9.--Summary of Mid-Range Estimates of the Employment Effects in the United States.

Category	M X Net	A	B
Textiles	M	- 9,358	- 4,861
	X	5,097	1,397
	Net	- 4,261	- 3,464
Iron & Steel	M	- 4,148	- 527
	X	932	79
	Net	- 3,216	- 448
Other	M	-31,389	- 5,107
	X	41,144	6,184
	Net	9,855	1,077
Total	M	-44,795	-10,495
	X	47,173	7,660
	Net	2,378	- 2,835

The Scheme B employment effects are less promising. These indicate a net loss of 2,833 jobs for just one "round" of Scheme B. Most of this, however, is due to the substantial employment losses in textiles. Under Scheme A textile employment losses account for about 21 per cent of the total number of displaced workers. Under Scheme B, on the other hand, the employment losses in textiles account for almost half of all the displaced workers. The status of the restrictions on textiles, however, is critical to this analysis.

An alternative method of looking at the aggregate employment effects of Scheme A versus Scheme B is to compute an employment-bias index similar to the import-bias index used in Table 5-1. This

index for the total employment effects is .69, substantially less than one. Scheme B, therefore, is significantly unemployment-biased relative to Scheme A. This bias is reduced to .92 if the quota-affected categories are excluded. A major category for which Scheme B is not relatively unemployment-biased is Road Motor Vehicles (30). An index value of 2.59 indicates the strong employment-bias of Scheme B for this category.

5.6 Liberalization of Textile and Steel Quotas

The most significant import quotas affecting the principals of this study are the U.S. agreements restricting imports of iron and steel and the U.S. and E.E.C. quotas on textiles. In both instances, the administration of the quotas lies primarily with the exporting countries. The general studies of quotas by Mintz (73), Magee (69), and Bergsten (11) and the comprehensive study of iron and steel by MacPhee (67) provide much of the required information for this section.

Mintz's estimate of the cost of the U.S. textile quota as interpreted by Magee (69) indicates that the tariff implicit in the quota is at least about 35 per cent. The E.E.C. restrictions imply a lower tariff because of the high proportion of relatively unrestricted imports of Textile Semi-Manufactures (5). If one assumes that the E.E.C. restrictions are roughly equivalent except for this category, the tariff implicit in the E.E.C. textile quotas is about half that of the implicit U.S. tariff. Table 5-10 presents the increases in U.S. and E.E.C. imports of textiles (5-7) if the textile quotas were eliminated. The increases implied by both an

TABLE 5-10.--Changes in Trade Due to the Elimination of Textile and Steel Quotas (millions of dollars).

Category	Prin	1	2
Textiles	USM	1,024	591
	EM	1,238	710
Iron & Steel	USM	2,190	1,178
	EX	887	477
	JX	814	438

infinitely elastic supply and a less than infinitely elastic supply are presented. Bergsten (11) suggests that Japan would not share in the expansion of textile exports to the U.S. and E.E.C. caused by an elimination of textile quotas. For this reason, no Japanese export figures are presented.

Magee's (69, p. 673) estimate of 17 per cent as the tariff implicit in the U.S. import quotas on iron and steel (10-11) is used to derive the increase in U.S. imports reported in Table 5-10.⁶ Under the assumption of constant market shares, the E.E.C. and Japan shares in the expansion of exports to the U.S. are also reported.

The magnitude of these effects for textiles and steel indicates that liberalization of these quotas will have a substantial effect on trade in these categories. These results are also significant even when compared to the total effects of general trade liberalization.

⁶There are also restrictions on some imports in Metal Manufactures (14), but these are not considered. The most significant of these is the restriction on stainless tableware.

Quota effects are particularly important in the U.S. labor market where the mid-range estimates of the employment losses in textiles and steel are 21,076 and 17,682, respectively. These losses combined with the losses caused by reductions in the relatively high explicit tariffs make it clear that trade liberalization will, indeed, result in substantial displacements of workers in the textile and steel industries.

As a final note, the consideration of the textile and steel quotas in this section is not meant to deny the significance of other non-tariff barriers in these and other categories. The difficulty in dealing with non-tariff barriers, of course, is that no two are exactly alike. In this respect the textile and steel quotas differ from other non-tariff barriers because their magnitude and scope make them more tractable than more subtle and diverse forms of non-tariff barriers.

CHAPTER 6

SUMMARY AND CONCLUSIONS

The two major objectives of this study were to obtain improved estimates of the relevant price elasticities of import demand and to use these elasticities to examine the static price effects of trade liberalization. In regard to the former, the estimates of price elasticities obtained in this study are "improved" estimates in several senses: First, the categories for which the estimates were made are comparable for the three principals; second, the price elasticities were estimated directly for the principal to which they are meant to apply; third, the consistency of the estimates was improved by considering the potential bias in using OLS when unit value and quantity variables are measured with error; and finally, to avoid potential bias the specification of the estimated equations was not generally restricted to the use of a relative price variable.

The analytical framework used to examine the effects of trade liberalization is distinguished by three characteristics: First, the "industry" level effects of across-the-board versus harmonization tariff reductions and the effects of eliminating textile and steel quotas were computed; second, the possibility of rising supply prices was considered; and third, a critique of the traditional use of elasticity identities which relate trade elasticities to domestic demand and supply elasticities was presented.

The overall estimates of the effects of alternative tariff reductions indicate that the U.S. and Japanese interests (in terms of trade balance, welfare, and employment) are best served by an across-the-board tariff reduction rather than reductions proportional to the original height of the tariffs. The interests of the E.E.C., on the other hand, do not appear particularly sensitive to the difference between the two approaches. The results also indicate an expansion ranging from about three to seven per cent in imports and exports for each principal.

The estimated results for the elimination of the textile quotas indicate that U.S. imports of textiles will rise by about twenty to thirty-three per cent and E.E.C. imports will rise by about thirteen to twenty-five per cent. The elimination of the U.S. restrictions on steel imports would result in an increase in imports by at least twenty-two to forty per cent, and E.E.C. and Japanese exports to the U.S. should rise by about the same proportion. The U.S. employment effects of the elimination of the textile and steel quotas are substantial and are not compensated in the short-run by any accompanying increases in employment in the export sector.

Four points should be emphasized in evaluating the basic results of this study. First, the elasticities estimated here are generally higher than previous estimates. There is evidence that this is the result of the frequent use of 2SLS in this study and the relatively rare use of a relative price variable. This conclusion, however, is tentative due to the possibility of intervening factors. Second, the estimated effects for the thirty-seven categories

represent static price effects and do not include effects such as changes in income, tastes, technology, or market structure. Third, the actual effects of the negotiated tariff reductions will likely differ from any of those presented here. However, these estimates represent the effects of the two basic alternative approaches to tariff reduction. Finally, long-term comparative advantage in a particular category cannot really be inferred from any of the results presented here. The contributing factors to these results are much too complex to single out comparative advantage as a single factor.

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