TARIFF PROTECTION IN INDUSTRIAL COUNTRIES AN EVALUATION[1]

BELA BALASSA
Yale University

I

VINER expressed the opinion in 1950 that "there is no way in which the 'height' of a tariff as an index of its restrictive effect can be even approximately measured, or, for that matter, even defined with any degree of significant precision."[2] Undaunted by Viner's and others' critical remarks, a long line of investigators, using more or less ingenious methods, have made attempts to compare the height of tariff levels in industrial countries.[3] More recently, these inquiries have been given added impetus by the establishment of the European Common Market[4] and tariff negotiations undertaken in the framework of the Kennedy round.[5]

Estimates of the height of national tariff levels are designed to give expression to the restrictive effect of duties on trade flows.[6] In a general equilibrium framework, the restrictive effect of a country's tariff can be indicated by the difference between potential and actual trade, when the former refers to trade flows that would take place under *ceteris paribus* assumptions if the country in question eliminated all of its duties. Tariffs affect the pattern of production and consumption and generally reduce imports *and* exports under full employment conditions as changes in relative prices associated with the imposition of tariffs lead to resource shifts from export industries to import-competing industries.

[1] Data collection and calculations have been carried out within the framework of the Atlantic Trade Project, sponsored by the Council on Foreign Relations and directed by the present author. He is indebted to G. Basevi, R. N. Cooper, and W. M. Corden for comments on an earlier draft. Special thanks are due to Harry G. Johnson, whose advice and suggestions have been of great help in improving the argument of the paper.

[2] Jacob Viner, *The Customs Union Issue* (New York: Carnegie Endowment for International Peace, 1950), pp. 66–67.

[3] The earliest efforts were: United Kingdom Board of Trade, *Publications* (2d ser., Cd. 2.337 [1905]); League of Nations, *Tariff Level Indices, 1927* (Geneva, 1927); and J. G. Crawford, "Tariff Level Indices," *Economic Record* (December, 1934), pp. 213–21.

[4] Raymond Bertrand, "Comparison du niveau des tarifs douaniers des pays du Marché Commun," *Cahiers de l'Institut de Science Économique Appliqu e*, Series R, No. 2 (February, 1958); and H. C. Binswanger, "Der Zollschutz in den Ländern der Europäischen Wirtschaftsgemeinschaft und in der Schweiz," *Aussenwirtschaft* (March–June, 1958), pp. 119–46.

[5] See, e.g., M. Mesnage, "Comparaison statistique du tarif douanier commun de la CEE, du tarif des États-Unis d'Amerique et du tarif du Royaume-Uni de Grande-Bretagne de d'Irlande du Nord," *Informations Statistiques* (Office Statistique des Communautés Européennes), No. 3 (1963), pp. 101–23, and Research and Policy Committee of the Committee for Economic Development, "The Height of United States and EEC Tariffs," *Trade Negotiations for a Better Free World Economy: A Statement on National Policy* (Washington, 1964).

[6] While the terms-of-trade effects of tariffs occupy a central place in the theory of tariffs, these are largely disregarded in empirical investigations that have used a partial-equilibrium framework and have, explicitly or implicitly, assumed infinite export-supply elasticities. Cf., e.g., R. N. Cooper, "Tariff Dispersion and Trade Negotiations," *Journal of Political Economy* (December, 1964), pp. 597–606. See, however, M. E. Kreinen, "Effect of Tariff Changes on the Prices and Volume of Imports," *American Economic Review* (June, 1961), pp. 310–24.

In empirical investigations, however, attention is focused on imports, so that the difference between potential and actual imports is presumed to express the restrictive effect of duties.[7]

Among the *ceteris paribus* assumptions, two are of special interest: the assumption of given exchange rates and of given tariffs in other countries. For one thing, the maintenance of balance-of-payments equilibrium would probably necessitate a devaluation in the country that unilaterally reduced its tariffs;[8] for another, actual changes in trade flows would depend on the changes that occurred in all the national tariffs. To avoid the complications associated with changing more than one variable, in the following discussion we will consider the restrictive effects of national tariffs under the assumption that exchange rates (and domestic prices) remain unchanged, and we will disregard at the earlier stages of the argument the interaction of tariffs imposed in individual countries.

II

In international comparisons of the height of tariff levels, two procedures have been generally employed: the calculation of weighted and unweighted averages of duties. Under the first alternative, duties on individual commodities are often weighted by the imports of the country in question, which is equivalent to expressing the amount of duty paid in a given year as a percentage of the value of total imports. In turn, the second procedure entails calculating a simple average of all duties from national tariff schedules.

Although there are several recent examples of weighting with own imports,[9] this approach should not claim our attention since it has been repeatedly shown to provide distorted results: low duties associated with high levels of imports are given large weights, whereas high duties that restrict imports have small weight and prohibitive duties zero weight. Thus, while on the basis of a comparison of tariff averages weighted by own imports France would have been classified among low-tariff countries in 1955, this result appears to have been due to the restrictive effect of high duties on the imports of various categories of products.[10]

To remedy these deficiencies, it has been suggested that domestic production or consumption should be used as weights.[11] But these choices, too, are open to several objections. The composition of imports under free trade will differ from the composition of consumption under protection, in part because of the distorting effects of duties on consumer's choice, and in part because of intercommodity differences in "tradeability," when the latter depends, among other things, on the relative importance

[7] The decline in imports following the imposition of duties will generally be associated with a fall in the consumption and an increase in the domestic production of the protected commodities; the latter is customarily referred to as the protective effect of the tariff.

[8] Correspondingly, if exchange rates vary over time, an international comparison of national tariff levels will have little meaning. For a recent attempt, see E. Lerdau, "On the Measurement of Tariffs: The U.S. over Forty Years," *Economia Internazionale* (1957), pp. 232–47.

[9] See, e.g., European Economic Community, Commission, *Third General Report on the Activities of the Community* (Brussels, 1960); and Joint Economic Committee, U.S. Congress, *Trade Restrictions in the Western Community* (Washington, 1961).

[10] See my *The Theory of Economic Integration* (Homewood, Ill.: Richard D. Irwin, Inc., 1961), pp. 45–46; see also K. Bieda, "Trade Restrictions in the Western Community," *American Economic Review* (March, 1963), pp. 130–32.

[11] Swedish Customs Tariff Commission, *Revision of the Swedish Customs Tariff* (Stockholm, 1957), pp. 33–36.

of specific inputs and the ratio of transportation costs to the value of output. Thus, over nine-tenths of the world production of coffee and tin enters international trade, but only a small fraction of the output of construction materials is traded.[12]

In turn, following the suggestions made in a League of Nations report (see n. 3), Raymond Bertrand has calculated an unweighted average of duties for the approximately 1,100 four-digit headings of the Brussels Tariff Nomenclature (BTN). This method has also been applied by the Commission of the European Economic Community (EEC) in comparing tariff levels in the United States, the United Kingdom, and the Common Market.[13] Actually, the calculation of unweighted averages involves giving equal weights to all BTN headings under the assumption that the "law of large numbers" will lend meaning to the results. But the relative importance of the individual BTN headings differs considerably. In the Common Market countries, for example, imports of automobiles (BTN 87.02) amounted to $667.6 million in 1962 as against imports of zinc articles for construction (BTN 79.05) of $14 thousand.[14]

To give expression to the relative importance of individual products in international exchange, one may instead weight tariffs by the value of world trade. We will thereby escape, in a large part, the distorting effects of the idiosyncrasies of national tariffs on imports, although intercountry similarities in the structure of tariffs will still affect the commodity composition of international exchange. At the same time, weighting by the value of world trade will offer further advantages over the use of unweighted averages if we consider groups of commodities rather than all goods taken together.

This last observation brings us to the question whether one should calculate an average of tariffs on *all* commodities entering international trade. Calculations of this type have a long history, and an over-all average has recently been used in evaluating the protectiveness of the U.S. and Common Market tariffs by the Committee for Economic Development.[15] In turn, the EEC Commission has suggested restricting the investigation to non-agricultural products.

There are good reasons for excluding food, beverages, and tobacco, since the tariff is only one of the protective measures employed in the case of these commodities. A comparison of tariffs on agricultural commodities in the Common Market and the United Kingdom would make little sense, for example, since the former employs duties and the latter subsidies to protect domestic agriculture. Neither would comparisons with the United States be meaningful, given that the latter's system of agricultural protection involves the use of price-support measures and quotas.[16] Finally, revenue

[12] Production (consumption) weights would be of use, however, in measuring the production (consumption) cost of protection.

[13] See nn. 3, 4, and 5.

[14] A further difficulty with the commission's study is that in cases when a range rather than a single figure is indicated for a BTN heading in the U.S. or United Kingdom tariff classification, the lower and upper limits have been taken separately, and the BTN heading in question has been assigned double weight. Since in these two countries duties are generally given in terms of a range for commodities that are protected by relatively high tariffs, the tariff averages calculated by the use of this method are subject to an upward bias.

[15] *Trade Negotiations for a Better Free World Economy* (cited in n. 5); see also R. N. Cooper, *op. cit.*

[16] The difficulties associated with the international comparison of duties on agricultural commodities are exemplified by a calculation made in the Committee for Economic Development study. According to the latter, using U.S. imports as weights, the

duties on coffee, tea, alcoholic beverages, and tobacco further complicate the picture.

These considerations suggest that the usefulness of tariff comparisons will be enhanced if we excluded from the scope of the investigation agricultural products that are subject to non-tariff measures. Adjustments would also have to be made for non-agricultural commodities that are protected by quotas or receive domestic subsidies.[17] But aside from the effects of non-tariff measures, we face a further problem that has been largely disregarded in making international tariff comparisons: the implications of duties on raw materials and intermediate products for the protection of goods at a higher level of fabrication.[18] It is easy to see that high duties on materials and intermediate products will raise the average level of tariffs on non-agricultural commodities but will reduce the degree of protection accorded to final goods by increasing the cost of inputs.

We have to distinguish, therefore, between nominal and effective rates of tariffs when the latter will take account of duties levied on material inputs.[19] Under the usual assumptions of the international immobility of labor and capital, the effective rate of duty will indicate the degree of protection of value added in the manufacturing process.[20] If input coefficients are constant in the relevant range, the effective rate of duty (z) for any commodity can be expressed in the framework of an input-output system. Let t denote the nominal rate of tariffs, a the material input coefficients, and v the proportion of value added to output, all measured at world-market prices. For commodity i we have, then, equation (1):

EEC tariff averages at 12.1 per cent if sugar is included and 9.6 percent without sugar (*Trade Negotiations for a Better Free World Economy*, p. 72). And, whatever the weights, the tariff average of the Common Market will be affected by its high duty on sugar imports, while U.S. sugar production is protected by quotas. Thus, using combined U.S.-EEC imports as weights, the average of EEC tariffs is 8.6 excluding sugar and 10.2 including sugar.

[17] Petroleum, petroleum products, lead and zinc, and steel flatware are subject to import quotas in the United States, while the United States as well as the Common Market relies on formal and informal agreements to limit imports of some manufactures from Japan, Hong Kong, and India. Finally, subsidies are given to shipbuilding in most industrial countries.

[18] Several writers have considered this problem in a national context in regard to Canada and Australia. The most important contributions are: Clarence L. Barber, "Canadian Tariff Policy," *Canadian Journal of Economics and Political Science* (November, 1955), pp. 513–30, and W. M. Corden, "The Tariff," in Alex Hunter (ed.), *The Economics of Australian Industry* (Melbourne: Melbourne University Press, 1963).

More recently, the effects of protection in the presence of intermediate goods have attracted the attention of several economists. After the first version of this paper had been completed, I had the occasion to see Harry G. Johnson's "The Theory of Tariff Structure, with Special Reference to World Trade and Development," *Trade and Development* ("Études et Travaux de l'Institut Universitaire de Hautes Études Internationales" [Geneva: Librairie Droz, 1965]); and G. Basevi, "The U.S. Tariff Structure: Estimates of Effective Rates of Protection of U.S. Industries and Industrial Labor," *Review of Economics and Statistics* (in press). Also, W. M. Corden is engaged in research on the theoretical aspects of tariff structures.

[19] At the same time, there is no need to take account of tariffs paid at earlier stages of production, since material inputs are available to the domestic producer at the world-market price, inclusive of transportation costs, plus the duty.

[20] Similar calculations should be made for estimating the effective duty on the exports of manufactures from less-developed areas. I have noted elsewhere that, from the point of view of the entrepreneur's decision to transform a raw material into semifinished or finished products for exportation to developed countries, the tariff burden on value added in the production process rather than the nominal rate of duty is relevant (*Trade Prospects for Developing Countries* [Homewood, Ill.: Richard D. Irwin, Inc., 1964], p. 116). See also Harry G. Johnson, "Tariffs and Economic Development: Some Theoretical Issues," *Journal of Development Studies*, October, 1964.

$$z_i = \frac{(1+t_i) - \sum_j a_{ji}(1+t_j) - \left(1 - \sum_j a_{ji}\right)}{1 - \sum_j a_{ji}} = \frac{t_i - \sum_j a_{ji}t_j}{v_i}. \qquad (1)$$

For given world-market prices, this formula will indicate the excess in domestic value added, obtainable by reason of the imposition of tariffs, as a percentage of value added in a free-trade situation. It is easy to see that the effective and the nominal rates of duty will be identical if the weighted average of duties on material inputs is the same as the tariff on the final product; the effective tariff will be higher than the nominal rate of duty if the product bears a higher tariff than its inputs, and vice versa.

These relationships can also find application in international comparisons. Assume, for example, that material inputs account for 60 per cent of the value of output of a given commodity in a free-trade situation, and country A levies a 10 per cent duty on the materials and 20 per cent on the product itself, while B admits the materials duty free and applies a 16 per cent tariff to the final product. Now, according to the conventional analysis, the higher rate of duty in country A would provide a greater degree of protection to the final product than B's lower tariff does, and the average of nominal rates of tariffs will also be higher in country A, regardless of the system of weighting. On the other hand, the effective tariff on the final product will be 40 per cent in country B as against 35 per cent in country A. It appears, then, that the protectiveness of national tariffs cannot be indicated by comparing nominal rates of duties and averages of these duties—weighted or unweighted.[21]

III

We have concluded that, in international comparisons of the protective effect of national tariffs, one should use effective rather than nominal rates of duties. In the present paper, effective tariffs have been calculated for the United States, the European Common Market, the United Kingdom, Sweden, and Japan. These countries are the main participants in the Kennedy round of tariff negotiations and account for about 80 per cent of world exports and over 40 per cent of world imports of manufactured goods. The investigation has been limited to manufactured products, and raw materials have been considered only as inputs. This solution has been chosen in part because the countries in question compete largely in the field of manufactures and in part because tariffs provide the principal means of protection in the case of manufactured goods, while quotas and subsidies predominate in agriculture.

In order to calculate the effective rates of tariffs, we need comparable data on nominal tariff rates and input-output coefficients *net* of duties. Input-output tables using a common system of classification that also insures comparability with trade statistics, have been published for the five Common Market countries (Belgium, France, Germany, Italy, Netherlands), pertaining generally to the year

[21] Nominal tariffs will continue to have relevance for the consumer's choice between domestic goods and imports, however. The effects of nominal duties on the domestic consumption of protected commodities will be considered in Section VI below.

1959.[22] Comparable tables for the other countries under consideration are not available, however, and we have chosen to use "standardized" input-output coefficients in all cases. In deriving these coefficients, we have relied largely on the input-output tables for Belgium and the Netherlands.[23] The choice has been made for these countries because they had nil or low duties on most commodities in 1959, and hence the distortion in input-output relationships, due to the existence of duties, is relatively small.

The application of identical input-output coefficients for all countries is justified if the countries in question have identical production functions with unitary substitution elasticity in all industries, or if intercountry differences in efficiency are neutral in the sense that production functions differ only by a multiplicative constant. Under these assumptions, differences in the relative prices of inputs would not affect the coefficients.[24]

While the above assumptions have often been made in empirical research,[25] they may not be fulfilled in the real world. One may argue, however, that we can abstract from non-neutral differences in production functions, since firms in the industrial countries under consideration presumably have the same "technological horizon." At the same time, the use of standardized coefficients has the important advantage that the results will not be affected by international differences in the composition of output in individual industries.

Standardized input-output coefficients have been derived for thirty-six industries, including all of manufacturing except for food processing. In the system of classification applied we have been constrained by the breakdown used in the input-output tables of the Common Market countries which provide a rather narrow definition of some industries (e.g., cleansing agents and perfumes) while a number of diverse commodities are included in others (e.g., miscellaneous chemical products). A more detailed breakdown has been employed in regard to inputs, however, whenever the use of a specific input could be ascertained. For example, from the category "synthetic materials" we have selected synthetic rubber as an input for rubber goods.

For each industry, separate consideration has been given to all inputs that contribute at least 4 per cent of the value of output. The number of inputs distinguished in the case of individual industries has been between one and six, with automobiles at the upper end of the range. Other material inputs and non-material inputs (transportation, trade, etc.) have been included in separate categories. Within the group of other material inputs, fuels, paper, non-metallic minerals, and metal manufactures predominate; hence we have used a weighted average of tariffs on these products in the calculations. There are no duties on non-material inputs.

In regard to tariffs, we have used the BTN which is employed by the EEC, the United Kingdom, Sweden, and Japan.

[22] Office Statistique des Communautés Européennes, *Tableaux "Entrées-Sorties" pour les pays de la Communauté Européenne Économique*, October, 1964.

[23] The input-output tables of the other three countries have served as a basis, however, in regard to automobiles, aircraft, and precision instruments that are not produced in substantial quantities in Belgium and the Netherlands.

[24] The reader will note that the coefficients derived from input-output tables are expressed in value rather than in quantity terms and hence indicate relative shares.

[25] Cf., e.g., Kenneth Arrow, H. B. Chenery, B. Minhas, and R. M. Solow, "Capital-Labor Substitution and Economic Efficiency," *Review of Economics and Statistics* (August, 1960), pp. 225–50.

For the United States, tariff categories have been reclassified according to the BTN in *Comparative Tariffs and Trade;*[26] we have relied on this compilation while adjusting the results for reductions in duties accomplished in the Dillon round of tariff negotiations. Further, the specific duties applied chiefly in Britain have been expressed in *ad valorem* equivalents, whereas the common external tariff has been used in the case of the EEC.

Tariffs shown for the four-digit BTN headings have been expressed in terms of the four-digit items of the Standard International Trade Classification (SITC) that is employed in reporting trade statistics by all the countries under consideration.[27] Since the industrial classification applied is less detailed than the four-digit SITC, it has been necessary to average the tariff figures relating to the latter.[28] In averaging tariffs, we have used the combined imports of the five industrial areas as weights.[29] Subsequently, effective rates of duties have been calculated by utilizing the formula given in the previous section.

IV

Nominal and effective rates of duties for the thirty-six industries of the five countries (country groupings) under consideration are shown in Table 1. In turn, Table 2 provides the country ranking of tariffs for each industry, the industry ranking of tariffs for each country, and unweighted averages of the latter rankings for the five countries (country groupings) under consideration. In the same table, the thirty-six industries are also ranked according to the labor intensiveness of the manufacturing process, expressed in terms of labor-input coefficients.[30]

With few exceptions, we find effective duties to be higher than nominal rates. This result is explained, in part, by the relatively low duties on materials as compared to semimanufactures and finished goods and, in part, by the absence of tariffs on non-material inputs that do not enter international trade. The differences are especially pronounced—and effective rates are more than double nominal rates—in the case of textile fabrics and hosiery, leather, chemical materials, steel ingots, and non-ferrous metals. Being semifinished products that require little technological sophistication for their manufacture, these commodities are actual or potential exports of the less-developed countries; hence, the results provide evidence for the validity of complaints recently voiced by these countries regarding the protective effect of "graduated" tariffs in industrial areas.[31]

[26] Committee for Economic Development, *Comparative Tariffs and Trade* (Washington, 1964). U.S. tariffs have further been adjusted to express them on a c.i.f. basis.

[27] The BTN headings by and large correspond to the four- and five-digit items of the SITC. Whenever necessary, averages have been calculated by using import values for individual countries as weights. This solution has been chosen by reason of the incomparability of the national classifications and the small number of observations within each four-digit item.

[28] The correspondence has been established by the use of the *Classification Statistique et Tarifaire* (Luxembourg, Office Statistique des Communautés Européennes, April, 1963).

[29] In view of our previous discussion, this solution appears to be superior to weighting with own imports, or using unweighted tariff averages, while data on world trade are not available in the appropriate breakdown. At the same time, it has been judged permissible to average nominal rates of duties pertaining to individual commodities, since the commodity categories of the industrial classification employed generally include goods on the same level of fabrication.

[30] The share of wages plus employer-financed social security payments in the value of output, derived from the input-output tables cited above.

[31] See my *Trade Prospects for Developing Countries*, p. 116; and United Nations, *World Economic Survey, 1962, Part I* (New York, 1963), p. 79.

In turn, effective duties are lower than nominal tariffs in the case of printed matter and ships, and, in some of the countries, the protective effect of the low duties levied on these goods is more than offset by duties on their inputs, so that the effective rate of tariff is negative.[32]

[32] As noted below, however, the case of ships is hardly more than a *curiosum*, since most industrial countries subsidize their shipbuilding industries in one form or another.

Further instances of negative effective duty are agricultural machinery in the United States, pig iron in the EEC and Sweden, and paper in Sweden. Finally, a comparison of the ranking of individual commodity categories according to nominal and effective rates of duties indicates that high tariffs on semimanufactures reduce the *relative* degree of protection in the case of most consumer goods (cloth-

TABLE 1

NOMINAL AND EFFECTIVE TARIFF RATES, 1962

	United States		United Kingdom		Common Market		Sweden		Japan	
	Nominal	Effective	Nominal	Effective	Nominal	Effective	Nominal	Effective	Nominal	Effective
(21) Thread and yarn	11.7	31.8	10.5	27.9	2.9	3.6	2.2	4.3	2.7	1.4
(22) Textile fabrics	24.1	50.6	20.7	42.2	17.6	44.4	12.7	33.4	19.7	48.8
(23) Hosiery	25.6	48.7	25.4	49.7	18.6	41.3	17.6	42.4	26.0	60.8
(24) Clothing	25.1	35.9	25.5	40.5	18.5	25.1	14.0	21.1	25.2	42.4
(25) Other textile articles	19.0	22.7	24.5	42.4	22.0	38.8	13.0	21.2	14.8	13.0
(26) Shoes	16.6	25.3	24.0	36.2	19.9	33.0	14.0	22.8	29.5	45.1
(29) Wood products including furniture	12.8	26.4	14.8	25.5	15.1	28.6	6.8	14.5	19.5	33.9
(32) Paper and paper products	3.1	0.7	6.6	8.1	10.3	13.3	2.0	− 0.7	10.5	12.9
(33) Printed matter	2.5	2.2	2.7	0.2	3.3	− 0.7	0.7	0.0	1.6	− 4.2
(35) Leather	9.6	25.7	14.9	34.3	7.3	18.3	7.0	21.7	19.9	59.0
(36) Leather goods other than shoes	15.5	24.5	18.7	26.4	14.7	24.3	12.2	20.7	23.6	33.6
(37) Rubber goods	9.3	16.1	20.2	43.9	15.1	33.6	10.8	26.1	12.9	23.6
(38) Plastic articles	21.0	27.0	17.9	30.1	20.6	30.0	15.0	25.5	24.9	35.5
(39) Synthetic materials	18.6	33.5	12.7	17.1	12.0	17.6	7.2	12.9	19.1	32.1
(40) Other chemical material	12.3	26.6	19.4	39.2	11.3	20.5	4.5	9.7	12.2	22.6
(42) Cleaning agents and perfumes	11.2	18.8	11.1	11.2	13.8	26.7	10.9	27.9	26.2	61.5
(43) Miscellaneous chemical products	12.6	15.6	15.4	16.7	11.6	13.1	2.5	0.0	16.8	22.9
(45) Non-metallic mineral products	18.2	30.4	13.6	20.9	13.3	19.8	6.0	10.0	13.5	20.8
(46) Glass and glass products	18.8	29.3	18.5	26.2	14.4	20.0	13.8	22.6	19.5	27.4
(48) Pig iron and ferromanganese	1.8	9.3	3.3	17.9	4.0	−13.8	0.0	− 0.7	10.0	54.3
(49) Ingots and other primary steel forms	10.6	106.7	11.1	98.9	6.4	28.9	3.8	40.0	13.0	58.9
(50) Rolling-mill products	7.1	− 2.2	9.5	7.4	7.2	10.5	5.2	13.2	15.4	29.5
(51) Other steel products	5.1	0.5	17.0	46.8	9.9	20.9	5.4	9.5	13.4	14.1
(54) Non-ferrous metals	5.0	10.6	6.6	19.4	2.4	5.0	0.4	0.6	9.3	27.5
(55) Metal castings	6.6	10.0	16.0	26.9	12.4	21.0	8.0	34.7	20.0	32.5
(56) Metal manufactures	14.4	28.5	19.0	35.9	14.0	25.6	8.4	16.2	18.1	27.7
(57) Agricultural machinery	0.4	− 6.9	15.4	21.3	13.4	19.6	10.0	16.0	20.0	29.2
(58) Non-electrical machinery	11.0	16.1	16.1	21.2	10.3	12.2	8.8	11.6	16.8	21.4
(59) Electrical machinery	12.2	18.1	19.7	30.0	14.5	21.5	10.7	17.7	18.1	25.3
(60) Ships	5.5	2.1	2.9	−10.2	0.4	−13.2	0.9	− 5.8	13.1	12.1
(61) Railway vehicles	7.0	7.3	21.1	33.3	11.1	− 0.2	8.7	13.8	15.0	18.5
(62) Automobiles	6.8	5.1	23.1	41.4	19.5	36.8	14.7	30.5	35.9	75.7
(64) Bicycles and motorcycles	14.4	26.1	22.4	39.2	20.9	39.7	17.1	35.8	25.0	45.0
(65) Airplanes	9.2	8.8	15.6	16.7	10.5	10.8	3.7	3.0	15.0	15.9
(66) Precision instruments	21.4	32.2	25.7	44.2	13.5	24.2	6.6	14.9	23.2	38.5
(67) Sport goods, toys, jewelry, etc.	25.0	41.8	22.3	35.6	17.9	26.6	10.6	16.6	21.6	31.2

Source: Tariffs: National tariff schedules. Trade: National and international trade statistics. Input-output coefficients: Office Statistique des Communautés Européennes, *Tableaux "Entrées-Sorties" pour les pays de la Communauté Européenne Économique*, October, 1964.

TABLE 2

RANKINGS OF LABOR-INPUT COEFFICIENTS, NOMINAL AND EFFECTIVE TARIFF RATES, 1962

	Standardized Labor-Input Coefficients*	United States				United Kingdom				Common Market				Sweden				Japan				Five Areas Together	
		Nominal		Effective		Nominal		Effective		Nominal		Effective		Nominal		Effective		Nominal		Effective		Nominal	Effective
		A†	B‡	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	C§	C
(21) Thread and yarn	29	1	19	1	8	2	30	2	19	3	34	4	32	5	31	3	29	4	35	5	35	32	27
(22) Textile fabrics	27	1	4	1	2	2	10	4	7	4	9	3	1	5	9	5	5	3	14	2	7	9	3
(23) Hosiery	17	2	1	3	3	3	3	2	7	4	6	5	2	5	1	4	1	1	4	1	3	1	1
(24) Clothing	26	3	2	3	5	1	2	2	9	4	7	4	14	5	5	5	14	2	5	1	10	2	7
(25) Other textile articles	24	3	7	3	19	1	4	1	6	2	1	2	4	5	8	4	13	4	25	5	32	8	14
(26) Shoes	22	4	11	4	17	2	5	2	12	3	4	3	7	5	6	5	10	1	2	1	8	4	8
(29) Wood products and furniture	23	4	15	3	14	3	25	4	23	2	10	2	10	5	22	5	21	1	16	1	13	17	16
(32) Paper and paper products	18	4	33	4	33	3	32	3	33	2	27	1	26	5	32	5	35	1	32	2	33	33	34
(33) Printed matter	7	3	34	1	31	2	36	2	35	1	33	4	34	5	34	3	32	4	36	5	36	36	35
(35) Leather	32	3	23	3	16	2	24	2	15	4	29	5	24	5	21	4	12	1	13	1	4	24	12
(36) Leather goods other than shoes	13	3	12	3	18	2	15	2	21	4	12	4	15	5	10	5	15	1	8	1	14	11	17
(37) Rubber goods	16	5	24	5	22	1	11	1	5	1	11	2	6	4	12	3	8	3	30	4	24	16	11
(38) Plastic articles	21	2	6	4	12	4	17	2	17	3	3	3	8	5	3	5	9	1	7	1	12	3	4
(39) Synthetic materials	28	2	9	1	6	3	27	4	29	4	21	3	25	5	20	5	24	1	17	2	16	18	22
(40) Other chemical materials	25	2	17	2	13	1	13	1	10	4	23	4	20	5	27	5	27	3	31	3	26	25	21
(42) Cleansing agents and perfumes	30	3	20	4	20	4	29	5	32	2	16	3	11	5	11	2	7	1	3	1	2	15	13
(43) Miscellaneous chemical products	12	3	16	3	24	2	23	2	31	4	22	4	27	5	30	5	33	1	21	1	25	26	25
(45) Non-metallic mineral products	11	1	10	1	9	2	26	2	26	4	19	4	22	5	24	5	26	3	26	3	28	23	23
(46) Glass and glass products	5	2	8	1	10	3	16	3	22	4	14	5	21	5	7	4	11	1	15	2	22	12	19
(48) Pig iron and ferromanganese	35	4	35	3	27	3	34	2	28	2	32	5	36	5	36	4	34	1	33	1	6	35	30
(49) Ingots and other primary steel	−36	3	22	1	1	2	28	2	1	4	31	5	9	5	28	4	2	1	29	3	5	30	2
(50) Rolling-mill products	33	4	26	5	35	2	31	4	34	3	30	3	30	5	26	2	23	1	22	1	18	29	32
(51) Other steel products	31	5	31	5	34	4	18	1	3	3	28	2	19	4	25	4	28	2	27	3	31	28	24
(54) Non-ferrous metals	34	3	32	3	25	2	33	2	27	4	35	4	31	5	35	5	31	1	34	1	21	34	31
(55) Metal castings	3	5	29	5	26	2	20	3	20	3	20	4	18	4	19	1	4	1	12	2	15	19	18
(56) Metal manufactures	10	3	13	2	11	1	14	1	13	4	15	4	13	5	18	5	18	5	19	3	20	14	15

* Ranking of industries according to the share of wages plus employer-financed social security payments in the value of output, derived from the input-output tables previously cited.

† Ranking of countries (country groupings) according to the rate of duty for individual industries.

‡ Ranking of industries according to the rate of duty for individual countries (country groupings).

§ Unweighted average of the ranking of industries according to the rate of duty in the five areas.

TABLE 2—*Continued*

	Standardized Labor-Input Coefficients*	United States				United Kingdom				Common Market				Sweden				Japan				Five Areas Together	
		Nominal		Effective		Nominal		Effective		Nominal		Effective		Nominal		Effective		Nominal		Effective		Nominal	Effective
		A†	B‡	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	C§	C
(57) Agricultural machinery	15	5	36	5	36	2	22	2	24	3	18	3	23	4	15	4	19	1	1	1	19	22	26
(58) Non-electrical machinery	8	3	21	3	23	2	19	2	25	4	26	4	28	5	16	5	25	1	20	1	27	21	28
(59) Electrical machinery	4	4	18	4	21	1	12	1	18	3	13	3	17	5	13	5	16	2	18	2	23	13	20
(60) Ships	9	2	30	2	32	3	35	4	36	5	36	5	35	4	33	3	36	1	28	1	34	31	36
(61) Railway vehicles	6	5	27	4	29	1	9	1	16	3	24	5	33	4	17	3	22	2	24	2	29	20	29
(62) Automobiles	19	5	28	5	30	2	6	2	8	3	5	3	5	4	4	4	6	1	1	1	1	7	6
(64) Bicycles and motorcycles	20	5	14	5	15	2	7	3	11	3	2	2	3	4	2	4	3	1	5	1	9	5	5
(65) Airplanes	1	4	25	4	28	1	21	1	30	3	25	3	29	5	29	5	30	2	23	2	30	27	33
(66) Precision instruments	2	3	5	3	7	1	1	1	4	4	17	4	16	5	23	5	20	2	9	2	11	10	9
(67) Sport goods, toys, jewelry, etc.	14	1	3	1	4	2	8	2	14	4	8	4	12	5	14	5	17	3	10	3	17	6	10

ing and textile articles, shoes and other leather goods, sport goods, toys, and jewelry) and investment goods (electrical and non-electrical machinery, railway vehicles, and airplanes).

The calculation of effective duties also influences the country ranking of tariffs in regard to individual industries. In terms of effective tariffs, the United States and Sweden appear to be more protective than nominal duties would indicate, while the opposite conclusion holds for the United Kingdom, the EEC, and especially Japan. Thus, if comparisons are made by using effective rather than nominal rates of tariffs, the United States has a higher "rank" in regard to eight commodities and a lower rank with respect to three products, and Sweden has a higher rank in thirteen cases and a lower rank in none. In turn, in the case of the United Kingdom, upward adjustments are made in three instances, and downward adjustments in nine, while the relevant figures for the Common Market are five and ten, and for Japan two and eleven. These changes in rankings find their origin in the relatively low duties on materials in the United States and Sweden that raise the protective effect of a given nominal duty in these countries.

V

So far the discussion has proceeded in terms of changes in the relative position of countries and commodities as we calculate effective instead of nominal rates of duties. To make intercommodity comparisons of effective tariff *levels*, some further clarification of the assumptions underlying the analysis is called for. In this connection, separate consideration should be given to homogeneous (standardized) and heterogeneous (differentiated) products.

In theoretical models of international trade, it is generally assumed that traded goods are homogeneous, and a distinction is made between export- and import-competing industries. The same commodity may be imported and produced domestically in this case, and tariffs will have no protective effect on a commodity exported by the tariff-imposing country.[33] Only a few manufactures (gray cloth, paper, steel ingots, unwrought metals) qualify as standardized products, however, while product differentiation characterizes consumer goods, machinery, and transport equipment, as well as intermediate products at a higher level of fabrication (e.g., rolled-steel products, worked metal, and textile fabrics). At the same time, heterogeneous commodities can be exported *and* protected, and hence the distinction between export- and import-competing industries becomes blurred.

Correspondingly, tariffs levied on differentiated products can have a protective effect in every country and lead to the substitution of domestic for foreign merchandise in everyone's consumption. A multilateral reduction of duties will, then, give rise to an increased exchange of consumer goods without necessarily affecting produced quantities in the participating countries. In turn, tariff reductions on investment goods and intermediate products at higher levels of fabrication may result in intensified intra-industry specialization and longer production runs through a decrease of product variety in the individual firms.

Among the developed countries under

[33] Product differentiation is implicitly assumed when calculating substitution elasticities between commodities sold on the world market, however. Cf., e.g., G. D. A. MacDougall, "British and American Exports: A Study Suggested by the Theory of Comparative Costs," *Economic Journal* (December, 1951; September, 1952), pp. 697–726 and 487–521, respectively.

consideration, a broad similarity exists with respect to the ranking of industries according to their effective duties. Effective tariff rates are generally high on textile fabrics and hosiery, clothing and shoes, steel ingots, and, with a few exceptions, on other textile articles (chiefly sacks, bags, and linen goods), sport goods, toys, and jewelry, as well as on automobiles, motorcycles, and bicycles. In turn, relatively low effective duties are shown for paper and printed matter, ships and airplanes, pig iron, rolling-mill products, and non-ferrous metals, and also for machinery and railway equipment.

The observed similarities in the ranking of commodities by effective tariffs provide an indication of the possibilities for increased intra-industry exchange among the countries in question. In order to derive more definite conclusions in regard to individual industries, however, account should be taken of substitution elasticities between domestic and foreign products, and one should also consider the implications of tariffs for trade with outsiders—most of which are developing countries.

The general tendency among developed countries is to protect the domestic production of textile fabrics. The textile industry has long been the "sick man" of the manufacturing sector in many of these countries, and it has often been compared to agriculture by the proponents and the opponents of its protection alike. At the same time, its "footloose" character, the relative simplicity of the technological process, and the labor intensiveness of its manufacture make the textile industry a candidate for becoming the first manufacturing export industry in many developing countries. Correspondingly, the main effect of the all-round protection of textile fabrics in developed economies is likely to be a retardation of the expansion of exports from less-developed areas. Similar considerations apply to sacks and bags, toys and sport goods, and, among mechanical goods, to bicycles.

In most of the developed countries, effective duties are also high on consumer goods, including clothing and shoes, as well as automobiles. As a possible explanation, it may be suggested that in the case of these commodities cost differences are relatively small among the industrial countries, while the possibilities of substituting foreign commodities for domestic merchandise are considerable and protectionist pressures are also strong. The strength of protectionist pressures is partly explained by the fact that, whereas the opposing economic interest will influence—and moderate—tariffs on intermediate products and investment goods, the consumers rarely have a say in tariff setting.

Effective duties are low on intermediate products that utilize specific—and bulky—inputs in their manufacture, such as paper, non-ferrous metals, and, with the exception of Japan, pig iron.[34] Moderate levels of protection are shown in the case of machinery and railway equipment, too. These products are generally highly differentiated and their international exchange contributes to lower manufacturing costs in all industrial countries. On the other hand, the low degree of protection of ships is largely illusory, since industrial countries generally provide subsidies to domestic shipbuilding, whereas "buy-national" provisions assist the domestic airplane manu-

[34] Still, as we have noted above, duties on non-ferrous metals provide a disincentive to the transformation of ores into metals in the less-developed countries. In turn, considerations of fuel economy may limit trade in the case of pig iron.

facturers in some of the producing countries.

But can these admittedly "partial" explanations of the structure of tariffs in the industrial countries be replaced or supplemented by the application of some general principle? One such classifying principle is the labor intensiveness of the manufacturing process in individual industries. It has often been suggested that industrial countries, and especially the United States, tend to protect labor-intensive manufactures.[35] Our results do not reveal such a tendency, however, and no definite relationship is shown between labor intensiveness and effective rates of duties. Thus, the rank correlation coefficient between labor-input coefficients and effective duties is between −.08 and −.14 in European countries and the United States, and −.41 in Japan. With the exception of the Japanese case, these estimates are not significantly different from zero at the 5 per cent level of confidence, and the results are little affected if—following Basevi—we calculate effective rates of protection for labor under the assumption that capital is freely mobile between countries.[36]

It is suggested here that the explanation lies in the inadequacy of Heckscher-Ohlin–type theories that rely on a single classifying principle—factor proportions—in attempting to explain international specialization and consider protection in its effect on the income of the scarce factor. In appraising the structure of protection in the industrial countries, we can hardly neglect technological factors, however. It would appear that these countries find it expedient to heavily protect industries where developing economies can easily compete because labor-intensive production methods can be used and the technological process is rather simple. In turn, relatively low tariffs are levied on machinery whose manufacture is relatively labor intensive but requires advanced technology and organizational know-how that are not available in less-developed countries.

Interest attaches also to intercountry differences in the protection of individual industries. Rank correlation coefficients calculated in regard to effective tariffs for pairs of countries indicate considerable similarities within western Europe. On the other hand—aside from the United Kingdom–Japanese comparison—the discrepancies in the structure of tariffs are the most pronounced between the United States and Japan, which are at the opposite end of the spectrum in terms of industrial development. Thus, while in intra-European comparisons the rank correlation coefficients are in the .65–.85 range, in the U.S.–Japan comparison the relevant coefficient is .395 (Table 3).

It stands to reason, then, that the United States and Japan show the largest deviations from the ranking of duties in the five importing areas, taken together. Among the European countries, discrepancies are the most pronounced in the case of the United Kingdom, where selected industries are heavily protected. In turn—possibly as a result of the averaging of national tariffs undertaken in connection with the EEC's establishment—the European Common Market fits the general pattern rather well, and neither do we observe large deviations in the case of Sweden. Thus, the rank correlation coefficient between effective tar-

[35] Cf., e.g., Beatrice N. Vaccara, *Employment and Output in Protected Industries* (Washington: Brookings Institution, 1960); and William P. Travis, *The Theory of Trade and Protection* (Cambridge, Mass.: Harvard University Press, 1964), pp. 191–93.

[36] For the United States, similar conclusions have been reached by Basevi, who compared various measures of labor intensiveness, on the one hand, and effective duties on value added and on labor costs, on the other (*op. cit.*).

iffs in the various countries and country groupings, on the one hand, and an unweighted average of these rankings, on the other, is .732 in the case of Japan, .737 for the United States, .770 for the United Kingdom, .867 for Sweden, and .907 for the EEC.

Among individual commodities and commodity groups, synthetic and other chemical materials, as well as glass and non-metallic mineral products, are high on the U.S. list. In the case of synthetic and chemical materials, the effective rate of duty is raised by reason of the use of the American selling price as a basis for determining duties on several of these products,[37] while U.S. tariffs are notoriously high on glass and its manufactures. In turn, in the case of agricultural machinery, airplanes, and automobiles, the degree of protection appears to be substantially lower in the United States than in the other countries under consideration. Agricultural machinery and airplanes are leading U.S. exports, whereas the observed disparities in tariffs on automobiles may be related to differences in the degree of substitutability between domestic and foreign cars in the United States as against European countries and Japan. Despite the inroads made by European producers in the American market, the possibilities for substitution between the large American and the small European cars appear to be rather limited. On the other hand, car manufacturers in European countries and Japan have to contend with the competing products of each other's industries, and governments use high tariffs to insure safe outlets for domestic production in the home market. The consequences of a reduction in the degree of protection are evident in France and Italy, where the decrease in tariffs following the establishment of the Common Market has led to an influx of foreign cars.

TABLE 3

RANK CORRELATION COEFFICIENTS FOR EFFECTIVE TARIFFS IN THIRTY-SIX INDUSTRIES, 1962*

	United States	United Kingdom	Common Market	Sweden	Japan	Five Areas Together
United States	.....	.481	.512	.506	.395	.737
United Kingdom	.481	.....	.746	.650	.362	.770
Common Market	.512	.746	.....	.827	.565	.907
Sweden	.506	.650	.827	.....	.689	.867
Japan	.395	.362	.565	.689	.....	.732
Five areas together	.737	.770	.907	.867	.732	.....

* Spearman rank correlation coefficient. All coefficients except those relating the United States and Japan, and the United Kingdom and Japan, are statistically significant at the 1 per cent level; the latter are significant at the 5 per cent level.

Mention can be made of the relatively high degree of protection of steel products and railway vehicles in England, miscellaneous textile articles (chiefly sacks and bags) and paper in the Common Market, metal castings in Sweden, and pig iron and rolling-mill products in Japan. Finally, in terms of effective tariffs, the ranking of plastic and synthetic materials is lower than the average in the United Kingdom; the same conclusion

[37] To achieve international comparability, we have estimated the rates of duties with respect to import values in cases where the American selling price is used as a basis for the determination of tariffs. The commodities in question include coal-tar–based chemical materials and products and rubber footwear.

pertains to precision instruments in the Common Market and in Sweden, and to sacks and bags, as well as to rubber products, in Japan.

VI

We come now to the question raised in the introductory sections of this paper regarding the "height" of national tariff levels.[38] The reader will recall that estimates of the height of tariff levels are designed to indicate the restrictive effect of duties on trade flows, defined as the difference between potential and actual imports. To insure international comparability, the decrease in imports due to the imposition of tariffs (dM) may, in turn, be expressed as a proportion of potential imports (M).

Under the assumption that cross-elasticities of demand and supply can be neglected and that the primary resources used in industries producing import substitutes are available at constant costs, the restrictive effects of tariffs on the imports of a given commodity will consist of three components: (1) the restriction of domestic consumption, (2) the increase in domestic production, and (3) the increase in the demand for this commodity as an input in the production of other protected goods. Let C_i denote the domestic consumption, P_i the domestic production, and M_i the imports of commodity i in a free-trade situation, while η_i stands for the elasticity of domestic demand and ϵ_i for the elasticity of supply of value added.[39] The effect of duties on the imports of commodity i can now be written as

$$dM_i = -\eta_i C_i t_i - \epsilon_i P_i z_i + \sum_j a_{ij}\epsilon_j P_j z_j . \tag{2}$$

And, for all importables, taken together, we have

$$\begin{aligned} dM &= -\sum_i \eta_i C_i t_i - \sum_i \epsilon_i P_i z_i + \sum_i \sum_j a_{ij}\epsilon_j P_j z_j ; \\ &= -\sum_i \Big[\eta_i C_i t_i + \epsilon_i P_i z_i \times \Big(1 - \sum_j a_{ji}\Big)\Big] \qquad (3) \\ &= -\sum_i (\eta_i C_i t_i + \epsilon_i v_i P_i z_i) ; \end{aligned}$$

and

$$\frac{dM}{M} = -\sum_i \Big(\eta_i \frac{C_i}{M_i} t_i + \epsilon_i v_i \frac{P_i}{M_i} z_i \Big) \frac{M_i}{M} . \tag{4}$$

Let us first assume that identical nominal tariffs (t_o) are levied on every commodity. By transforming equation (4) into (4a), the restrictive effects of tariffs

$$\begin{aligned} \frac{dM}{M} &= -\sum_i \Big[\eta_i \frac{C_i}{M_i} t_o + \epsilon_i \frac{P_i}{M_i} \Big(t_o - \sum_j a_{ji} t_o \Big)\Big] \frac{M_i}{M} \qquad (4a) \\ &= -t_o \sum_i \Big(\eta_i \frac{C_i}{M_i} + \epsilon_i \frac{P_i}{M_i} v_i \Big) \frac{M_i}{M} . \end{aligned}$$

on imports can be shown to vary in proportion with the common tariff, t_o. Further, under the assumption that for individual commodities the share of imports in domestic production and consumption, the proportion of value added to output, as well as domestic demand and supply elasticities and the structure of imports, are identical internationally,

[38] I am indebted to Harry G. Johnson for improvements in the mathematical formulation of the argument.

[39] Under the assumption of constant input-output coefficients, ϵ_i is also the elasticity of domestic supply.

the restrictive effect of tariffs would be proportional to the values taken by t_o in the particular countries.

Assume, instead, that C_i/M_i, P_i/M_i, v_i, η_i, and ϵ_i are identical for every commodity in all the countries but allow tariff rates to vary. Utilizing the relationships indicated in (5) to transform equation (4) into (4b), it will be apparent that the restrictiveness of national tariffs will depend on intercountry differences in regard to the averages of nominal *and* effective duties, calculated by weighting with potential imports.

TABLE 4

OVER-ALL TARIFF AVERAGES* AND STANDARD DEVIATIONS, 1962

	Nominal Tariffs			Effective Tariffs			Uniform Tariff Equivalents
	Weighted Average	Standard Deviation	Coefficient of Variation	Weighted Average	Standard Deviation	Coefficient of Variation	
United States	11.6	6.9	.59	20.0	16.6	.83	16.7
United Kingdom	15.5	6.2	.40	27.8	12.1	.44	23.8
Common Market	11.9	3.6	.30	18.6	11.5	.62	17.3
Sweden	6.8	4.6	.67	12.5	10.6	.85	12.2
Japan	16.2	7.6	.47	29.5	15.6	.53	26.4

* Tariff averages calculated by weighting with the combined imports of the five areas.
Source: Table 1 and United Nations, *Commodity Trade Statistics, 1962* (New York, 1964).

$$\frac{dM}{M} = -\left(\eta_i \frac{C_i}{M_i}\bar{t} + \epsilon_i v_i \frac{P_i}{M_i}\bar{z}\right); \quad (4b)$$

$$\bar{t} = \frac{\sum_i t_i M_i}{\sum_i M_i}; \qquad \bar{z} = \frac{\sum_i z_i M_i}{\sum_i M_i}. \quad (5)$$

Correspondingly, under these assumptions, an unambiguous conclusion regarding the restrictiveness of national tariffs could be given as long as both nominal and effective tariff averages pointed in the same direction.

A comparison of tariff averages indicates that, among the countries under consideration, the over-all average of nominal as well as that of effective duties is the highest in Japan, with the United Kingdom as a close second and Sweden at the opposite end of the scale. The United States and the EEC occupy the middle ground: the over-all average of nominal duties is slightly higher in the Common Market than in the United States, while the opposite conclusion holds with regard to averages of effective tariffs (Table 4).[40]

Aside from comparisons of tariff averages, much attention has been given to the dispersion of tariffs, and it has been alleged that a greater dispersion of the tariff distribution in the United States, as compared to the Common Market, increases the restrictiveness of U.S. duties.[41] The data of Table 4, indeed, show greater tariff dispersion for the United States than for the Common Market, although the differences are reduced if the dispersion of effective, rather than nominal, duties is calculated. But,

[40] Tariff averages have been calculated by using the combined imports of the countries in question as weights. For reasons mentioned above, the combined imports of these countries have been taken as a "proxy" for the structure of their potential imports.

[41] The existence of a positive correlation between tariff dispersion and the restrictiveness of duties has been claimed by R. Bertrand and M. Mesnage (for reference see nn. 4 and 5), while their argument has been criticized by R. N. Cooper, *op. cit.* Note, however, that Cooper considers nominal tariffs only.

a perusal of equation (4b) suggests that the restrictive effect of duties is unrelated to their dispersion. This result can be understood if we consider that, in the absence of "excess protection," there is no presumption that a 20 per cent duty on refrigerators and a 10 per cent tariff on washing machines would restrict imports more than a 15 per cent tariff on both.[42] At the same time, it may be argued that, after the successive tariff reductions undertaken over the past fifteen years, much of the "fat" of protection has been sliced off.

Next, we remove the assumption that the ratios of imports to consumption and to production are identical in the countries under consideration. In fact, these shares differ considerably from country to country, thereby affecting the restrictiveness of tariffs in the individual areas. The proportion of the imports of industrial goods to value added in manufacturing is the lowest in the United States (4.7 per cent in 1961) and the highest in Sweden (44.9 per cent). In turn, the relevant ratio is 16.4 per cent for the United Kingdom, 12.1 per cent for Japan, and, if trade among the member countries is excluded, it is 10.5 per cent in the European Common Market.[43] Thus, it would appear that the tariff figures overestimate the relative degree of protection in Sweden and, to a lesser extent, in the United Kingdom, and underestimate it in the case of the United States, while the EEC and Japan occupy a middle position.

The restrictiveness of tariffs is further affected by intercountry differences in domestic demand and supply elasticities. The paucity of comparable estimates does not permit us to derive definite conclusions in regard to the former, but we may assume that, among the industrial countries, differences are relatively small. On the other hand, information on the rate of unemployment and capacity utilization indicates that domestic supply elasticities may be higher in the United States than elsewhere. High supply elasticities, then, would increase the restrictive effect of a given tariff on U.S. imports.

Nothing has been said so far of intercommodity differences in regard to the variables determining the effects of tariffs on imports. It will be apparent that, in the presence of such differences, overall tariff averages will not appropriately indicate the restrictiveness of duties. Nevertheless, if information on all the relevant variables is available, we can calculate a "uniform-tariff equivalent"—defined as the common rate of duty levied on all imported commodities that has the same restrictive effect on imports as the actual tariffs.[44] The formula for the uniform-tariff equivalent is

[42] However, if eq. (2) is transformed so as to indicate the expansion of imports following the elimination of duties, changes in import prices will be denoted by $t_i/1 + t_i$ rather than $t_i/1$, and, under *ceteris paribus* assumptions, the country with the greater dispersion of tariffs will experience a smaller increase in imports (for proof, see Harry G. Johnson, *The World Economy at the Crossroads* [Oxford: Clarendon Press, 1965]). This result follows from the properties of the harmonic mean, but, under present-day conditions, its practical significance is negligible. Thus, in the example cited above, the elimination of tariffs would lead to an increase of imports by 39.7 per cent in the former case, and 39.1 per cent in the latter if imports of refrigerators and washing machinery were of equal value and had an import demand elasticity of -3.0.

[43] Organization for Economic Cooperation and Development, *Statistics of National Accounts, 1955–1962* (suppl.; Paris, 1964); and United Nations, *Commodity Trade Statistics, 1962* (New York, 1964).

[44] This concept is due to W. M. Corden; its application has been suggested to me by Professor Johnson. For simplicity's sake, I have assumed that no inputs are exported.

$$\bar{t}_o = \frac{\sum_i \left[\eta_i C_i t_i + \epsilon_i P_i \left(t_i - \sum_j a_{ji} t_j \right) \right]}{\sum_i \left[\eta_i C_i + \epsilon_i P_i \left(1 - \sum_j a_{ji} \right) \right]}; \quad (6)$$

$$= \frac{\sum_i \left(\eta_i C_i t_i + \epsilon_i v_i P_i z_i \right)}{\sum_i \left(\eta_i C_i + \epsilon_i v_i P_i \right)}.$$

VII

In the previous section, we have assumed that the primary resources utilized in producing import substitutes are available at constant costs. This assumption is indeed appropriate if unemployment prevails in the tariff-imposing country, since, in this case, an expansion in the output of import-competing industries does not necessitate drawing resources from other sectors of the economy. But, under full-employment conditions, resources will move into the import-competing sector from other industies, and, if all countries impose tariffs, production for export will decline. The shift in primary resources will, then, be accompanied by a fall in demand for material inputs in the export sector, and equation (2) has to be amended by adding a term for the reduction in the demand for imported inputs used in the contracting industries.

Let us now consider the effects of multilateral tariff reductions on trade in manufactured products among the industrial countries. Correspondingly, in equation (2), C_i', P_i', and M_i' will replace C_i, P_i, and M_i, when the former refer to actual ("tariff-ridden") rather than potential consumption, production, and imports, while $t_i' = t_i/1 + t_i$ will replace t_i. Tariff reductions will be associated with an expansion of exports and imports in every country, and the demand for imported inputs used in producing exports and import-competing goods will change in opposite directions.

But, as we have noted in Section V, with respect to differentiated commodities produced in industrial countries of similar economic structure, a clear distinction between exports and import-competing products cannot be made. Thus, following a reduction of tariffs, the British will buy more Italian cars and vice versa, and similar developments are expected in regard to other consumer goods. In turn, in the case of machinery and intermediate products at higher levels of fabrication, increased intra-industry specialization is foreseen. The import content of exports and of import-competing goods may, then, differ little; and if—as a first approximation—we assume that every country will experience a balanced expansion of its exports and imports, the effects of tariff reductions on imported inputs can be neglected. Accordingly, equation (2) would take the form[45]

$$dM_i' = \eta_i C_i' t_i' + \epsilon_i P_i' z_i' .$$

Assume further that, while the variables determining the restrictiveness of tariffs may differ from commodity to commodity, these are identical for commodities at the same level of fabrication that serve similar needs. Under this assumption, we can use averages of nominal and effective tariffs calculated for individual commodity categories to provide an indication of the expansion of imports following the elimination of tariffs. Such a calculation will have added interest, since intercountry differences in

[45] We have assumed that the values of the domestic demand and supply elasticities are not affected by the move from C to C' and from P to P'.

the tariff averages pertaining to individual commodity categories will also indicate the relative advantages and disadvantages bestowed on large sectors of the economy through tariff protection.

Averages of nominal and effective duties have been estimated for consumer goods,[46] investment goods,[47] and two categories of intermediate products. Semimanufactures whose main inputs are natural raw materials have been classified as intermediate products I,[48] while all intermediate goods at higher levels of fabrication have been included in intermediate products II.[49] Finally, industries that produce intermediate as well as final goods have been classified according to the main uses of their products as determined from the input-output tables.[50]

The results of the calculations shown in Table 5 support our previous conclusions regarding the disparities between nominal and effective duties and the general similarity of tariff structures in the main industrial countries.[51] As regards effective duties, we find that the large share of products requiring specific and bulky resource inputs for their manufacture tends to reduce the average of duties for the first group, while tariff averages are uniformly higher for intermediate products at higher levels of fabrication, and generally increase again in the case of consumer goods. Still, an intercountry comparison of tariff averages indicates a higher-than-average degree of discrimination in favor of consumer goods in Japan, and a lower-than-average one in the United States, whereas the Common Market and the Swedish tariff structures appear to favor intermediate

TABLE 5

AVERAGE OF NOMINAL AND EFFECTIVE RATES OF DUTIES FOR FOUR COMMODITY CATEGORIES, 1962*

	United States		United Kingdom		Common Market		Sweden		Japan	
	Nominal	Effective	Nominal	Effective	Nominal	Effective	Nominal	Effective	Nominal	Effective
Intermediate products I	8.8	17.6	11.1	23.1	7.6	12.0	3.0	5.3	11.4	23.8
Intermediate products II	15.2	28.6	17.2	34.3	13.3	28.3	8.5	20.8	16.6	34.5
Consumer goods	17.5	25.9	23.8	40.4	17.8	30.9	12.4	23.9	27.5	50.5
Investment goods	10.3	13.9	17.0	23.0	11.7	15.0	8.5	12.1	17.1	22.0
All commodities	11.6	20.0	15.5	27.8	11.9	18.6	6.8	12.5	16.2	29.5

* Tariff averages have been obtained by weighting with the combined imports of the five areas.
Source: Table 1 and United Nations, *op. cit.*

[46] Hosiery, clothing, other textile articles, shoes, other leather goods, cleansing agents and perfumes, automobiles, bicycles and motorcycles, precision instruments, toys, sport goods, and jewelry.

[47] Agricultural machinery, electrical and nonelectrical machinery, railway vehicles, and airplanes.

[48] Thread and yarn, wood products, paper and paper products, leather, synthetics, other chemical materials, non-metallic mineral products, glass, pig iron, and non-ferrous metals.

[49] Textile fabrics, rubber goods, plastic articles, miscellaneous chemical products, ingots and other primary forms of steel, rolling-mill products, other steel products, metal castings, metal manufactures.

[50] We have not included printed matter and ships in any of these categories; the former has been omitted because of the special character of its trade, the latter because of the prevalence of subsidies.

[51] To insure comparability with the preceding tables, the averages of t_i rather than $t_i/1 + t_i$ have been calculated.

products at the lowest levels of fabrication. Finally, with the exception of the latter two countries, the lowest duties are levied on investment goods.

We have also utilized the information provided in Table 5 to prepare illustrative estimates of the probable effects of the elimination of duties on imports into the individual countries for assumed values of the relevant variables. In the first place, we have assumed that, in the countries under consideration, the following demand and supply elasticities apply to the four commodity categories: intermediate products I, −0.2 and 0.1; intermediate products II, −0.3 and 0.2; consumer goods, −1.0 and 0.8; and investment goods, −0.3 and 0.3.[52]

The next question concerns the ratio of domestic production and consumption to imports in the various countries. For several reasons, information on the proportion of imports to value added cannot be directly utilized for this purpose. To begin with, while the latter involves calculating the ratio of the value of trade to value added in manufacturing, the relevant comparison is between the value of trade and the value of industrial output —or apparent consumption—that also includes non-industrial inputs as well as imports used as inputs. Accordingly, the figures previously cited should be adjusted downward. At the same time, as I have elsewhere shown, the required adjustment will depend on the size of the country, because the proportion of imported inputs to the value of output (consumption) tends to decline as the size of the country increases.[53] Thus, while in the case of Belgium and the Netherlands the adjustment factor is 2.5, it is 2.1 for Italy, 1.8 for France and Germany, and approximately 1.6 for the United States.[54]

Allowance should further be made for product differentiation, transportation costs, and intercountry differences in tastes. All these factors tend to reduce the amount of domestic output that is competing with imports, thereby necessitating an upward adjustment in the calculated shares of imports and a further narrowing in intercountry differences in these shares. This conclusion can be readily understood if we consider that in larger countries a wider assortment of domestic goods is available that are designed to serve particular needs, and transportation costs from the frontier to the place of consumption are also generally higher.

The latter factors are of special importance in the United States, and we have followed J. E. Floyd in assuming a ratio of consumption to imports of 4 in this country.[55] In turn, we have assigned a value of 2 to Sweden, under the as-

[52] By comparison, Robert M. Stern assumed demand and supply elasticities of −0.25 and zero for crude materials, −0.4 and 0.2 for semimanufactures, −0.5 and 0.25 for non-durable finished manufactures, and −1.0 and 0.5 for durable finished manufactures ("The U.S. Tariff and the Efficiency of the U.S. Economy," *American Economic Review*, Papers and Proceedings [May, 1964], pp. 459–79), while J. E. Floyd calculated with a demand elasticity of −0.3 and a supply elasticity of 0.5 for all commodities, taken together ("The Overvaluation of the Dollar: A Note on the International Price Mechanism," *American Economic Review* [March, 1965]). In contrast with these authors, we have assumed that the relationship between demand and supply elasticities differs as between commodity categories.

[53] For the Common Market countries I have calculated the proportion of industrial imports to value added in manufacturing and to apparent consumption from the input-output tables. The relevant magnitudes are 90.2 and 36.4 for Belgium, 35.6 and 19.9 for France, 48.1 and 27.4 for Germany, 31.2 and 14.5 for Italy, and 82.9 and 34.3 for the Netherlands ("Planning in an Open Economy," to be published).

[54] U.S. Bureau of the Census, *U.S. Commodity Exports and Imports as Related to Output* (Washington, 1965), and n. 53.

[55] The same ratio has been applied to every commodity category.

sumption that the factors necessitating downward and upward adjustments with regard to the share of imports in value added approximately balance in this case. Finally, we have calculated with consumption-import ratios of 3 for the European Common Market and Japan and 2.5 for the United Kingdom. In all instances, we have taken consumption-import and production-import ratios to be identical, given the fact that the countries in question export *and* import the commodities included in our four commodity categories.[56]

Substituting the assumed values into equation (7),[57]

$$\frac{dM}{M} = \sum_k \left(\eta_k \frac{C'_k}{M_k} \bar{t}'_k + \epsilon_k \frac{P'_k}{M'_k} \bar{z}'_k \right) \frac{M'_k}{M'}, \quad (7)$$

we find that the elimination of duties on manufactured goods would lead to the largest relative increases in imports in Japan (39.9 per cent), followed by the United States (38.2 per cent), the United Kingdom (30.9 per cent), the European Common Market (28.2 per cent), and Sweden (14.0 per cent). At the same time, we can indicate the influence of assumed differences in consumption-import ratios on the results by comparing the latter with estimates of uniform-tariff equivalents; under the assumption of identical consumption-import and production-import ratios for all countries, increases in imports would conform to intercountry differences in regard to $\bar{t}_o$. The estimated uniform-tariff equivalents are 26.4 for Japan, 23.8 for the United Kingdom, 17.3 for the Common Market, 16.7 for the United States, and 12.2 for Sweden.

[56] The relationship utilized by Floyd, $P/M = C/M - 1$, would apply only if we dealt with standardized commodities.

[57] Subscript k refers to the individual commodity categories.

It appears, then, that the relatively small share of imports in domestic consumption (production) increases the restrictiveness of the American tariff to a considerable extent, while the opposite conclusion applies to Britain and Sweden. Should we also consider that domestic-supply elasticities may possibly be higher in the United States than elsewhere—or assume larger differences in consumption-import ratios—the U.S. tariff may appear to be the most restrictive among the countries in question. Thus, if supply elasticities in the United States were one-half higher than in other industrial countries, American imports of manufactured products would rise by 54.1 per cent following the elimination of duties. On the other hand, the increase in imports would be 67.8 per cent if consumption-import and production-import ratios were assumed to be 5 rather than 4 in this country.

These conclusions provide some indication of the possibilities of increases in imports of manufactures in the countries under consideration following an all-around reduction of duties, and they can be useful in evaluating the possible consequences of the Kennedy round of tariff negotiations on trade flows. In regard to the latter, however, consideration should also be given to export-supply elasticities, since the expansion of exports associated with tariff reductions will be attenuated if exported commodities are supplied at increasing costs.

Intercountry differences in export-supply elasticities are determined, to a considerable extent, by the share of exports in manufacturing production and the availability of excess capacity. Both these factors point to higher export-supply elasticities in the United States than elsewhere. Thus, the degree of capacity utilization is generally lower in the

United States than abroad, and proportion of industrial exports to value added in manufacturing is also the lowest in the United States.[58] Relatively high export-supply elasticities in the United States, as compared to the other main industrial countries, would, then, contribute to the expansion of U.S. exports following an all-around reduction of tariffs.[59]

Finally, in attempting to use these results in appraising the possible consequences of the Kennedy round, it would be necessary to take account of the fact that our conclusions pertain to relative changes in exports and imports rather than to absolute increments; the latter will also depend on the balance of trade of these countries and the share of manufactured goods in their exports and imports.[60] At the same time, notwithstanding the export orientation of the industrial countries, the expansion of exports does not provide a measure of welfare gains. The relative magnitudes of welfare gains will be determined by the reduction in the cost of protection and changes in the terms of trade, when the need for a realignment of exchange rates in case of an unbalanced expansion of trade further complicates the picture.

[58] The relevant figures are 9.0 per cent for the United States, 20.0 per cent for the European Common Market, 33.3 per cent for Japan, 36.3 per cent for the United Kingdom, and 45.1 per cent for Sweden.

[59] These essentially short-run considerations assume relevance in the long run if wage and price adjustments are not fully reversible.

[60] In turn, an improvement (deterioration) in the trade balance will be mitigated through an increase (decline) in imports of material inputs.