Trade Liberalisation and "Revealed" Comparative Advantage[1]

I

In discussions on the possible effects of trade liberalisation in the framework of the Kennedy-round, attention has been focused on the short-run problems of adjustment and the consequences for the balance-of-payments of the countries participating in the negotiations. At the same time, little attention has been paid to the enduring effects of trade liberalisation: the reallocation of resources following the freeing of trade barriers. In the present paper, we propose to examine the latter problem.

Since the reallocation of resources depends on comparative advantage, we have to ascertain where the comparative advantage of industrial countries lies in their trade with each other. One possible solution would be to make comparisons on the basis of a production census undertaken simultaneously—and using identical methods of investigation—in all countries. In practice, production censuses have been conducted at different times, using different methods of inquiry, and sufficient information for making intercountry cost-comparisons has not been made available.

An exception is the case of the United States and the United Kingdom where interindustry cost-comparisons have been made for the year 1950 in a study prepared for the Organisation for European Economic Co-operation.[2] But 1950 can hardly be regarded a "normal" year in any sense and, at any rate, the long time elapsed since this inquiry has reduced the value of the comparisons. For present purposes, a further deficiency of the estimates is that costs have been defined as value added inclusive of depreciation, so that material costs are excluded while profits are comprised in the "cost" figures.

[1] Data collection and calculations were carried out in the framework of the Atlantic Trade Project, directed by the author and sponsored by the Council on Foreign Relations. The writing of this paper was undertaken while the author was a Social Science Research Council fellow.

[2] Deborah Paige and Gottfried Bombach, *A Comparison of National Output and Productivity of the United Kingdom and the United States*, Paris, O.E.E.C., 1958.

Alternatively, we may utilise the results of industry studies that provide cost comparisons for the manufacturing industries of developed countries. A study of this nature has been prepared for the National Industrial Conference Board, which has relied on information supplied by 147 companies conducting operations in the United States and abroad.[1]

The N.I.C.B. report provides much interesting material on production costs in the domestic and foreign operations of American firms but, in the absence of a cross-classification according to countries and industries, the comparative advantage of foreign countries, taken individually, is not indicated. Further, the industry-breakdown used in the report is not detailed enough for our purposes and neither does the sample include domestic companies of foreign countries.

In the absence of appropriate data on production costs in the manufacturing industries of individual countries, it may be proposed to rely on prevailing theories of international specialisation for determining the pattern of comparative advantage. Among these doctrines, the Heckscher–Ohlin theory and the classical theory of comparative advantage can claim our attention.

II

In a two-country, two-factor world where production functions are identical internationally, and the elasticity of substitution among the factors of production is zero or unity, the relative factor intensities of individual commodities will be uniquely determined, and international specialisation will correspond to intercountry differences in factor-endowments. If allowance is made for differences in tastes, relative factor-endowments can be expressed in terms of relative factor prices, i.e. the country with the lower relative price of labor will be considered labor-abundant, and his trade-partner capital-abundant.

In a comparative study of nineteen countries, Arrow, *et al.* have claimed to establish, however, that substitution elasticities are generally lower than unity, and also differ among industries, implying that relative factor intensities would not be independent

[1]Theodore R. Gates and Fabian Linden, *Costs and Competition: American Experience Abroad*, New York, National Industrial Conference Board, 1961.

of factor prices.[1] As wage-rates rise compared to the price of capital, the capital-intensity of the industry with the higher elasticity of substitution will increase relatively to the industry with the lower elasticity; now, if the latter industry was capital intensive at lower wage levels, a switch in factor intensities will occur and relative factor endowments will not uniquely determine comparative advantage.

But irrespective of the possibility of factor reversal, a calculation of direct *plus* indirect labor and capital coefficients will not provide an appropriate indication of comparative advantage if intercountry differences in efficiency exist. Under the assumption that these differences pertain equally to all industries the countries at a higher level of efficiency will possess advantages in industries that utilise intermediate products in larger quantities. It may then be suggested to separately consider direct labor and capital requirements and material inputs (intermediate products), when intercountry differences with regard to the latter will reflect relative efficiencies in intermediate stages of manufacturing.[2]

Difficulties arise in attempting to apply the Heckscher–Ohlin theory to the three-factor case, however. Whereas—in the absence of factor reversals—we can provide a unique ranking of industries according to their relative factor intensities in the case of two factors, in the three-factor case a unique ranking may be possible only with regard to pairs of factors. Thus we may rank industries, e.g. with respect to their labor and material requirements, but not necessarily with regard to labor, materials and capital.[3] And we can hardly speak of a homogeneous material input since the comparative advantages of industries utilising material inputs will also depend on the number of the preceding stages of transformation. A consideration of differences in natural

[1] K. J. Arrow, H. B. Chenery, B. S. Minhas and R. M. Solow, "Capital–Labour Substitution and Economic Efficiency", *Review of Economics and Statistics*, August 1961, pp. 225–50.

[2] On the importance of intercountry differences in the cost of intermediate products for determining relative costs see Arrow, *et al.*, *op. cit.*, p. 244, and *Costs and Competition: American Experience Abroad*, Ch. III and VIII.

[3] Take, for example, the case when in industries A, B and C, labor requirements per unit of output are 1, 1, 1, capital requirements 4, 3, 2, and material requirements 2, 6, 5. The ranking of industries with respect to capital and labor inputs will be A, B, C, for material and labor inputs B, C, A, and for material and capital inputs C, B, A.

endowments will increase the number of factors, and compound the difficulties of establishing a unique ranking.

Similar difficulties arise if more than two countries are considered. In the two-factor case, some conclusions can now be derived with regard to national economies at the opposite ends of the scale, such as the United States and Japan among the industrial countries, but less can be said concerning the countries of Western Europe that inhabit the middle ground. The introduction of more countries *and* more factors further complicates the problem and if we also take account of interindustry differences in efficiency among the industrial countries, the Heckscher–Ohlin theory will hardly offer a guide in evaluating comparative advantages.

In turn, the consideration of intercountry differences in the efficiency of individual industries underlies the explanation given by the classical theory of comparative advantage when data on labor productivity have been used as a proxy for efficiency. The explanatory value of this hypothesis has been indicated in United States–United Kingdom comparisons,[1] but comparable data on productivity are not available for all industrial countries, and in U.S.–U.K. relationships, too, in addition to the observed productivity differences in a single year (1950), changes over time would be of interest.

At any rate, the lack of consideration given to interindustry differences in capital costs and non-price factors reduce the usefulness of the classical doctrine for the present purposes. Non-price variables have often suffered neglect in theoretical discussions and in empirical studies, although quality-differences, goodwill, servicing, the existence of repair facilities, and differences in weights and measures all bear influence on the pattern of international trade among the industrial countries. Cost considerations will not be sufficient to explain the widespread use of British woolen goods and the success of Volkswagen, for example, and, more generally, a complete explanation of comparative

[1] G. O. D. MacDougall, " British and American Experts : A Study Suggested by the Theory of Comparative Costs ", Part I, *Economic Journal*, December 1951, pp. 694–98, and Bela Balassa, " An Empirical Demonstration of Classical Comparative Cost Theory ", *Review of Economics and Statistics*, August 1963, pp. 231–38.

advantage could not leave out of consideration the non-price variables.

III

But is it necessary to explicitly take account of all influences that determine comparative advantage? This would be a rather laborious exercise and, in view of the difficulties of assigning numerical values to these variables, it might bring disappointing results. Instead, for purposes of indicating the possible consequences of trade liberalisation, it appears sufficient to provide information on " revealed " comparative advantage.

It is suggested here that " revealed " comparative advantage can be indicated by the trade performance of individual countries in regard to manufacturing products, in the sense that the commodity pattern of trade reflects relative costs as well as differences in non-price factors. For one thing, comparative advantage would be expected to determine the structure of exports;[1] for another, under the assumption of uniformity in tastes and a uniform incidence of duties in every industry within each country, export–import ratios would reflect relative advantages. Thus, while the heterogeneity of statistical commodity groups allows for exports and imports within the same category, the greater is a country's advantage in producing the commodities in question, the higher the ratio of the f.o.b. value of exports to that of imports is likely to be.

The assumption of the uniformity of tastes and uniform incidence of duties is not fulfilled in the real world, however. Rather, imports will be affected by intercountry differences in tastes, as well as by interindustry disparities in the degree of protection. Moreover, in the case of intermediate products, export–import ratios are influenced by demand for purposes of further transformation in producing for export. To take account of these influences, separate consideration has to be given to the special circumstances relating to individual products, which fact reduces the generality of the comparisons.

[1] Relative export performance has been used as an indicator of comparative advantage by H. H. Liesner in examining the possible effect of entry into the Common Market on British industry (H. H. Liesner, " The European Common Market and British Industry ", *Economic Journal*, June 1958, pp. 302–16). By comparison, in the present inquiry we have extended the scope of investigation to cover the main industrial countries which fact has necessitated a reappraisal of the methodology used by Liesner.

On the other hand, as long as all exporters are subject to the same tariff, data on relative export performance are not distorted by differences in the degree of tariff protection. Correspondingly, in evaluating " revealed " comparative advantage, we have given greater weight to export performance than to export–import ratios, and, in order to exclude extra-area trade, we have regarded the European Common Market as a unit.[1] Other areas included in the investigation are the United States, Canada, the United Kingdom, Sweden and Japan. These countries, the largest exporters of manufactured goods, account for over four-fifths of world exports of manufactures.

The inquiry has been limited to manufactured goods, partly because these provide the lion's share in trade among industrial countries, and partly because a large number of primary products are subject to subsidies, quotas, and special arrangements, so that the ensuing trade pattern can hardly reflect comparative advantage. Manufactured goods have been defined to include the products classified in commodity categories 5 to 8 of the Standard International Trade Classification, the exception being unwrought metals which—following the customs of international organisations—we have regarded as primary products.

With respect to manufactured goods, we have attempted to establish a commodity classification based on the elasticity of substitution in production, i.e. commodities with high substitution elasticity have been included in one category. Our point of departure has been the three-digit breakdown of the S.I.T.C., which we have supplemented by a four-digit breakdown whenever this appeared necessary and was made possible by the availability of statistical information.

Altogether, we have distinguished seventy-four categories, having excluded from the investigation commodities that are not easily transportable, such as Lime, cement and fabricated building materials (S.I.T.C. 661), Clay construction materials (662), and Mineral manufacturers n.e.s. (663), as well as commodities where the countries under consideration, taken together, have an import surplus. This solution has been chosen because in such instances

[1]Note, however, that inasmuch as in the first period under consideration the trade-pattern of the E.E.C. countries was determined by their comparative advantage, taken individually, a certain degree of " aggregation bias " has been introduced in the results.

other exporters are likely to benefit from an overall tariff reduction; less developed countries in regard to Mineral tar and crude chemicals (521), Dyeing and tanning extracts (532), Wood and cork manufacturers (631), Jute fabrics (653·4), Pearls and precious stones (667), Silver (681), and Miscellaneous metals (688·9), and Switzerland in the case of Watches and clocks (864). Further, for obvious reasons, we have excluded Developed cinematographic film (863), Printed matter (892), as well as the motley collection of Other miscellaneous manufactured articles, n.e.s. (893–896, 898).

IV

The export performance of individual industries in a particular country can be evaluated by (*a*) comparing the relative shares of a country in the world exports of individual commodities, and (*b*) indicating changes in relative shares over time. In both instances, the data have to be made comparable through appropriate "normalisation". This we have accomplished by dividing a country's share in the exports of a given commodity by its share in the combined exports of manufactured goods of the ten industrial countries under consideration, and expressing the result in index number form. Thus, for a given export commodity of a particular country, an index number of 110 will mean that the country's share in this commodity's exports is 10% higher than its share in the total exports of manufactured goods. Similar calculations have been made for changes in shares between the two three-year periods (1953–55 and 1960–62) that have been chosen as representative of the mid-fifties and the early sixties.

Correspondingly, we have calculated (1) the relative share of country i's exports of commodity j in the years 1953–55; (2) the relative share of country i's exports of commodity j in the years 1960–62; and (3) the ratio of the relative share of country i's exports of commodity j in the second period to that in the first period. In all cases, the expression "relative share" refers to the ratio of the share of country i in the exports of commodity j to the share of country i in the exports of all manufactured goods.

In symbols,[1]

$$\frac{X^o_{ij}}{X^o_{nj}} \Big/ \frac{X^o_{it}}{X^o_{nt}} = \frac{x^o_{ij}}{x^o_i} \tag{1}$$

$$\frac{X^l_{ij}}{X^l_{nj}} \Big/ \frac{X^l_{it}}{X^l_{nt}} = \frac{x^l_{ij}}{x^l_i} \tag{2}$$

$$\frac{x^l_{ij}}{x^l_i} \Big/ \frac{x^o_{ij}}{x^o_i} \tag{3}$$

In evaluating relative advantages in the exportation of manufactured goods, various assumptions may be made. We may assume, for example, that relative shares observed in the most recent period will pertain also to the future, or we may take relative growth rates as an indicator. Both of these methods have their advantages and disadvantages. On the one hand, in considering relative export performance in a certain year, or an average of several years, we neglect the trend factor; on the other, relative growth rates can give a misleading impression of comparative advantage since high growth rates are compatible with small exports in absolute terms, while a country that has a large segment of the export market in a given commodity can hardly be expected to further increase its share.

These considerations indicate the need for using some combination of the two indicators for expressing comparative advantage. One possible solution would be to project the continuation of past trends in relative shares by multiplying equations (2) and (3). We have decided against using this formula since it involves the questionable assumption that changes in relative shares take the form of a geometrical progression which can be extrapolated into the future. Instead, a compromise solution has been chosen by calculating the arithmetical average of equations (2) and (4). This choice reflects the presumption that while past trends in relative shares can be expected to continue, this will take

[1]Explanation of symbols:

X = exports,
x = relative share of exports.
Superscripts: o = average for the years 1953–55,
l = average for the years 1960–62.
Subscripts: i = country i,
n = ten industrial countries taken together,
j = product j.

place at a declining pace as compared to the past. The reader will observe that any other average of the two figures could have been taken, and our choice is based on the assumption that it is appropriate to give equal weights to the two indicators.

$$\frac{x^1_{ij}}{x^1_i} \cdot \frac{x^1_{ij}}{x^1_i} \Big/ \frac{x^o_{ij}}{x^o_i} \tag{4}$$

$$\frac{1}{2}\left[\frac{x^1_{ij}}{x^1_i} + \frac{x^1_{ij}}{x^1_i} \cdot \frac{x^1_{ij}}{x^1_i} \Big/ \frac{x^o_{ij}}{x^o_i}\right] \tag{5}$$

In the case of export–import ratios, too, indices of relative level and relative growth have been calculated, when the procedure of " normalisation " has taken the form of dividing the export–import ratio of a country for a given commodity by that of the ten countries, taken together. After appropriate transformation, carried out on the basis of considerations similar to those relating to export shares, the following indicator has been derived :[1]

$$\frac{1}{2}\left[\frac{x^1_{ij}}{m^1_{ij}} + \frac{x^1_{ij}}{m^1_{ij}} \cdot \frac{x^1_{ij}}{m^1_{ij}} \Big/ \frac{x^o_{ij}}{m^o_{ij}}\right] \tag{6}$$

V

Export-performance indices provide an indication of relative advantages (and disadvantages) for individual countries but the dispersion of these indices—representing the " markedness " of comparative advantage—is likely to differ from country to country. In general, one would expect that large countries, as well as countries that occupy a middle position in terms of technological development, would produce a great variety of commodities and hence show relatively small differences in export performance indices. On the one hand, large countries usually possess a more balanced resource endowment and will have a home market sufficiently wide to permit the production of most industrial goods ; on the other, countries that are in the middle of the range among industrial economies are likely to export technologically less developed products to economies at higher levels of industrialisation and more sophisticated products to countries at lower levels of industrial development.

[1]In the equation, m stands for relative export–import ratios.

These expectations are by and large confirmed by empirical evidence. We find that the standard deviation of the export-performance indices is the smallest in countries that fulfill both conditions, such as the European Common Market (26·5) and the United Kingdom (55·5), while it is somewhat higher in the United States (70·2) that is at the upper end of the range in terms of technological advance. Further, the standard deviation of the export-performance indices is 119·6 in Sweden, the smallest of the countries under consideration in terms of home market for manufactured goods, it is 136·8 in industrially less developed Japan, and 205·1 in Canada—a country small in terms of domestic market and a relative newcomer among the industrial nations.

In the case of the European Common Market, the indices also reflect the lack of complete integration in this area. Despite the tariff-reductions undertaken during the second period under consideration, the trade pattern of the countries participating in the E.E.C. is still determined to a large extent by their comparative advantages, taken individually and, with the aggregation of national data, the dispersion of the indices is necessarily reduced. Nevertheless, differences in the relative position of Common Market industries are indicated by the fact that in case of one-half of the seventy-four commodities under review the export performance indices fall outside the 80 to 120 range.

The next problem concerns the similarities and dissimilarities shown in the interindustry pattern of export performance and export–import ratios for the individual countries. In case of the majority of these countries, there appears to be a considerable degree of correspondance between the two sets of indices: the rank correlation coefficients are 0·92 for Canada, 0·87 for Sweden, 0·78 for the United States, 0·75 for Japan, while lower values have been obtained for the United Kingdom (0·62) and the European Common Market (0·57). Various factors explain the observed differences in the correlation coefficients: the "markedness" of comparative advantage, interindustry differences in the degree of protection and, in the case of the Common Market, the problems related to the aggregation of national data.

Other things being equal, the more marked are interindustry differences in trade performance, the greater will be the correspondence between the indices of export performance and of

export–import ratios since the random error in the two sets of indices will be relatively small. The results will be further affected by the degree of skewness in the pattern of protection; in general, a high degree of protection of selected industries will reduce the correlation between the export performance and the export–import indices. Finally, the aggregation of data for the six Common Market countries will diminish the correspondence between the two indicators.

	Standard deviation of export performance indices	Rank correlation coefficient between indices of export performance and of export–import ratios
United States	70·2	0·776
Canada	205·1	0·902
European Common Market	26·5	0·567
United Kingdom	55·5	0·621
Sweden	119·6	0·829
Japan	136·8	0·753

Among the countries under consideration, Canada shows the greatest dispersion of the export performance indices as well as the highest correlation coefficient between the two sets of indices. With the exception of shipbuilding, there is little evidence of the distorting effects of protection on export–import ratios; this result is explained by the fact that while tariffs are generally high in Canada, large interindustry disparities in duties are not observed.

Japan, the country with the second highest standard deviation of export-performance indices, occupies fourth place as far as the correlation coefficient between the two indicators is concerned. The explanation lies in the high degree of protection applied to selected manufacturing industries that has distorted the ranking of the export–import ratios. The effects of protection are manifest in the case of perfumery and cosmetics, paper, furniture, woolen yarn and textile machinery, as well as in regard to wrought lead and tin, where high tariffs and/or quotas have virtually excluded all imports.

In turn, low tariffs contribute to the high correlation observed between indices of export performance and of export–import ratios in Sweden, and the distorting effects of protection on

export–import ratios are observable only in a few industries in the United States. The U.S. tariff appears to be nearly prohibitive for synthetic rubber material and synthetic fabrics, while subsidies to domestic production reduce the imports of ships.

High tariffs on imports of selected commodities have contributed to the relatively low degree of correlation between the two sets of indicators in the United Kingdom, however. The 19% tariff on glass and the 24% duty on synthetic yarn are largely responsible for the small imports of these commodities; more importantly, the wide differences shown between indices of export performance and of export–import ratios for all kinds of steel products appear to be due to the fact that, among the industrial countries, Britain has the highest tariffs on steel.

Tariffs and quotas account for the relatively high export–import ratios for cotton fabrics and a few other products in the European Common Market, too. Nevertheless, a consideration of individual commodities indicates that, in the case of the E.E.C., the error possibilities introduced by the aggregation of national data have had a greater influence on the observed differences between the two sets of indices than did protect. The export–import ratio was reduced by large German imports of woolen yarn and fabrics, for example, while after integration an increasing part of German demand may be satisfied by production in the partner countries.

VI

Despite the observed differences between indices of export performance and of export–import ratios, the ranking of products at the top and at the bottom of the list is reasonably clear for all the countries under consideration. Taking account of import tariffs and other influences affecting export–import ratios, the "revealed" comparative advantage of the countries in question can then be indicated.

The United States appears to have relative advantages with respect to chemical materials and products, aircraft, wrought tin and nickel, as well as in regard to railway vehicles, metal-working machinery and plastic materials. On the other hand, the U.S. is at a disadvantage in the production of woolen yarn and fabrics,

cotton yarn,[1] footwear, and pottery, followed by blankets, carpets, simple forms of steel (bars, rods, sections and wire), and ships.

Cotton and woolen yarns, floor coverings and pottery also appear on the list of products in which Canada has a comparative disadvantage; further commodities on this list are hoops and strips of iron and steel, wrought tin, synthetic dyes and glassware. At the same time, Canadians possess relative advantages in the manufacturing of paper, organic chemicals, lead, copper, aluminum, pig iron, railway construction material, and fertilizers.

While the "aggregation problem" makes the evaluation of comparative advantage more difficult in the case of the E.E.C. countries, it appears clear that the Common Market has relative advantages in manufacturing passenger cars, footwear, clothing, glass, and musical instruments, and disadvantages in producing paper, rubber goods, tractors, power generators, railway equipment and aircraft. In turn, tractors, buses and trucks, pigments and paints, and explosives are on the top of Britain's list, followed by woolen fabrics, bicycles, wrought tin and copper. At the same time, Britain appears to be at a comparative disadvantage in the manufacture of fertilizers, jewelry, travel goods, paper, cotton and synthetic fabrics, and clothing.

By comparison, Sweden possesses relative advantages in regard to railway construction material, paper, ships, plumbing and heating fixtures, lead, copper ,and rubber goods, and disadvantages in cotton and synthetic yarns, woolen fabrics, synthetic dyes, fertilizers, and photographic equipment. Finally, we find the Japanese ahead in exporting footwear, cotton yarn and fabrics, clothing, pottery, and—surprisingly—buses and trucks, while they appear to be at a disadvantage in the manufacture of aircraft, tractors, wrought nickel and zinc, essential oils, and chemical products.

The reader will note that the commodities at the two ends of the comparative scales are, with few exceptions, standardised products or nondurable consumer goods. This is hardly surprising since, in the case of homogeneous products, national product differentiation plays a relatively small role and trade patterns are determined largely by intercountry differences in relative costs,

[1] For purposes of the analysis, unbleached and bleached cotton goods have been considered together.

while low labor costs (Japan) and high labor quality (E.E.C.) are of importance in regard to nondurable consumer goods. On the other hand, medical and pharmaceutical products, scientific and optical instruments, as well as electrical and much of nonelectrical machinery, are characterised by specialisation within commodity categories, and most industrial countries export *and* import them. Still, we can provide an indication of the pattern of comparative advantages in these commodity-groups if we examine the relative position of the countries in question with regard to the various groups of products.

In the chemical group, Canada appears to have comparative advantages with respect to organic and inorganic chemicals and manufactured fertilizers, the United Kingdom in synthetic dyes, paints and varnishes, medical and pharmaceutical preparations, perfumes and cosmetics, and explosives, while the United States has a leading position in the exportation of medical and pharmaceutical preparations, plastic materials, and other chemical materials and products. In turn, Sweden and Japan are at a comparative disadvantage in most chemicals, and Canada in the highly processed products of this group.

Among material-intensive commodities, Canada leads in leather and leather goods, with the United States at the bottom of the list. At the same time, the United Kingdom, and Japan have relative advantages in the manufacture of rubber tyres while in other rubber goods they are surpassed by Sweden. In both instances, Canada is at a disadvantage. In turn, Canada and Sweden are in a leading position with regard to paper, in the production of which the European Common Market and the United Kingdom have a decided disadvantage. Finally, the E.E.C. is in the most favorable position in the case of glass, Sweden leads in the exportation of glassware, and Japan in pottery.

Turning to textile products, we find Japan to possess relative advantages in manufacturing cotton yarn and thread, cotton and synthetic fabrics, tulle and lace, made-up textile fabrics, blankets and floor coverings; however, she cedes first place to the European Economic Community in the case of wool yarn, to the United States in synthetic yarns, and to the United Kingdom in woven woolen fabrics. On the other hand, Sweden and Canada appear

to be at a comparative disadvantage with respect to most textile products, the United States in cotton yarn, woolen yarns and fabrics, tulle and lace, blankets and floor coverings, and the United Kingdom in cotton yarn and thread, while the European Common Market occupies the middle position in most cases.

By and large, the United States and the United Kingdom are at a disadvantage in iron and steel products, when export–import ratios in Britain are often raised as a result of high tariffs. Within this group of products, Sweden leads in the highly manufactured forms of iron and steel (hoops, and strips, tubes, pipes and fittings) and shares first place with the Common Market in iron and steel bars and with Canada in railway construction material. In turn, Canada has the lead in the case of pig iron and also in universals, plates, and sheets of iron and steel.

As to wrought ferrous-metals, our previous discussion has indicated relative advantages for Canada and Britain in copper, the United States in nickel, Canada in aluminum and lead, the United Kingdom in zinc, and the United States and the United Kingdom in tin. Countries at a comparative disadvantage in these metals are the United States in regard to copper and lead, Japan in nickel, aluminum and zinc, Sweden in zinc and tin, and Canada also in tin.

We find further that the United Kingdom and the United States are in a favorable position with regard to much of non-electrical machinery. The United Kingdom occupies first place in the exportation of power-generating machinery, textile machinery, as well as tractors, although Canada is ahead in other agricultural machinery. At the same time, the United States leads in metal-working machinery, office machinery and other nonelectrical machinery, with Sweden occupying the second place in the last two instances. Finally, with the exception of textile and office machinery, Japan and the E.E.C. appear to be at a comparative disadvantage in this category of products and Canada is also behind in several commodity groups.

The classification employed in this study in regard to electrical machinery is rather aggregated; by reason of the unavailability of statistical information in a more detailed breakdown, we have been able to distinguish only two commodity groups: electrical generators and other electrical machinery. The

United Kingdom and the United States appear to have a comparative advantage in regard to the first while Japan is ahead in the second—rather heterogeneous—category. In both instances, Canada and Sweden are at a disadvantage.

Turning to transport equipment, we find the United States in the lead in the case of aircraft and railway vehicles, she falls behind Japan in the exportation of bodies and frames of automotive vehicles, and is at a decided disadvantage in shipbuilding, bicycles and passenger automobiles. In turn, the countries of the Common Market have a strong lead in car exports, but are behind in regard to most other types of transportation equipment. Finally, Sweden and Japan appear to have a comparative advantage in shipbuilding while the United Kingdom and Japan share in first place in the case of buses and trucks, as well as in bicycles.

Among household accessories, Sweden possesses relative advantages in sanitary and plumbing equipment and furniture, the United Kingdom being at a disadvantage in the former case, and the United States and Canada in the latter. Turning to non-durable consumer goods, we find the United States, the United Kingdom and Canada at a comparative disadvantage in regard to clothing, footwear and leather goods; in all three instances Japanese producers have a leading position, with the European Common Market a close second in the case of clothing and footwear.

In turn, the United States has comparative advantages in the manufacture of different types of precision instruments, such as scientific, medical and optical equipment, as well as photographic and cinematographic equipment. The United Kingdom appears to be at a disadvantage in the former case, Canada, Sweden and—surprisingly—Japan, in the latter. Finally, Japan and the Common Market countries lead in the exportation of musical instruments and the E.E.C. in jewelry; Canada, Sweden and the United Kingdom are far behind.

VII

We have set out to examine the "revealed" comparative advantage of the main industrial countries in manufactured goods by utilising available information on their trade performance

(export shares and export-import ratios) in regard to seventy-four commodity categories. This method appears to be the most satisfactory in its application to standardised products and non-durable consumer goods but has given less clearcut results in the case of machinery and precision instruments.

It appears that cost differences largely determine the export performance of industries manufacturing standardised products that are usually found at the extremes of the comparative range, although non-price factors bear influence on trade in steel and nonferrous metals. Considerations of the continuity of shipments and international differences in specifications seem to restrict the imports of steel into the United States, for example, while ownership relations affect the pattern of trade in nonferrous metals. At the same time, interindustry disparities in tariff levels have a differential impact on export-import ratios.

Cost differences often find their origin in the availability and cost of raw materials in the case of material-intensive commodities while labor costs appear to be the main factor determining relative advantages in regard to textile products. Exceptions are woolen fabrics and synthetic yarns where, respectively, quality differences and technological advance play an important role. Labor costs and quality differences are of importance in the case of other nondurable consumer goods, too.

In turn, specialisation within commodity categories is observable in regard to machinery and precision instruments. While differences in the level of technology are often of considerable importance, and labor costs greatly affect the determination of comparative advantage in the case of light electrical equipment, most industrial countries export *and* import these commodities and relative advantages are generally less pronounced. This conclusion may be objected to on the grounds that these commodity groups could be made more homogeneous if an adequately detailed statistical breakdown were available. A consideration of the pattern of trade in countries that publish a more detailed trade classification suggests, however, that intra-group specialisation exists within any meaningful commodity category.

At any rate, although in the presence of product differentiation, comparative advantages in regard to machinery and

precision instruments are not indicated as clearly as in regard to standardised products and nondurable consumer goods, this should not mean that a reduction or elimination of tariffs would not lead to an expansion of trade in the former group of products. Rather, whereas the observed differences in relative advantages provide an indication of cost savings obtainable through the reallocation of resources after a reduction of tariffs for standardised products, decreases in duties would give rise to a more extended differentiation and specialisation in machinery and precision instruments.

It appears, then, that the benefits of international specialisation are of a different character depending on the category of products under consideration. While the traditional gains derived from substituting cheaper imports for more expensive domestic merchandise are relevant in regard to simple manufactures, economies of scale obtainable through specialisation within commodity categories are likely to provide the main benefit of tariff reductions in the case of more sophisticated products.[1] It goes without saying that the dividing line between the two groups of products is not clearcut; it is difficult to classify transport equipment, for example, and national product differentiation is of importance in the case of nondurable consumer goods, too. In connection with the latter, mention should also be made of improvements in consumer welfare due to the increased exchange of consumer goods following a reduction in tariffs.

This discussion indicates some of the deficiencies of the traditional theories of international trade that attempt to explain international specialisation, and to indicate the gains from specialisation, by the use of a single classifying principle—should this be intercountry differences in factor proportions or in production functions. Comparative advantages appear to be the outcome of a number of factors, some measurable, others not, some easily pinned down, others less so. One wonders, therefore, whether more could not be gained if, instead of enunciating general principles and trying to apply these to explain actual trade flows, one took the observed pattern of trade as a point of

[1]Economies of scale are understood here in a broader sense to include cost-reductions obtained through the lengthening of production runs obtainable by consequence of the reduction of product variety in individual plants.

departure, and subsequently attempted to find the main influences that have determined the pattern.

The present paper may be considered as a step in the application of the latter alternative. Its limited scope permitted but a censory survey of the possible determinants of comparative advantages, and it may be usefully followed by more detailed investigations. It would appear desirable to explore the principal influences determining trade flows in more detail and one may also wish to examine the stability of the trade performance indices, the effects of changes in relative prices on these indices, or the relationship between the level of technological development and comparative advantage.

Finally, note should be taken of various limitations of the analysis that affect the results to a lesser or greater extent. Mention has already been made of the often arbitrary choice of the commodity groups that has been imposed upon us by the availability of statistical data. The restriction of the investigation to manufactured goods also creates certain inconveniences in comparing the relative position of the industrial countries in regard to individual commodities, given that the United States and Canada appear to have comparative advantages *vis-a-vis* Western Europe in a number of agricultural products and raw materials. Also, it has not been possible to take account of the advantages provided by Commonwealth preference to British exports of various manufactured goods. It is hoped, however, that the paper in its present form may also be of some interest to students of international trade.

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