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Volume Author/Editor: Irving B. Kravis and Robert E. Lipsey

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Chapter Author: Irving B. Kravis, Robert E. Lipsey

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EMPIRICAL RESULTS

The Price Competitiveness of the United States, 1953–64

PERHAPS THE MOST striking result of the study is that there was little change in U.S. price competitiveness relative to the European countries between 1953 and 1964 for our products as a group.[1] Relative to each foreign country, the index of price competitiveness—that is, the change in the ratio of foreign to U.S. prices—stayed within a range of five percentage points. Within that narrow range, U.S. price competitiveness tended to decline between 1953 and 1961 or 1962, and to recover afterward. The sharpest decline in the early period was relative to the EEC (Common Market) countries other than Germany, and this loss in position was not fully regained by 1964. The EEC countries also improved their position relative to the United Kingdom.

As this implies, there was a large degree of similarity of the extent and timing of the movement of the international price indexes of the United States, the United Kingdom, and the EEC countries. From 1953 to 1964 the prices of internationally traded goods, shown in Table 2.1 for the whole group of metal products and equipment we cover, rose by about 15 per cent in the United States and Germany, 18 per cent in the United Kingdom, and by 13 per cent in the EEC as a whole. In all three areas, the sharpest rises occurred between 1953 and 1957; there were smaller increases from 1957 to 1961 and again from 1963 to 1964.

When price levels are compared, U.S. prices were consistently higher. European price levels were between 7 and 11 per cent below U.S. prices

[1] The data for Japan are not adequate for the calculation of overall indexes.

Table 2.1
International Prices, Price Competitiveness, and Price Levels of All Covered Commodities, 1953, 1957, 1961–64

	1953	1957	1961	1962	1963	1964
INTERNATIONAL PRICE INDEXES (1962 = 100)						
U.S.	88	97	99	100	100	101
U.K.	88	96	100	100	101	104
EEC	90	97	99	100	100	102
Germany	88	94	98	100	100	102
INDEXES OF U.S. PRICE COMPETITIVENESS (1962 = 100)						
Relative to						
U.K.	100	100	101	100	101	104
EEC	102	100	99	100	100	102
Germany	100	98	99	100	100	101
PRICE LEVEL INDEXES (U.S. FOR EACH YEAR = 100)						
U.S.	100	100	100	100	100	100
U.K.	90	89	90	90	91	93
EEC	93	91	90	91	91	92
Germany	91	89	90	91	91	92

Source: Aggregation of indexes shown in Appendixes C, D, and E, as described in Chapter 4.

in all the years for which we have data, and ended the period 7 to 8 per cent below. The data do not suggest that there were very great differences between the United Kingdom and Germany or the EEC.

The similarity of movements in the overall international price indexes conceals a considerable variation among the countries in price movements for individual commodity divisions. This can be seen in Tables 2.2 and 2.3, which show the international price indexes and the indexes of price competitiveness for the six major two-digit SITC categories included in our study.[2] The United States lost heavily in price competitiveness relative to all the other countries in iron and steel, even though there was some improvement in the last year, 1964. In nonferrous metals and in electrical equipment, on the other hand, the United States im-

[2] Some categories in SITC section 8, not shown separately in Tables 2.2, 2.3, and 2.4 are included in the figures of Table 2.1.

Table 2.2
International Prices: Machinery, Transport Equipment, Metals, and Metal Products, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
IRON AND STEEL (SITC 67)						
U.S.	84	101	102	100	99	100
U.K.	99	110	102	100	96	104
EEC	101	118	104	100	96	104
Germany	94	111	104	100	96	104
Japan	NA	NA	110	100	99	100
NONFERROUS METALS (SITC 68)						
U.S.	96	100	101	100	100	108
U.K.	95	101	101	100	102	115
EEC	100	102	101	100	101	117
Germany	100	105	101	100	100	115
MANUFACTURES OF METAL, N.E.S. (SITC 69)						
U.S.	86	98	98	100	100	102
U.K.	90	101	103	100	99	103
EEC	87	99	100	100	97	98
Germany	84	93	98	100	99	101
Japan	NA	NA	98	100	93	101
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
U.S.	81	92	99	100	101	102
U.K.	80	92	98	100	101	103
EEC	80	88	97	100	100	102
Germany	80	87	97	100	101	102
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
U.S.	102	108	104	100	97	97
U.K.	96	98	103	100	101	101
EEC	98	100	102	100	100	99
Germany	96	98	101	100	99	98
Japan	NA	124	106	100	97	99
TRANSPORT EQUIPMENT (SITC 73)						
U.S.	89	94	96	100	99	100
U.K.	87	94	100	100	102	107
EEC	94	98	97	100	101	102
Germany	90	95	96	100	101	101

Source: Appendix C (extrapolated indexes).

Table 2.3
U.S. Price Competitiveness: Machinery, Transport Equipment, Metals, and Metal Products, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
IRON AND STEEL (SITC 67)						
Relative to						
U.K.	117	108	101	100	97	104
EEC	119	117	102	100	98	104
Germany	112	110	102	100	97	104
Japan	NA	NA	108	100	100	100
NONFERROUS METALS (SITC 68)						
Relative to						
U.K.	100	101	100	100	102	106
EEC	105	102	100	100	101	108
Germany	104	105	100	100	99	107
MANUFACTURES OF METAL, N.E.S. (SITC 69)						
Relative to						
U.K.	105	103	105	100	100	100
EEC	102	101	101	100	97	95
Germany	99	95	100	100	99	98
Japan	NA	NA	99	100	94	99
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
Relative to						
U.K.	99	99	99	100	100	101
EEC	99	95	98	100	100	100
Germany	99	94	98	100	100	100
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
Relative to						
U.K.	94	91	99	100	105	103
EEC	96	92	97	100	103	101
Germany	94	91	97	100	102	101
Japan	NA	115	102	100	100	102
TRANSPORT EQUIPMENT (SITC 73)						
Relative to						
U.K.	98	100	104	100	103	107
EEC	107	105	101	100	101	102
Germany	102	101	100	100	102	101

Source: Appendix D.

proved its position relative to all the European countries. Nonelectrical machinery showed little or no trend. The same was true for miscellaneous metal manufactures except that U.S. price competitiveness declined relative to the EEC countries as a whole. In transport equipment the United States gained considerably on the United Kingdom but lost relative to the EEC countries.

In most of the divisions, Table 2.4 indicates, foreign prices were lower than U.S. prices in 1964, but the range was wide. The largest differences were in iron and steel, where European prices were about 20 per cent below those of the United States. In the other divisions the 1964 divergence was 10 per cent or less. In almost half of the other comparisons U.S. prices were lower or no more than 3 per cent higher than those of the other countries.

Japanese price data were insufficient for computation of a total index, but as can be seen from Tables 2.2–2.4 we are able to present Japanese indexes for three major divisions. In two of these, iron and steel and electrical machinery, the Japanese position improved greatly relative to all the other countries and in the third, miscellaneous metal manufactures, the Japanese price level was favorable throughout the period, but did not change substantially. We could not calculate price indexes for the other three major divisions, but in one of them, transport equipment, Japanese prices for two major components, automobiles and ships, clearly declined relative to those of other countries. Japanese price levels in 1964 were low not only in miscellaneous metal manufactures but also in iron and steel and electrical machinery, relative to both the United States and European prices.

The Diffusion of the Changes

The summary indexes presented in Tables 2.1–2.4 were built up from the much more detailed indexes on a three-, four-, and even five-digit level presented in appendixes C (international price indexes), D (indexes of price competitiveness), and E (indexes of price levels). The detailed indexes are interesting in their own right, since they represent price relationships for much more homogeneous groups of commodities than the summary indexes. Inferences derived from the detailed indexes

Table 2.4
Price Levels: Machinery, Transport Equipment, Metals, and Metal Products, 1953, 1957, 1961–64
(U.S. for each year = 100)

	1953	1957	1961	1962	1963	1964
IRON AND STEEL (SITC 67)						
U.S.	100	100	100	100	100	100
U.K.	92	85	79	78	76	82
EEC	88	87	76	74	72	78
Germany	85	83	77	76	73	78
Japan	NA	NA	75	70	70	70
NONFERROUS METALS (SITC 68)						
U.S.	100	100	100	100	100	100
U.K.	92	93	93	92	94	98
EEC	96	93	91	91	92	99
Germany	98	98	93	94	93	100
MANUFACTURES OF METAL, N.E.S. (SITC 69)						
U.S.	100	100	100	100	100	100
U.K.	97	95	97	92	92	92
EEC	97	96	97	96	93	91
Germany	90	87	92	92	91	90
Japan	NA	NA	74	74	69	73
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
U.S.	100	100	100	100	100	100
U.K.	89	90	90	90	90	91
EEC	92	89	91	93	93	92
Germany	92	88	91	93	93	93
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
U.S.	100	100	100	100	100	100
U.K.	97	94	102	103	108	106
EEC	90	86	91	94	97	95
Germany	90	87	93	96	98	97
Japan	NA	103	91	89	90	91
TRANSPORT EQUIPMENT (SITC 73)						
U.S.	100	100	100	100	100	100
U.K.	85	87	90	87	89	93
EEC	102	100	96	96	97	98
Germany	94	94	92	93	94	93

Source: Appendix E.

about relationships between prices and trade movements and between prices and other variables are thus less subject to errors resulting from the aggregation of unlike commodities than those from summary data. However, these indexes are much more vulnerable to chance variation and to errors in individual observations. The individual categories to which they refer are analyzed in Part Four, but some general observations about their behavior relative to the summary indexes are in order at this point.

When the disaggregated indexes of price competitiveness are examined, most of the changes reported in the summary indexes seem to represent not only average changes for each group but also a large degree of consensus among the individual categories. In three-quarters of the cases, a majority of the component series within a two-digit SITC division moved in the same direction as the weighted average for the group as a whole.[3]

Although the direction of changes in prices and price competitiveness within each division is generally the same, in almost every instance, some subgroups move against the tide. Even within iron and steel, a division in which U.S. price competitiveness declined with monotonous regularity before 1964, there were in each period gains in U.S. price competitiveness relative to Germany and the United Kingdom in a quarter or more of the subgroups.

Also, the degree of diffusion of these changes in price competitiveness, that is, the proportion of the price competitiveness indexes moving in one direction, was not very closely related to the extent of changes in price competitiveness. A simple regression between the diffusion levels and the indexes of price competitiveness (taking the index of price competitiveness as a function of the proportion of subgroup indexes rising in that country for that division in that year) produces an $\bar{r}^2$ of only .57. However, the relationship is closer within all the SITC divisions except 69. The $\bar{r}^2$ for the other divisions ranges from .63 and .65 in electrical machinery (SITC 72), nonelectrical machinery (SITC 71), and transport equipment (SITC 73) to .84 and .85 in nonferrous

[3] Taking the price competitiveness indexes in each SITC division separately, there were 100 possible comparisons between a country's index for a commodity division in a particular time period and the corresponding diffusion measure (the latter being the proportion of series moving in the same direction as the group average). Eight cases in which the proportion was 50 per cent or in which there was no change in the index were counted as neither agreement nor disagreement.

metals (SITC 68) and iron and steel (SITC 67). For the international price indexes the corresponding $\bar{r}^2$ for all divisions was .59.

Categories Marked by Large Price Level Differences

The appendix tables also provide more details about relative price levels. Table 2.4, which presents some of these data, shows few examples of foreign price levels for major divisions more than 20 per cent below those of the United States, except in iron and steel, and none more than 10 per cent above. These did appear more frequently in the detailed price data, as we would expect, and the location of such observations points up some of the strengths and weaknesses of the U.S. position.

The U.S. competitive position, as measured by price levels, was clearly weakest in iron and steel. Subgroups in this division accounted for a disproportionate share of those showing foreign prices more than 20 per cent below U.S. prices in every year after 1957, particularly in 1962 and 1963 when almost half of the subgroups with these wide price disparities were in iron and steel.

Among nonferrous metals, zinc appeared on this list most frequently, but lead and worked aluminum also made several appearances. In miscellaneous metal manufactures, wire products (SITC 693), and fasteners (SITC 694) were most often in this category.

Among machinery subgroups these large price advantages for European and Japanese producers were less common. However, certain groups fell into that class in several years and relative to more than one country, particularly leather machinery among the nonelectrical machinery items and electricity distribution equipment among the electrical machinery ones. In transport equipment every competitor's prices for ships and boats were more than 20 per cent below U.S. prices in every year.

The group of products in which the U.S. showed price advantages of 10 per cent or more is in some ways more interesting because it is less well publicized, but it includes several important types of product. For example, agricultural machinery for preparing and cultivating the soil showed price levels strongly favorable to the United States. However, aircraft, which might be an even stronger case, are missing from the indexes because we lack price data on countries other than the United

Kingdom and the United States. The record of trade suggests that their price levels, if they could have been measured, would have shown that the United States held a position of unchallenged supremacy.

Individual-country Weighting Systems

One main difference between our indexes and those previously available is that we compare price levels and price movements for the same commodities in each country. We attain comparability by using weights derived from total exports of the OECD countries to aggregate all the individual-country prices. The question answered by the international price indexes is, for example: What have been the changes in each country's prices for the machinery and metal products exported by the OECD countries?

For other purposes one might wish to ask what changes have taken place in each country's prices for the products exported by the United States or by Japan. If we were interested in an index for the deflation of export values we might wish to measure each country's price changes for its own exports.

All of these and similar questions[4] can easily be answered by weighting our basic data in different ways. For example, Table 2.5 gives each country's total international price index based on OECD weights (those used in this study) and on the export weights of each country.

The logical expectation is that each country's price performance would appear most favorable in the index based on its own weighting system, because end-of-period weights for each country reflect the effects of shifts in its composition of exports toward those commodities in which its price competitiveness is improving. The results in Table 2.5 belie this expectation. The U.S. price index based on U.S. weights shows a larger rise in U.S. prices than U.S. indexes based on OECD, U.K., German, or Japanese weights. The U.K. index based on U.K. weights gives a less favorable picture of the development of U.K. price com-

[4] For example, at the request of the UN Commission on Trade and Development, price level indexes for machinery were calculated using as a weighting system the pattern of exports of developed countries to less developed ones, so as to measure the price differentials that might have been encountered in 1964 by countries receiving international aid, as a result of the tying of commodity purchases to the donor country. The results were incorporated in a report submitted to UNCTAD entitled "Some Evidence on Price Differentials Connected with Aid Tying," March 1968.

Table 2.5
Comparison of International Price Indexes Based on Various Country Weights, All Covered Commodities, 1953, 1957, 1961–64
(1962 = 100)

Weight Based on Exports of	1953	1957	1961	1962	1963	1964
	U.S. INTERNATIONAL PRICE INDEX					
OECD	88	97	99	100	100	101
U.S.	86	95	99	100	100	102
U.K.	87	95	99	100	100	101
EEC	87	96	99	100	100	101
Germany	86	95	99	100	100	101
Japan	96	106	101	100	97	97
	U.K. INTERNATIONAL PRICE INDEX					
OECD	87	97	100	100	100	104
U.S.	84	93	99	100	101	104
U.K.	86	95	99	100	101	104
EEC	88	97	100	100	100	104
Germany	87	96	100	100	101	104
Japan	96	106	101	100	98	101
	EEC INTERNATIONAL PRICE INDEX					
OECD	90	97	99	100	100	102
U.S.	87	92	98	100	100	102
U.K.	89	95	98	100	100	102
EEC	91	98	99	100	100	103
Germany	89	96	98	100	100	103
Japan	95	104	100	100	98	101
	GERMAN INTERNATIONAL PRICE INDEX					
OECD	86	94	98	100	100	102
U.S.	86	91	97	100	100	102
U.K.	87	93	98	100	100	102
EEC	89	95	98	100	100	102
Germany	87	94	98	100	100	102
Japan	93	101	99	100	98	101

Note: Each country's international price index based on OECD weights (those used in this study) is compared with indexes based on the export weights of each country. These OECD-weighted indexes, except those for the United States, differ from the ones in Table 2.1 because the latter are derived from the index of price competitiveness and the U.S. international price index (see Chapter 4 for explanation).

petitiveness than any of the others except that based on U.S. weights. The German index based on German export weights is more favorable than only the index based on U.S. weights.

One consistent feature of these indexes is the effect of the Japanese export structure in lowering prices. Every one of the four areas listed would have shown a smaller increase in prices if weighting had been by the composition of Japanese exports; and some of the differences are large. The United States would have shown almost no price increase, instead of the 15 per cent rise in the OECD-weighted index and the even larger gain in the U.S.-weighted index. One possible explanation for these differences is that Japan's successful entry into world markets, based to a large extent on price competition, tended to force down other countries' prices or restrain their price increases on the goods in which Japan was specializing. The U.S. export composition was related to prices in the opposite way; the United States, the United Kingdom, the EEC countries, and Germany all showed greater price increases in the indexes based on U.S. weights than in any other weighting system. The implication of this result is that the U.S. export bundle was heavily weighted, relative to those of other countries and particularly relative to Japan, toward goods that were rising in price.

We can only speculate about the implications of these differences in the relative importance of categories with rapidly rising prices in each country's exports. The differences might reflect differences in the rapidity with which entrepreneurs in different countries shift into products in which technological developments make price cuts possible. On the other hand, the products with declining prices might be in that category not as a result of technological change specific to that product but just because they are products in which Japan, with its high rate of productivity increase or possibly its aggressive export policy, is a leading exporter. For the United States, the explanation might lie in specialization in technologically advanced products that are price inelastic and income elastic.

Effects of Price Changes on Trade Quantities

Ideally, one should use these new indexes to measure the elasticity of substitution of trade, defined as the percentage change in relative quantities associated with a 1 per cent change in relative prices, holding constant such factors as income and the level of trade restrictions. We have in fact estimated elasticities from the equation

$$Q_{F/S} - 1 = a + b(P_{F/S} - 1)$$

where F represents a foreign country; S, the United States; Q, the index of relative export quantities;[5] P, the index of U.S. price competitiveness; b, the elasticity; and a, a constant.

The b in our equations must be regarded as descriptive of a particular historical relationship between quantity and price rather than as an estimate of one of the parameters of the international economy. The relationship we measure is a rather gross one since important nonprice influences have not been measured separately. Some of these factors, like market shares, are part and parcel of the functioning of a competitive economy and could be incorporated in a more thorough analysis than we have been able to make. Others, such as the progressive establishment of the Common Market, are not inherent in the operation of a competitive market but can be readily observed and could also be taken into account. In addition some among the wide variety of other influences, described in Scope for International Differences in Prices in the next chapter, limit the efficient operation of the market that is implicitly assumed in studies of quantity-price relations and are difficult to incorporate in a systematic analysis. Finally, to obtain the parameter b rather than an historically descriptive b, we would, for reasons described in Chapter 6, have to be more certain than we are that our observed changes in $Q_{F/S}$ were responsive to changes solely in supply conditions to the exclusion of influences arising from demand changes.

An additional difficulty is that the number of observations is fairly small. Almost every calculation therefore requires, for reaching a minimally adequate number of observations, the pooling of situations that we have reason to believe should not be pooled. In some cases these are different countries and in others, different commodity divisions. All our calculations suffer from the aggregation of markets, since we use data for the exports of each commodity to all destinations. Furthermore, the data exclude each exporter's own domestic market which is, however, counted in the exports of its competitors.

[5] Defined as the percentage change in the foreign country's exports divided by the percentage change in U.S. exports. For the method of measuring Q, see Chapter 6.

The elasticities we present incorporate the effects on quantity-price relationships of all these undesired factors. Because it cannot be assumed that the net effects will be unvarying from situation to situation, the elasticities we calculate should be taken very cautiously.

The historical elasticity of substitution for U.S. exports relative to those of two main foreign competitors, the United Kingdom and Germany, appears to have differed sharply between 1953–61 and 1961–64 for the products covered in this study. The data for large commodity divisions, pooled for all divisions and all countries, indicate that it was around −8 in the early period and around −1.25 in the later one. Quite possibly, nonprice factors, rather than a genuine shift in the degree of substitutability of U.S. and foreign goods, cause this difference. Data at a much more detailed commodity level are available only for 1961–64, and they yield results that are fairly consistent with those from the broader aggregates for the same period.

When we correlate relative quantities and relative prices between pairs of countries for the various categories of goods at a given moment in time (1963), we find, as MacDougall did earlier,[6] a significant inverse relationship: that is, a country tends to export relatively larger quantities of those product categories in which it has relatively lower prices. These "product" elasticities of substitution, calculated from fairly large numbers of observations for three- and four-digit SITC groups and subgroups in 1963, were larger than most of those estimated by earlier analysts. If the earlier data were subject to much larger errors of observation than ours, as we believe they were, we would expect our elasticity coefficients to be higher. We found coefficients for all three countries to be above 3.

Nonprice Factors Affecting the Competitive Position of the United States

Although we could not quantify nonprice factors in a way that could be used in econometric analysis, we did attempt to gather some information about nonprice factors that seemed to have a direct bearing on the U.S. competitive position. While our main objective in the study was the

[6] G. D. A. MacDougall, "British and American Exports: A Study Suggested by the Theory of Comparative Costs," *Economic Journal,* December 1951 and September 1952.

development of the price measures summarized in a preceding section, the broader motivation was to obtain an understanding of the factors at work determining the competitive position of the United States in world trade and changes therein. In our interviews,[7] therefore, businessmen were asked to discuss the sensitivity of their export sales to changes in relative prices and to comment on any nonprice factors that were deemed important.

With a few exceptions the generalizations we can make about these factors are nonquantitative and more impressionistic than the price indexes; they are not based, as the price indexes are, on many thousands of numbers which were gathered and summarized in an objective way. They are derived mainly from our interviews and also, to some extent, from trade publications, and they are therefore our generalizations of industry opinions. Some of the factors, like the role of technology, are well known and have received wide attention; others, like the part played by delivery time, have been less noted and appreciated.

We describe these factors more fully in Chapter 3, offer some limited quantification of one or two of them in Chapter 7, and link them to specific commodity groups in Part Four. Here we merely summarize them:

Technological Leadership

The strength of the U.S. trade position in machinery and related products rests to a large degree on the availability in the United States of products more sophisticated or technologically advanced than those produced abroad. In some products, such as computers and numerically controlled machine tools, the United States leads in knowledge. In others, such as machinery for the printing, baking, and pharmaceutical industries, the scale of the American economy makes the production of larger, faster, and more efficient machinery economical in this country before it is feasible abroad. Because of the greater technological sophistication of American industry, technological advances occur early in a given industry and the industry can find customers who are ready to use a more sophisticated product. In some of these cases American companies producing both at home and abroad recognize these differences by systematically lagging the production of new products abroad by one "product generation." We have found this to be true, for example, in the case of office machinery and construction machinery.

[7] See Chapter 4 for a description of the data sources.

Generally, products whose technology is well established and for which there are mass markets are cheaper abroad.[8]

Large Size of the Domestic Market

The large size of the market gives the U.S. economy an advantage not only in providing volume for new products more quickly, but also in making possible longer production runs and therefore lower costs. Of course the European and Japanese economies now also enjoy very large markets and are able to obtain the advantage of long production runs for many products, since the cost-reducing effects of larger and larger volumes are not limitless. However, the number of product variants for which economies of scale can be obtained is a continuous function of the size of the economy; in the American market a large volume of production is practicable even for relatively specialized variants of products which have only narrow markets in the smaller economies of U.S. competitors. In the anti-friction-bearing industry, for example, foreign firms were able to offer widely used types and sizes at half or less of the U.S. price during the study years, but the United States was still the largest exporter because it could supply specialized kinds of bearings requiring greater precision or resistance to heat, rust, radiation, or altitude. Even when such bearings were available abroad, they were usually produced in small quantities and at correspondingly high costs.

The economies of scale in this sense are not necessarily identified with large-scale enterprises. In the machine tool industry, for example, such economies tend to be achieved by a high degree of specialization by each of many small firms,[9] and the same tendency appears in other machinery industries such as textile machinery.

Quality of Product

No one country has a monopoly on reputation for quality, and product lines can be found in which each of the major industrial countries enjoys the reputation of quality leader. U.S. exports of machinery and equipment tend, however, to depend somewhat more frequently than those of

[8] Cf. Raymond Vernon, "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics,* May 1966; and Irving B. Kravis, "'Availability' and Other Influences on the Commodity Composition of Trade," *Journal of Political Economy,* April 1956.

[9] A few years ago it was reported that although there were over four hundred distinct types of machine tools, each plant typically produced a single or at most a few types. See Murray Brown and Nathan Rosenberg, "Prologue to a Study of Patent and Other Factors in the Machine Tool Industry," *Patent, Trademark, and Copyright Journal of Research and Education,* Spring 1960, p. 45.

other countries on the degree of confidence in the quality of American products established by technological leadership. Purchasers of a number of products reported to us that U.S. products (bearings and pumps, for example) were sometimes purchased, despite their higher prices, when critical uses were involved. The factor involved here was not only the average level of quality, but the confidence of the buyer in the consistency of the quality, or in the small risk of failure to meet the required standard.

In some cases (such as the bearings and pumps mentioned above), the main objective may be to avoid costly breakdowns that would be wasteful of both capital and labor, and the ability to meet this objective enhances the competitive position of the U.S. firms in all markets.

In other instances, the design of U.S. equipment, aimed at saving maintenance and other labor costs, is an adaptation to American conditions; Europeans, facing lower wage rates, may prefer to economize on capital rather than on labor. It was reported, for example, that European wire drawing machines were designed to operate at high speeds with one highly qualified operator while in the United States one man attended three slower-speed machines which "are designed so as to be virtually 'idiot proof' and to make the operator . . . a machine 'attendant.' "[10]

Foreign machinery is often adapted in other respects also to the different requirements prevailing abroad. Where markets are smaller, machines are designed for smaller volume, with lower speeds and, for industries such as printing, baking, and pharmaceuticals, for greater versatility. Occasionally, however, market conditions dictate the reverse directions of specialization. For example, in certain kinds of textile machinery the United States produces slower, more versatile varieties geared to rapid changes in style while Europe turns out high-speed machines that make standard styles (e.g., machines for sweaters).

Factors such as these account for most of the apparent cross-exporting that is observed in international trade (that is, country A both exports to and imports from country B goods in a given commodity classification). Putting aside the consequences of the fact that each country is not a single geographical point and each year is not a single point in

[10] From a letter of a U.S. machinery company attached to the brief of the Bethlehem Steel Company submitted to the Trade Information Committee, Office of the Special Representative for Trade Negotiations, Washington, D.C., February 3, 1964 (processed).

time, we have found only one clear-cut case of cross-exporting of a truly homogeneous product (see the section on aluminum in Part Four). The amount of cross-exporting can thus be regarded as an index to the heterogeneity of commodity classifications.[11]

Heterogeneity gives rise to trade because the national differences in machinery requirements such as those described in the previous paragraphs are only statements of central tendencies, and the dispersions around each mean are evidence of overlapping requirements. Thus, the United States exports large printing machines to Europe for high production in long runs, while it imports smaller and more versatile machines from Europe.

Speed of Delivery

In many cases speed of delivery was an important advantage for American firms during the study years. In almost all categories covered by our study, U.S. suppliers were able to offer shipment sooner after the placement of orders than their foreign competitors. This difference did not appear to have been a cyclical phenomenon, but one which persisted, although with fluctuating magnitude, over the whole period covered by this study. U.S. firms rather consistently offered earlier shipment not only on custom equipment such as is often called for in international bidding but also on standard machines and equipment and even supplies sold off the shelf. It is clear that buyers were often willing to pay premiums for early shipment by purchasing the higher-priced U.S. goods in preference to identical goods at lower prices from European or Japanese suppliers.

[11] For a discussion of the reasons for apparent cross-exporting, over a wide range of products, see Herbert G. Grubel, "Intra-Industry Specialization and the Pattern of Trade," *Canadian Journal of Economics and Political Science*, August 1967.