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WHOLESALE PRICES AND UNIT VALUES AS MEASURES OF INTERNATIONAL PRICE COMPETITIVENESS

IN THE ABSENCE of adequate international price data for measuring changes in international price competitiveness, economists have turned to the closest available approximations, domestic wholesale price indexes, implicit price indexes from national accounts, and export and import unit value indexes.[1] For many reasons these variables may, as we mentioned earlier, fail to represent international price changes satisfactorily.[2] Without international price data with which to compare the proxy measures it was difficult, we noted, to say how important the defects were. When the various proxies moved differently, it was clear that at least some were giving a misleading picture of international price movements, but there was little basis for saying which, if any, were correct, and it was even difficult to account for the divergent movements.

The calculation of our international price indexes provides a standard of comparison for these proxy variables and should permit us to measure differences in behavior of the various types of price series. We would

[1] See, for example, Hal B. Lary, *The United States as World Trader and Banker*, New York, NBER, 1963, pp. 56–68; Walter S. Salant *et al.*, *The United States Balance of Payments in 1968*, Washington, D.C., The Brookings Institution, 1963, pp. 70–80; and Bela Balassa, "Recent Developments in the Competitiveness of American Industry and Prospects for the Future," *Factors Affecting the U.S. Balance of Payments*, Joint Economic Committee, 87th Cong., 2nd sess., 1962; in which wholesale and consumer prices, implicit price deflators, and export and import unit values were all examined for the light they can shed on U.S. international competitiveness; and Hans Neisser and Franco Modigliani, *National Incomes and International Trade*, Urbana, Ill., 1953, in which price variables constructed from wholesale price and unit value data were used in constructing a model of world commodity trade. An article by Helen B. Junz and Rudolf R. Rhomberg, "Prices and Export Performance of Industrial Countries, 1953–63," *IMF Staff Papers*, July 1965, used comparisons of export unit values, wholesale prices, unit labor costs, and productivity as measures of international competitiveness.

[2] See Chapter 1 and Lary, *op. cit.*, pp. 56–57.

not argue that a discrepancy between one of our indexes and a proxy series, resulting from differences in the base year or in the index number formula, implies that the proxy is defective or inappropriate. We do assume in the following discussion that a discrepancy attributable to a difference in price movements on the commodity or subgroup level, or to a lack of data for the proxy series on a subgroup ostensibly covered, reflects error in the proxy variable as a measure of international price change. That is not to say that a particular series, such as a wholesale price, incorrectly measures the domestic price it is intended to represent, although we suspect that is often the case, particularly in the machinery area, in which conventional price index methods do not cope adequately with quality improvement. Our conclusions refer only to its accuracy in international price measurement, and it could be in error for that purpose even if it were a perfectly accurate domestic price measure.

We have made two types of comparison between our indexes and others. One method is to compare our aggregate indexes with frequently used indexes published by others (as in Table 8.8) or with indexes derived from published data but arranged by us in the SITC classification system (Table 8.1). In one sense, this comparison of the conclusions that would be reached by using our indexes with those that have been reached using the various proxy variables is the most important. The results of the comparison are inevitably ambiguous, however. Some part of the discrepancy will be due to the previously mentioned differences in base-year or index-number type. Other discrepancies will reflect such factors as the failure on the part of some users to adjust domestic price indexes to international weights or to insure the comparability of coverage of different indexes; that is, they will be only a measure of the carelessness of users.

We attempted to eliminate some of this ambiguity in our second method of comparison. For this, we constructed new international price and price competitiveness indexes from the basic wholesale price and unit value series for individual commodities, weighting these by the 1963 OECD international trade values used in weighting the NBER subgroup indexes (Tables 8.2, 8.4, and 8.6). Any differences between these and the NBER international price indexes can then be attributed either to differences in the behavior of the underlying basic prices or to differences in coverage, usually inadequate coverage in the domestic index. We can test for the role of coverage differences by comparing the several types of index on the three- and four-digit levels and aggregating the comparisons (Tables 8.3, 8.5, and 8.7). Differences between these and the previously described results are attributed to differences in coverage, and the remaining changes in proxy series relative to international prices are attributed to errors in the measurement of individual prices, including coverage differences within four-digit subgroups. Deficiencies in coverage can be just as serious as defects in the basic price data, and as likely to lead to incorrect conclusions, but the task of correcting for them may be simpler.

In addition to these comparisons of the indexes themselves, we estimated quantity-price relationships using indexes derived from our wholesale price data and compared them with those obtained from international price indexes. This exercise was not repeated for unit value indexes, partly because the very detailed series necessary to convert the foreign unit value series into world-trade-weighted indexes were not available.

Price Indexes from International and Wholesale Price Data

For the United States, we have sufficiently detailed information on individual-commodity wholesale prices and weights to compare domestic price indexes with domestic weights and international price indexes with international weights. The detail is needed to avoid the finding of apparent discrepancies which reflect merely differences in the definitions of product classifications, and we have been able to eliminate at least some of the more obvious of these.

The comparison of the two sets of indexes, in terms of SITC categories, reveals larger discrepancies in 1953–57 than in the later years (Table 8.1). In every case the wholesale prices overstated the initial-period price increases and, in every case but one, the increases for the period as a whole. Electrical machinery and iron and steel were the divisions with the most persistent and substantial bias. In these two cases, it continued through 1963, but the relationship between the two indexes was then reversed in 1964.

In making these comparisons we have gone some distance toward providing comparability in coverage between the domestic and international data by applying the same commodity classification system to the

Table 8.1
U.S. Wholesale Price Indexes Based on Domestic Weights vs. U.S. International Price Indexes Based on International Weights, 1953, 1957, 1961–64

Weighting Basis	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
TOTAL MACHINERY, TRANSPORT EQUIPMENT, METALS, AND METAL PRODUCTS						
International	110	103	101	100	102	115
Wholesale	117	104	100	100	101	122
METALS (SITC 67, 68, AND 69)						
International	115	101	99	100	103	118
Wholesale	118	103	100	100	102	124
IRON AND STEEL (SITC 67)						
International	120	100	98	99	101	118
Wholesale	126	103	100	100	100	131
NONFERROUS METALS (SITC 68)						
International	104	101	99	100	108	113
Wholesale	108	102	98	99	106	113
METAL MANUFACTURES, N.E.S. (SITC 69)						
International	114	100	102	100	103	120
Wholesale	117	102	101	100	102	123
MACHINERY AND TRANSPORT EQUIPMENT (SITC 7)						
International	110	103	101	100	101	115
Wholesale	116	104	100	100	101	122
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
International	114	107	101	101	101	126
Wholesale	120	108	101	101	102	135
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
International	106	96	96	97	101	95
Wholesale	115	100	98	99	99	110
TRANSPORT EQUIPMENT (SITC 73)						
International	106	102	104	99	100	113
Wholesale	114	104	100	98	102	119

Notes to Table 8.1

Note: The international price index here is an aggregation of indexes for subgroups and groups using 1963 OECD export values as weights. The index from wholesale prices is an aggregation of domestic series using the weights of the BLS wholesale price index. The differences between them stem from differences both in individual price series (including coverage) and in weighting.

Source: Appendixes C and F.

two sets of data. The discrepancies would have been considerably larger in some of the product areas of our study if we had used the BLS series as published. In electrical machinery, for example, the published BLS series shows a 19 per cent rise from 1953 to 1964, as compared to the 12 per cent rise in the series adjusted for comparability by adding domestic appliances, television sets, etc., and the 5 per cent decline in the international price index. This discrepancy illustrates the need for careful attention to commodity coverage, even aside from weighting differences, in judging international price movements.

A comparison between international and wholesale prices for the total of products covered by our study, weighted identically so as to remove the effect of weighting differences, can be performed for the United States and Germany (Table 8.2). We did not compute an aggregate international price index for Japan or an aggregate index from wholesale prices for the United Kingdom because the data had too many gaps.

In the United States the international price index rose considerably less than the index derived from wholesale prices between 1953 and 1961—13 per cent as compared to 21 per cent (Table 8.2). The main difference in the German figures was that international prices apparently rose more than domestic ones in response to the Suez crisis in 1956, but the effect of this divergence was short-lived. After 1961 the two indexes moved closely together in both the United States and Germany.

In general, the international price indexes for the two countries were much more similar to each other than the wholesale price indexes. The largest range between the total U.S. and German international price indexes in Table 8.2 for any one period was three percentage points, while the range between the wholesale price series was as high as twelve percentage points.

The index from wholesale price data was usually biased upward relative to the index from international price data. We can see this rela-

Table 8.2
Comparison of Price Indexes from International and Wholesale Price Data, International Weights, 1953, 1957, 1961–64

Type of Price Data	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
TOTAL MACHINERY, TRANSPORT EQUIPMENT, METALS, AND METAL PRODUCTS						
United States						
International	110	103	101	100	102	115
Wholesale	116	104	100	100	101	122
Germany						
International	107	104	102	100	102	116
Wholesale	104	111	103	100	102	120
IRON AND STEEL (SITC 67)						
United States						
International	120	100	98	99	101	118
Wholesale	127	102	100	100	101	130
United Kingdom						
International	113	94	97	97	108	108
Wholesale	127	103	103	100	100	135
Germany						
International	117	93	96	96	109	110
Wholesale	106	110	101	98	100	116
Japan						
International	NA	NA	90	101	100	NA
Wholesale	124	98	92	100	100	112
NONFERROUS METALS (SITC 68)						
United States						
International	104	101	99	100	108	113
Wholesale	113	106	97	98	105	120
United Kingdom						
International	106	100	99	102	112	120
Wholesale	114	108	98	101	111	137

(continued)

Table 8.2 (continued)

Type of Price Data	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
NONFERROUS METALS (continued)						
Germany						
International	105	96	99	100	116	116
Wholesale	97	105	96	98	109	104
METAL MANUFACTURES, N.E.S. (SITC 69)						
United States						
International	114	100	102	100	103	120
Wholesale	121	105	101	101	103	133
United Kingdom						
International	113	102	104	100	104	122
Wholesale	117	110	103	102	104	142
Germany						
International	108	106	102	100	101	117
Wholesale	106	110	104	100	101	122
Japan						
International	NA	NA	92	86	104	NA
Wholesale	115	100	97	98	103	114
MACHINERY OTHER THAN ELECTRICAL (SITC 71)						
United States						
International	114	107	101	101	101	126
Wholesale	119	107	101	101	101	131
United Kingdom						
International	114	107	102	100	102	127
Wholesale	NA	NA	NA	NA	NA	NA
Germany						
International	109	111	103	101	101	127
Wholesale	110	114	105	101	102	137
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
United States						
International	106	96	96	97	101	95
Wholesale	110	100	97	98	100	105

(continued)

Table 8.2 (concluded)

Type of Price Data	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (continued)						
Germany						
International	102	104	98	99	99	103
Wholesale	NA	NA	101	99	100	NA
Japan						
International	NA	98	92	86	104	NA
Wholesale	105	100	97	97	99	97
TRANSPORT EQUIPMENT (SITC 73)						
United States						
International	106	102	104	99	100	113
Wholesale	112	105	100	100	99	116
United Kingdom						
International	106	107	101	102	104	121
Wholesale	NA	NA	NA	NA	NA	NA
Germany						
International	104	100	106	100	99	108
Wholesale	94	108	102	101	100	105

Note: The indexes from wholesale prices are aggregated using the same weighting, at the four-digit SITC level, as those based on international prices. Differences between the two indexes in this table therefore reflect differences in individual price movements but not in weighting. The index based on U.S. wholesale prices in Table 8.1 differs from this one solely in weighting.

tionship by taking each country (i.e., the United States, the United Kingdom, Germany, and Japan), for one SITC division [3] in one period as the unit of observation: [4]

	Number of Cases
Index from wholesale prices rises relatively	47
No relative change	12
Index from wholesale prices falls relatively	24

[3] The SITC divisions included are 67, 68, 69, 71, 72, 73.
[4] The source of the figures is Table 8.2.

This apparent bias in the wholesale price measures was evident in all the years through 1963, but the direction of the bias was then reversed. From 1963 to 1964 the indexes from wholesale prices fell relative to the international price indexes in more cases than they rose:

	Number of Cases				
	1953–57	*1957–61*	*1961–62*	*1962–63*	*1963–64*
Index from wholesale prices rises relatively	10	14	10	10	3
No relative change	0	1	1	4	6
Index from wholesale prices falls relatively	4	0	7	4	9

The wholesale price indexes seemed to perform better as international price measures during 1962 and 1963, when international price changes were small, than in 1953–57, when they were large. In general, the large discrepancies between wholesale and international price indexes, at this level of aggregation, were associated with periods of large price changes, as can be seen in the following cross tabulation of discrepancies against the size of international price changes:

Wholesale Price Index Minus International Price Index (percentage points)	*Change in International Price Index*				
	≥5%	*3 and 4%*	*2%*	*1 and 0%*	*Total*
≥5	17	6	0	4	27
3 and 4	6	3	2	1	12
2	2	2	4	5	13
0 and 1	3	6	2	20	31

Of 39 discrepancies of three percentage points or more, 32 took place during periods of international price changes of 3 per cent or more. Among the 31 discrepancies of zero or one percentage point, on the other hand, only 9 were during such periods, and 20 involved years of little or no international price change.

The relationship between wholesale and international price indexes seems to vary with the direction of change in international prices. When international prices increased substantially wholesale prices sometimes rose more and sometimes less. When there were large international price decreases, however, wholesale prices declined less, if at all. In other words, compared with the international prices collected for the present study, the prices used in the official wholesale price indexes tended to understate price increases about as often as they overstated them, but they almost always understated price decreases. This relationship between wholesale and international prices is similar to that found by Stigler and Kindahl between transactions prices and U.S. wholesale prices reported by the BLS.[5] The similarity of the two findings suggests that the differences occur because wholesale prices are mainly list (instead of transactions) prices rather than because they are domestic (instead of international) prices.

A comparison of Table 8.1 with Table 8.2 makes clear that, at least for the United States, the major discrepancies between domestically weighted wholesale price indexes and the corresponding international price indexes with international weights are not mainly the result of weighting differences but rather of differences in the price movements reported for individual commodities and in the samples of commodities. Taking the 1964/1953 price ratios, for example, we find that the three indexes compare as follows:

	Wholesale Price Indexes		
	Domestic Weights	*International Weights*	*International Price Indexes*
Total	122	122	115
Iron and steel	131	130	118
Nonferrous metals	113	120	113
Nonelectrical machinery	135	131	126
Electrical machinery	110	105	95

For iron and steel the internationally weighted wholesale price indexes are hardly closer to the international price indexes than the domestically weighted wholesale price indexes. For nonferrous metals they are even further away. In the machinery groups, weighting seems to be more important, but it still accounts for less than half of the difference between domestic and international price indexes.

The comparisons to this point have been based on consistent classification and on the best coverage available in each source of data. It is conceivable that the upward drift of wholesale prices relative to inter-

[5] George J. Stigler and James K. Kindahl, *The Behavior of Industrial Prices,* New York, NBER, 1970.

national prices, evident in Table 8.2, could be the result of differences in commodity coverage, even when the same weights are used for both indexes, because there are many gaps, particularly among the wholesale price data.

Most countries had fairly good coverage of iron and steel in their wholesale price indexes, the main exception being Germany, for which several important groups were completely unrepresented. In nonferrous metals the number of series was much lower, but all of the countries did include copper and aluminum in either wrought or unwrought forms or both. Only the United States and Japan had reasonably good coverage in metal manufactures not elsewhere specified. Two groups were omitted from the U.K. index and the number of series in the other groups was small. The German index was even weaker, including at its peak only seven series for this whole SITC division.

The worst coverage deficiencies appear in the wholesale price indexes for the machinery division. The U.S. data for nonelectrical machinery were by far the most complete, but they omitted such important trade items as aircraft engines and computers. We could not even compute an index for the United Kingdom because no detailed price series are published. Only an aggregate index for all engineering and allied industries and indexes for a few broad subgroups are available. The German index omits all internal combustion engines, office machinery, and most of the miscellaneous machinery groups of SITC 719. The Japanese index is somewhat better, although inferior in coverage to that of the United States.

For electrical machinery our British index could cover virtually none of the major items because of the aggregation mentioned above. The other countries' indexes contain important gaps but are not hopelessly thin. However, even the covered groups contain some serious deficiencies, as can be seen in Chapter 13, where several detailed comparisons are made between wholesale prices and international prices.

All the wholesale price indexes for transport equipment omit two principal export products, aircraft and ships, both of which were characterized by major technological developments. The German and Japanese indexes do not include locomotive prices, and all the automobile and truck prices are subject to problems of unmeasured quality changes (see Chapters 14 and 15).

Since the coverage deficiencies of the wholesale price indexes are concentrated in the machinery groups, probably being worst in those types of machinery that are most complex and those undergoing the most rapid technological change, we may expect them to be biased upward relative to the more comprehensive international price indexes regardless of the relationship for specific commodities.

The effects of coverage differences at the four-digit level and above are eliminated in Table 8.3. The ratios of wholesale to international price indexes, for all four-digit SITC subgroups for which both were available, were aggregated, using our OECD trade weights, to the two-digit and to the total levels. The relative upward trend of the wholesale price indexes remains strong for the United States, but not for Germany, in the total for all covered commodities. In the individual two-digit divisions for the United States, the United Kingdom, and Japan, the upward drift of the wholesale price series (stemming mainly from the first two periods) ranged between 4 and 26 per cent over the period as a whole.

The aggregated ratios of Table 8.3 are compared with ratios of wholesale to international price indexes derived from Table 8.2 for those indexes covering the whole time period, in the table below. For each country, column 1 shows the results with identical weighting (from Table 8.2); column 2, the results with identical weighting and coverage (from Table 8.3).

	United States		*United Kingdom*		*Germany*	
	(1)	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*
Total covered commodities	106	107	not available		103	101
Iron and steel (SITC 67)	110	110	125	126	115	100
Nonferrous metals (SITC 68)	106	106	114	123	90	97
Metal manufactures (SITC 69)	111	112	116	116	104	105
Nonelectrical machinery (SITC 71)	104	104	not available		108	102
Electrical machinery (SITC 72)	111	109	not available		not available	
Transport equipment (SITC 73)	103	106	not available		97	94

For the United States, the two indexes are close; the largest difference is three percentage points. This similarity indicates that coverage

Table 8.3
Aggregation of Ratios of Wholesale to International Price Indexes, 1953, 1957, 1961–64

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
TOTAL MACHINERY, TRANSPORT EQUIPMENT, METALS, AND METAL PRODUCTS						
United States	106	102	98	100	100	107
Germany	95	106	101	100	99	101
IRON AND STEEL (SITC 67)						
United States	107	102	101	100	100	110
United Kingdom	110	110	106	104	93	126
Germany	84	118	108	102	90	100
Japan	NA	NA	103	99	99	NA
NONFERROUS METALS (SITC 68)						
United States	107	104	99	99	98	106
United Kingdom	110	108	100	101	101	123
Germany	94	111	99	101	94	97
METAL MANUFACTURES, N.E.S. (SITC 69)						
United States	107	105	99	101	100	112
United Kingdom	105	108	99	103	100	116
Germany	99	104	102	101	100	105
Japan	NA	NA	108	115	100	NA
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
United States	104	99	100	100	100	104
Germany	99	102	101	100	101	102
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
United States	105	105	100	100	99	109
Germany	NA	NA	103	101	101	NA
Japan	NA	102	104	102	94	NA
TRANSPORT EQUIPMENT (SITC 73)						
United States	111	101	94	101	100	106
Germany	93	103	97	100	101	94

differences at or above the four-digit level were not a major factor in the relative increase in wholesale prices. Since weighting differences have also been eliminated, there are only two possible explanations. One would be a rise in reported domestic prices compared to export prices for identical products. The other would be a systematically biased selection within four-digit groups, either of products declining relatively in price in our study, or of products rising relatively in price in the domestic indexes. Both are plausible, since export products are more likely to be those enjoying productivity gains while the domestic indexes, based on fixed specifications, may be biased toward older products.

The German data give quite different results. There are much larger differences between the two ratios, as we would expect in view of the poor coverage of the German wholesale price series. The difference is not consistent in direction, but what there is suggests that some of the relative increase in wholesale relative to international prices in the German case does arise from differences in coverage.

Price Competitiveness Indexes from International and Wholesale Price Data

Biases in price indexes based on wholesale price data would not be serious for our main purpose, the comparison of international price movements, if they were uniform among countries. There was some indication in the previous section that they were not, but that question can be examined more directly by comparing our measures of international price competitiveness with those derived from wholesale price data. These results (Table 8.4) are not completely consistent with Table 8.2 because the total price competitiveness indexes are aggregates of subgroup price competitiveness indexes rather than ratios of aggregate price indexes (see Chapter 4). However, the results are sufficiently similar to the previous ones that we need not comment in detail.

If ratios of price competitiveness of wholesale to international data for the four-digit subgroups are aggregated for subgroups for which both sets of data are available, the effects of differences in coverage can be separated from those of differences in price movements.

In the table below, we show, in column 1 for each country, ratios based on identical weighting (from Table 8.4) and, in column 2, ratios based on both identical weighting and identical coverage (from Table

Table 8.4
Comparison of Indexes of U.S. Price Competitiveness from International and Wholesale Price Data, 1953, 1957, 1961–64

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
TOTAL MACHINERY, TRANSPORT EQUIPMENT, METALS, AND METAL PRODUCTS						
Relative to Germany						
International	97	101	101	100	101	101
Wholesale	86	104	103	100	101	93
IRON AND STEEL (SITC 67)						
Relative to U.K.						
International	93	93	99	97	107	89
Wholesale	100	100	103	100	100	103
Relative to Germany						
International	98	93	98	97	107	93
Wholesale	83	107	101	100	98	87
Relative to Japan						
International	NA	NA	92	100	100	NA
Wholesale	96	96	92	100	100	85
NONFERROUS METALS (SITC 68)						
Relative to U.K.						
International	101	99	100	102	104	107
Wholesale	102	103	102	105	106	119
Relative to Germany						
International	101	95	100	99	108	103
Wholesale	89	100	99	101	103	91
METAL MANUFACTURES, N.E.S. (SITC 69)						
Relative to U.K.						
International	98	102	95	100	101	96
Wholesale	96	105	103	101	101	107
Relative to Germany						
International	96	105	100	99	99	100
Wholesale	89	103	102	98	98	90
Relative to Japan						
International	NA	NA	101	94	105	NA
Wholesale	96	96	97	97	101	87

(continued)

Table 8.4 (concluded)

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
Relative to Germany						
International	95	104	102	100	100	101
Wholesale	89	105	104	100	101	98
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
Relative to Germany						
International	96	107	103	102	98	108
Wholesale	NA	NA	104	100	100	NA
Relative to Japan						
International	NA	88	98	100	101	NA
Wholesale	88	90	98	98	98	75
TRANSPORT EQUIPMENT (SITC 73)						
Relative to Germany						
International	99	98	100	102	99	99
Wholesale	81	102	104	100	101	87

Note: These indexes were calculated by aggregating all the available four-digit subgroup indexes of each type in each two-digit division. The indexes from international price data do not necessarily include only those subgroups covered also by wholesale price data.

8.5). Comparing the ratios, we conclude that coverage deficiencies were rarely responsible for the difference between international price and wholesale price measures of competitiveness.

	United States Relative to			
	United Kingdom		*Germany*	
	(*1*)	(*2*)	(*1*)	(*2*)
Total covered commodities	not available		92	94
Iron and steel (SITC 67)	116	121	94	96
Nonferrous metals (SITC 68)	111	114	88	92
Metal manufactures (SITC 69)	111	118	90	94
Nonelectrical machinery (SITC 71)	not available		97	97
Electrical machinery (SITC 72)	not available		not available	
Transport equipment (SITC 73)	not available		88	87

Table 8.5
U.S. Price Competitiveness: Aggregation of Ratios of Wholesale-price-based to International-price-based Indexes, 1953, 1957, 1961–64

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
TOTAL MACHINERY, TRANSPORT EQUIPMENT, METALS, AND METAL PRODUCTS						
Relative to Germany	88	105	103	99	100	94
IRON AND STEEL (SITC 67)						
Relative to						
U.K.	108	109	104	106	93	121
Germany	82	118	108	101	92	96
Japan	NA	NA	101	98	99	NA
NONFERROUS METALS (SITC 68)						
Relative to						
U.K.	102	103	102	103	103	114
Germany	88	106	101	102	96	92
METAL MANUFACTURES, N.E.S. (SITC 69)						
Relative to						
U.K.	100	102	115	101	99	118
Germany	89	103	103	99	101	94
Japan	NA	NA	99	105	99	NA
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
Relative to Germany	94	101	101	99	101	97
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
Relative to						
Germany	NA	NA	102	98	99	NA
Japan	NA	102	104	99	97	99
TRANSPORT EQUIPMENT (SITC 73)						
Relative to Germany	81	103	104	98	102	87

Note: These are aggregates of ratios, calculated at the four-digit level, of wholesale price competitiveness to international price competitiveness indexes. They therefore include only those subgroups for which both types of data are available.

In several cases the discrepancies were larger when coverage differences were removed, and in no case was as much as half of the apparent error in the measurement of price competitiveness from wholesale prices due to coverage differences.

Price Indexes from International Prices and Export Unit Values

Most of the price indexes now used as measures of international price competitiveness are based on what are called unit value data, and the indexes themselves are frequently referred to as unit value rather than price indexes.[6] For most countries we cannot explain differences between these indexes and ours because we do not know what portion of any discrepancy should be attributed to differences in index number formulas, in choice of base years, in the sample of commodities, or in weighting. For the United States, however, we were able to go back to the original commodity observations and combine them by our own weighting system and methods of aggregation; we can thus make a useful comparison with the NBER indexes. The U.S. unit value indexes presented here, it should be clear, are not those constructed and published by the Department of Commerce. The component series we used do enter into the Commerce indexes, but we combined them using weights similar to those employed for the NBER indexes in order to facilitate comparisons with the latter.

For the total of all the commodity groups covered in our study, the export unit value index showed a substantially greater rise in U.S. prices than the NBER index: 22 per cent instead of 15 per cent (Table 8.6), mainly because the underlying unit value index rose much more than the international price index from 1953 to 1957 and from 1957 to 1961.

The two series for iron and steel show a similar relationship, with the unit value index rising 31 per cent from 1953 to 1961 while the international price index increased by only 20 per cent. In nonferrous metals the unit value index was no higher in 1964 than in 1962, despite the widely publicized price increases in 1964. These did appear to affect the international price index.

[6] See Chapter 1 for a brief discussion of the deficiencies of unit value indexes as measures of international prices and price competitiveness.

Table 8.6
Comparison of U.S. Price Indexes from International Price and Export Unit Value Data, 1953, 1957, 1961–64

Index Basis	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
TOTAL MACHINERY, TRANSPORT EQUIPMENT, METALS, AND METAL PRODUCTS						
International prices	110	103	101	100	102	115
Export unit values	116	106	100	100	99	122
IRON AND STEEL (SITC 67)						
International prices	120	100	98	99	101	118
Export unit values	126	104	101	99	101	133
NONFERROUS METALS (SITC 68)						
International prices	104	101	99	100	108	113
Export unit values	122	90	101	98	102	111
METAL MANUFACTURES, N.E.S. (SITC 69)						
International prices	114	100	102	100	103	120
Export unit values	116	104	98	103	105	129
MACHINERY OTHER THAN ELECTRIC (SITC 71)						
International prices	114	107	101	101	101	126
Export unit values	116	112	100	104	104	141
ELECTRICAL MACHINERY, APPARATUS, AND APPLIANCES (SITC 72)						
International prices	106	96	96	97	101	95
Export unit values	104	102	99	104	96	104
TRANSPORT EQUIPMENT (SITC 73)						
International prices	106	102	104	99	100	113
Export unit values	115	107	97	94	94	105

Note: These indexes were calculated by aggregating all the available four-digit subgroup indexes of each type in each two-digit division. The indexes from international price data do not necessarily include only those subgroups covered also by unit value data.

Source: International prices: unlinked indexes underlying Appendix C; export unit values: unlinked indexes underlying Appendix G.

In both machinery groups and in metal manufactures, n.e.s., unit value series showed a strong upward bias relative to the international price indexes. For electrical machinery the result was a rise in prices over the period as a whole instead of the decline shown by the international price series.

The unit value index for transport equipment showed wide year-to-year differences from the international price index but no consistent bias. However, the coverage is so poor that it could be said that this group was not really included in the official unit value index during these years.

During the first two periods unit value increases were typically greater than international price increases at this two-digit level. The export unit values rose relatively in 10 out of 12 cases. After that relative increases did not predominate. Throughout the whole period, however, the unit values fluctuated more widely. The change in the unit value indexes was greater than that in the international price indexes in 18 cases, equal in 2, and smaller in 10.

The results from aggregating ratios of unit value to international price indexes for the United States are given in Table 8.7. The aggregation of these ratios eliminates the effects of lack of comparability in coverage by comparing only those subgroups for which we have both unit value and international price data. There are still large discrepancies, compared with international prices for the aggregate in the 1957/1953 and 1961/1957 ratios. In several instances there were greater departures

Table 8.7
Aggregation of Ratios of Unit Value to International Price Indexes, United States, 1953, 1957, 1961–64

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963	1964/1953
All covered commodities	108	107	99	101	98	113
Iron and steel (SITC 67)	106	104	103	100	100	112
Nonferrous metals (SITC 68)	119	90	102	99	96	104
Metal manufactures, n.e.s., (SITC 69)	104	108	95	102	102	111
Nonelectrical machinery (SITC 71)	106	107	100	103	102	120
Electrical machinery (SITC 72)	100	121	105	108	98	134
Transport equipment (SITC 73)	114	103	90	94	95	94

from international prices than in the comparisons of Table 8.6, which were not corrected for coverage differences. They also show larger divergences from international prices than did the wholesale price data; in the two-digit divisions their deviations from the international indexes were larger than those of the wholesale price indexes in 24 out of 30 cases (compare Tables 8.7 and 8.3). The unit values were erratically related to international prices, rising much faster in 1953–57, declining sharply in some cases in later years, and rising rapidly at other times relative to the international prices.

Since the export unit value index is the closest the United States comes to an official international price index it is worth commenting on the coverage in these commodity groups. The iron and steel division boasts the best coverage. Although several items are missing, including wire rods, the main groups are represented and the number of series is substantial—thirty-five in the best year. In nonferrous metals the unit value data are confined to copper and aluminum. All the other metals are unrepresented. The manufactures of metal, n.e.s. (SITC 69) are represented by no more than five unit value series, even though the division is heterogeneous, and before 1961 only two of the eight groups are covered at all for the whole eight years.

The lack of data is even more serious in nonelectrical machinery because this division is so important in U.S. and in world trade. Only agricultural equipment can be claimed to be at all well covered, and that coverage is confined to two subgroups. There are no data on such important products as aircraft engines, computers, machine tools and other metalworking machinery, textile machinery other than sewing machines, or most special industry machinery. Even the few series that are included show many instances of erratic changes in unit values that are unlikely to represent price changes, as is pointed out in several of the chapters in Part Four.

Electrical equipment is almost equally ill-covered and includes a similar number of unit value changes that are unbelievable as price movements. Coverage of transport equipment is confined to road motor vehicles, excluding all railway equipment, aircraft, and ships.

On the face of it, then, the U.S. export unit value data for at least the machinery portion of the index are so inadequate that one could not expect them to provide a good representation of international price movements even if the individual series were highly accurate. In addition, many of the individual series that are used are poor approximations of prices even for the specific products they are supposed to represent.

The only comprehensive unit value index that has been available in the past for this range of commodities is the one published by the United Nations for machinery as a whole (SITC 7). This index, for exports of all developed countries, is compared with a combination of our indexes for the United States, the United Kingdom, the EEC countries, and Japan in Table 8.8.

The relation between the two series is similar to that between the NBER and reweighted U.S. export unit value indexes. In particular, the unit value series seems to have a strong upward bias relative to the international price series over the period as a whole, and the bias in the UN series, an increase of 24 per cent as compared with 13 per cent in the NBER series, is similar to that we found above for the U.S. export unit values for all commodities covered. The major discrepancy between the two series was in the second period. The two indexes remained close together in the next three years of comparatively stable prices, as they had been in the first period when prices rose rapidly.

There are a number of possible explanations for divergence between these two series, aside from deficiencies in the basic unit value data, which have been discussed earlier. The country coverage of the UN series is

Table 8.8
Machinery: NBER International Price Indexes vs. UN Export Unit Value Indexes, 1953, 1957, 1961–64
(each year on earlier year as 100)

	NBER[a]	UN[b]
1957/1953	108	109
1961/1957	103	109
1962/1961	101	102
1963/1962	100	101
1964/1963	101	101

[a]Indexes for the United States, the United Kingdom, the EEC countries, and Japan combined, using each country's exports of machinery in 1963 as weights.

[b]Source: *Monthly Bulletin of Statistics,* United Nations, November 1965, p. xxv. Developed area exports to developed and underdeveloped areas. Developed area comprises the United States, Canada, western Europe, Australia, New Zealand, South Africa, and Japan.

slightly broader, including western European countries other than the United Kingdom and members of the EEC, Australia, New Zealand, and South Africa. However, the weight of the countries covered in the NBER index is so large that this factor could not account for the divergent movement of the two indexes.

Another difference is that the NBER international price index is a Laspeyres index on a 1963 base while the UN index consists of Paasche indexes on a 1953 base through 1956 and a 1959 base, 1956 through 1964, linked at 1956. On this account we might expect the UN index to rise more rapidly than the NBER index, if we can assume a shift in the value of trade toward those commodities with relatively falling prices. The NBER index should weight these more heavily in the early years because the weights of the NBER index are based on a later year's trade.

This difference in index number formula appears unlikely to account for all or most of the apparent upward bias in the unit value index. The U.S. machinery unit value indexes, which must account for a large share of the weight of the UN index, show very similar biases even when put into the same weighting and index number formulation as the NBER international price indexes (Tables 8.6 and 8.7). This fact suggests strongly that the bias in the UN export unit value index, like that in the U.S. export unit value index, is attributable to deficiencies in the basic data or in coverage. Whichever is the reason, the unit value indexes appear to be seriously biased as measures of international prices of machinery and metals.[7]

Quantity-Price Relations Derived from Wholesale Price Indexes

Of the two generally available types of price series, wholesale prices offer a more promising basis than unit values for analyzing changes in international price competitiveness in the absence of indexes of international prices such as we constructed for 1953–64. Their behavior is less erratic, and for the period we studied they came closer to the results of the international price indexes.

However, wholesale prices intended for these purposes should not be

[7] Unless there are offsetting errors in the other commodity components, the UN unit value series overstate the deterioration in the terms of trade of developing countries, a deterioration for which these series have often provided the main documentation.

taken ready-made from the official or other standard source without any attention to country-to-country differences in commodity coverage and weighting. In the absence of international price data, the concordance of the wholesale price series of the countries being compared should, at the very minimum, be improved by reweighting and by adding or eliminating commodities so that coverage will be more nearly similar. Adjustments of this kind, which we made in using the wholesale price indexes discussed above (see also Appendix F), do not require new data collection as do international price indexes, and they should be feasible for any serious analyst of quantity-price relations in international trade. Even so, adjusted wholesale price indexes are still apt to be deficient because of inadequate coverage and, more basically, because they refer to domestic rather than international prices.

In view of these considerations, we compare the quantity-price relationships derived from our international price indexes with those derived from our adjusted wholesale price indexes. We begin our comparisons with two-digit categories for which we had both the index based on wholesale prices and the one based on NBER international price data.[8]

The first pair of equations shows the comparisons when data for U.K.-U.S., German-U.S. and Japanese-U.S. ratios are pooled (51 observations), and the second pair when only U.K.-U.S. and German-U.S. ratios are pooled (41 observations):

$$(Q_{F/S} - 1)_W = -.17 + \underset{(3.34)}{0.15T} - \underset{(3.92)}{6.45}(P_{F/S} - 1)_W \quad \bar{R}^2 = .45 \quad (1)$$

$$(Q_{F/S} - 1)_N = -.14 + \underset{(3.03)}{0.15T} - \underset{(3.38)}{6.85}(P_{F/S} - 1)_N \quad \bar{R}^2 = .43 \quad (2)$$

$$(Q_{KG/S} - 1)_W = -.21 + \underset{(3.32)}{0.15T} - \underset{(2.92)}{4.83}(P_{KG/S} - 1)_W \quad \bar{R}^2 = .45 \quad (3)$$

$$(Q_{KG/S} - 1)_N = -.25 + \underset{(3.47)}{0.17T} - \underset{(1.54)}{3.51}(P_{KG/S} - 1)_N \quad \bar{R}^2 = .40 \quad (4)$$

where the subscripts W and N stand for wholesale and NBER international prices, respectively, and where the other symbols have the same meanings as in Chapter 6.

There is little basis in these equations for preferring one source of

[8] Equations based on international prices in this chapter differ from those in Chapter 6 because the latter include some groups for which there are no matching wholesale data.

price data over the other. However, our earlier results (described in Chapter 6) indicate that we are not warranted in assuming, as we do in pooling the data in these equations, that the relationships are the same for all countries. When we compare the relationships derived from wholesale and international prices separately for each foreign-U.S. comparison, a different picture emerges. The following comparisons are based on 14 observations for the U.K./U.S., 27 for Germany/U.S., and 10 for Japan/U.S.

$$(Q_{K/\$} - 1)_W = -.14 + \underset{(1.39)}{0.04T} - \underset{(.58)}{1.62}(P_{K/\$} - 1)_W \qquad \bar{R}^2 = .07 \tag{5}$$

$$(Q_{K/\$} - 1)_N = -.06 - \underset{(.04)}{.001T} - \underset{(3.55)}{5.25}(P_{K/\$} - 1)_N \qquad \bar{R}^2 = .59 \tag{6}$$

$$(Q_{G/\$} - 1)_W = -.41 + \underset{(4.06)}{0.29T} - \underset{(1.09)}{2.34}(P_{G/\$} - 1)_W \qquad \bar{R}^2 = .56 \tag{7}$$

$$(Q_{G/\$} - 1)_N = -.36 + \underset{(4.53)}{0.26T} - \underset{(1.45)}{4.27}(P_{G/\$} - 1)_N \qquad \bar{R}^2 = .57 \tag{8}$$

$$(Q_{J/\$} - 1)_W = -.80 + \underset{(15.74)}{0.85T} - \underset{(3.24)}{4.98}(P_{J/\$} - 1)_W \qquad \bar{R}^2 = .99 \tag{9}$$

$$(Q_{J/\$} - 1)_N = -.77 + \underset{(15.88)}{0.89T} - \underset{(3.12)}{3.24}(P_{J/\$} - 1)_N \qquad \bar{R}^2 = .99 \tag{10}$$

In the case of the United Kingdom, the equation based on international price data is clearly superior to that from wholesale price data. The elasticity coefficient and $\bar{R}^2$ are higher, and the coefficient is statistically significant whereas it is not significant in the wholesale price equation and $\bar{R}^2$ is low. With respect to the other two countries, the coefficients themselves give us little guidance for choice.

At the three- and four-digit level the elasticities based on overlapping observations (29 for the U.K./U.S., 57 for Germany/U.S., and 22 for Japan/U.S.) have negative signs whether wholesale or international prices are used. However, the elasticities derived from wholesale price data are small and not statistically significant while those derived from international price data are in the -1 to -2 range and are statistically significant for the United Kingdom and Japan. The comparisons, which are based on pooled data for 1962/1961, 1963/1962 and 1964/1963, are shown below.

Ratio	*Constant*	*Elasticity*	$\bar{r}^2$
U.K.-U.S.			
Wholesale prices	−0.05	−0.49 (0.58)	0
International prices	−0.02	−2.15 (3.37)	.27
Germany-U.S.			
Wholesale prices	−0.001	−0.95 (0.97)	0
International prices	0.001	−1.15 (1.61)	.02
Japan-U.S.			
Wholesale prices	0.11	−1.39 (1.24)	.02
International prices	0.12	2.21 (2.41)	.19

Thus in those cases where the levels of the coefficients and their *t*-values provide some basis for choosing between the two sources of price data, they seem to support the use of international rather than wholesale prices. This reason for our preference is in addition to those set forth in the earlier parts of this chapter, and is buttressed by the implausible behavior of some of the price series themselves, as described in the various product chapters of Part Four.

Summary

We found that neither existing wholesale price indexes nor indexes of export unit values can be relied upon to describe accurately changes in the international prices of the main industrial countries.

The difficulties in the wholesale price index arise because its coverage of machinery classifications is inadequate from the standpoint of international trade and because it uses methods that do not lend themselves to making allowances for quality change. More adequate measures of domestic price change and adjustments to allow for the importance of goods in international trade would help, but the fact remains that to varying degrees from country to country and from time to time, the domestic and international prices of commodities have diverged, and not entirely because of failures to measure domestic prices adequately.

During the years covered by our study the wholesale price indexes tended to overstate the increase in international prices not only for all the covered commodities as a whole but quite often for the major subgroups as well. The wholesale price indexes tended to miss the shading of prices during periods of price decline and to fail to catch price increases adequately when demand conditions improved. The discrepancies between the changes shown by the wholesale price indexes and those shown by the international price indexes were small during periods of little price change but became large, frequently five points or more, when there were larger changes in international prices.

In view of the deficiencies of conventional wholesale price indexes as measures of international price movements, it is to be expected that they will sometimes give misleading indications of relative price changes for pairs of countries. In general, wholesale price data for 1953–64 provide an unduly unfavorable view of the changes in the price competitiveness of the United States with respect to Germany. Between 1953 and 1957, for example, wholesale prices point to a 14 per cent decline in U.S. price competitiveness, but the international price indexes show only a 2 or 3 per cent decline. Although during the rest of the period the two indexes moved similarly at the aggregative level there were a number of major divergences, notably in iron and steel and in nonferrous metals.

We were able to examine only two unit value indexes, but the results indicate that they are even less reliable as measures of international price competitiveness for metals and machinery than wholesale prices.

An index of export unit values constructed from series used in the official U.S. index deviates from our U.S. international price index to a greater degree than did our reconstructed U.S. wholesale price series. The unit value indexes show larger and more erratic time-to-time changes and tend to have more upward bias than the wholesale price series. For electrical machinery, the unit value series rose 4 per cent during 1953–64, while the international price index fell 5 per cent. In iron and steel and nonelectrical machinery the index from unit values exaggerates the price increase by about fifteen percentage points, almost doubling the rise shown by our international price indexes in the first of these divisions. The better agreement in the nonferrous metals division over the whole period is probably a fortuitous result of large offsetting discrepancies in the shorter periods. These unit value figures are our calculations from series used in the official index by the Department of Commerce, which does not publish indexes at this level of disaggregation. The deficiencies, which apparently stem from inadequate coverage and the erratic behavior of included series, are to some extent inevitable in unit value series, particularly those that aim to cover complex commodities.

The other unit value index we compared with our international price indexes is a UN index for machinery as a whole (SITC 7). Between 1953 and 1964 this index shows a 24 per cent increase. The increase in the NBER international price series was 13 per cent.

In the absence of true indexes of international prices such as those constructed in this study for 1953–64, wholesale price indexes, adjusted for differences in classification, weights, and coverage, provide a better second-best measure of relative price changes for the analysis of international trade than unit value indexes even though they, too, have ineradicable defects.