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QUALITY CHANGE AND OTHER INFLUENCES ON MEASURES OF EXPORT PRICES OF MANUFACTURED GOODS AND THE TERMS OF TRADE BETWEEN PRIMARY PRODUCTS AND MANUFACTURES

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ABSTRACT

Measures of long term trends in world export prices of manufactured goods and in the terms of trade between manufactured goods and primary products are sensitive to the choice of country weights and of base periods and, most important of all, the treatment of quality change. Later base periods and higher weights for rapidly growing exporters, such as Japan or the newly industrializing East Asian countries, are associated with lower estimates of the long-term increase in prices.

Conservative estimates of the bias in the most commonly used measure of export prices of manufactured products, the United Nations export unit value index for manufactures, suggest that this measure overstates the long-run rise in manufactured goods prices by more than half of one per cent per year, probably one per cent or more. If this is the case, there has been no long term trend toward rising prices of manufactures relative to primary products. However, no conceivable estimate of bias in measures of manufactured goods prices would reverse the picture of declining relative primary product prices during the 1980s.

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Introduction

The issue of long-term changes in the terms of trade between primary products and manufactures has a long history, going back at least to Torrens (1821), Ricardo (1832), and Mill (1848). It engaged the attention at various times, of Jevons (1866) and Keynes (1912), and of Singer (1950), Prebisch, in United Nations (1950), Lewis (1952), Kindleberger (1956), Haberler (1959, 1961) and Viner (1953), among more recent commentators. The classical views were based mostly on theoretical considerations of the inevitability of increasing costs, while the later debate has been centered around empirical questions.

Many improvements have taken place in the measures of prices of primary products, but the manufactures side of the debate has rested on a collection of inappropriate or low-quality series stitched together in a variety of ways by different analysts. The purpose of this paper is to examine the implications for this discussion of some efforts to construct better price series for exports of manufactures by developed countries for the period since 1953. Among the issues that are examined here with the new price data are:

(1) The effects of shifting the dates of the export weights used;

(2) The effect of changing the country on whose export pattern the weighting is based;

(3) The difference between price movements for exports to developing countries and those for exports to all countries,

and

(4) Most important, the effects of making some adjustments for changes in the "quality" or characteristics, of manufactured goods, not taken into account in standard price measures.

It has been said that the importance of the quality improvement issue to the terms of trade debate has been exaggerated because there have been quality

improvements in primary products as well as in manufactures. For example, Spraos (1983) mentions that in Kenya, the proportion of coffee beans harvested that was of the highest quality rose from .2 per cent in 1955-58 to 16 per cent in 1964-65 and that the proportion of iron ore exports that had an iron content of more than 60 per cent rose from one third in 1960 to more than half in 1964 (p. 58). It is not clear how that information is relevant to the question of bias in price measurement unless it is shown, as it has not been so far, that the primary product prices used for price indexes fail to take account of such quality improvement.

These changes in the average quality of primary products could certainly produce an upward bias in primary product prices if these prices were measured by unit values that took no account of quality distinctions. However, most price indexes for primary products and most calculations of the terms of trade between primary products and manufactures use specification prices for primary commodities, a procedure that should eliminate that source of bias. On the other hand, if commodities sold on organized markets, the source of specification prices, are a small part of total commodity trade, the reported prices may be biased as new and improved versions of commodities gradually replace the traditional specifications.

How large is the alleged movement in the net barter terms of trade? Spraos (1980) calculated many varieties, and these can be used as one reference point. For periods going back to the 1870s and ending before World War II the annual deterioration for primary product terms of trade reported ranged from a quarter of one per cent to one per cent per year, according to his calculations, clustering roughly around one half of one per cent. For periods after 1950, to 1975 or so, and excluding petroleum from primary products, the rates of deterioration range up to over 2 per cent per year. For the totality of primary

products, Spraos thought the evidence for the long run, extending through the 1970s, did not show any statistically significant trends. Extending the data through the 1980s would probably restore that negative coefficient for relative primary product prices but would not bring it outside the range mentioned above.

A paper by Cuddington (1990) examining terms of trade for 26 individual commodities from 1900 to 1983 lists time coefficients ranging from +2 per cent per year to -1.2 per cent per year in trend-stationary models, with 5 out of 6 negative coefficients smaller than 1 per cent in absolute value. Of 10 negative time coefficients for commodities for which difference - stationary models are used, only 2 are above 1 per cent per year.

Grilli and Yang (1988) calculated that the trend rate of decline in primary commodity prices relative to manufactures prices from 1900 through 1986 was .5 per cent per year, or .6 per cent per year if fuels were excluded from primary products.

A. Measures of Prices of Manufactured Goods[1]

Measures of manufactured goods prices have long been a weak link in all kinds of empirical studies of international merchandise trade. The deficiencies of these indexes affect studies of international competitiveness, of real exchange rates, of income, price, and substitution elasticities, of export supply, and of the terms of trade.

What are these deficiencies? Most countries do not survey export and import prices at all, although the number doing so has increased over the last twenty years. Most trade studies rely on indexes of export and import unit values, despite a long history of adverse appraisals of their accuracy as price

[1]This section is taken mainly from Lipsey, Molinari, and Kravis (1991).

measures and despite the use of unit values in some studies to measure quality differences or quality changes, uses that imply their inaccuracy for measuring price changes. Not only are the unit values inaccurate as measures of the prices of individual products, but in different countries they are combined with different weights and using different index-number formulas. They are relied on because they are almost universally available from customs records and have been for a long time.

An alternative to the unit-value indexes is the use of domestic wholesale or producer-price indexes. These are collected with a much higher degree of quality control than is applied to the unit-value indexes, but the prices themselves, and their weighting in the indexes, do not purport to apply to external trade. The producer-price indexes are computed with different weighting, coverage, and index-number formulas in different countries, as are the unit-value indexes.

A more general problem with both sources of data, and also with existing export and import price indexes, is that new products are underrepresented for some period after their introduction, and complex products are permanently underrepresented. A related problem is that price indexes for some manufactured goods suffer from upward bias due to the neglect of quality change, an issue that has been discussed extensively in connection with the domestic producer and consumer price indexes. The two issues are related because it is the complexity and rapid change in specifications that lead to the omission of many products from most countries' price indexes. Computers and computer accessories may be excluded completely, although they have become an increasingly important part of manufactured-goods trade.

To deal with these problems of measurement of manufactured goods prices in

international trade, the National Bureau embarked on a program of international price measurement research beginning over 30 years ago. The present BLS export and import price indexes for the United States were to some extent an outgrowth of those studies. The first phase of the National Bureau's research was summarized in Kravis and Lipsey (1971), and the latest publication is Lipsey, Molinari, and Kravis (1991). This research has produced new measures of the prices relevant to the explanation of trade flows. These are now being broadened with respect to the country coverage of the indexes and by experiments with methods of dealing with quality change. Some of the characteristics of these measures are:

1. Weighting. Two types of indexes of manufactured goods prices are constructed. The one discussed here, which is used, for example, in studying world trends in terms of trade, is a "world" or developed-country index of manufactured-goods prices, using as weights aggregate developed-country exports or developed-country exports to developing countries. Indexes for individual countries are also constructed based on these two sets of weights. A second type of index is intended mainly for studies of competition in international trade. It is calculated for the United States and for the aggregate of many of its major competitors, using the export weights of the United States and weighting at a fine level of commodity detail, such as the 4-digit SITC. Indexes of domestic prices with own-country export weights are also calculated for each of the three countries, to examine the possibility of divergences between export and domestic price movements and the implications for changes in margins of profitability of export and domestic sales.

2. Missing prices. In place of the assumption that prices for products not covered move in the same way as those covered in the same country, in the

aggregate indexes for all developed countries, a method is used that incorporates both country and commodity effects in estimating missing prices. The method is an adaptation of the country-product dummy (CPD) method developed by Summers (1973) for the estimation of country price levels. It involves fitting an equation to each block of country and commodity price change observations for a given year. The block is defined by the full list of commodities and countries in, say, a 2-digit SITC class. The equation contains dummy variables for both country and commodity and therefore permits the data to determine the degree to which each influences the estimate of the missing price.

3. Quality corrections. There have been almost no studies examining the relation of changes in product quality to the measurements of export and import prices, although there have been studies in which attempts were made to measure changes or differences in product quality by changes or differences in unit values (for example, Ohlsson, 1980; Aw and Roberts, 1988; Boorstein and Feenstra, 1991; and Rodrik, 1988). There have been a number of studies attempting to correct domestic U.S. prices for quality change, mostly by the use of hedonic price measures. Many of these are summarized in Gordon (1990). In the indexes used here, the effect on the U.S. export price indexes of introducing quality-adjusted price measures for a few commodities is calculated, as well as the effect on world price indexes, under two possible assumptions about the relation between quality and price change in the U.S. and price change in other countries' exports.

B. Data Collection

For these studies, export and domestic price data have been collected at the most detailed level available, some from price data on computer tape or

diskettes, but most keypunched from published or unpublished price compendia. These price data, which go back to 1953 for most countries included, are arranged according to the 4-digit SITC Revision 1. The countries included, some more extensively than others, are the U.S., the U.K., Germany, Japan, Canada, The Netherlands, Sweden, and France. We have also begun to collect data for Korea, Hong Kong, Singapore, and Taiwan, but they are not included in the indexes discussed here. The data are classified into the SITC Revision 1 at the four-digit level and then aggregated to 3-digit, 2-digit, and 1-digit levels for SITC 5-8, and to total manufactures, defined as SITC 5 through 8. The methods are explained most recently in Lipsey, Molinari, and Kravis (1991).

Factors Affecting Measures of Export Prices of Manufactured Goods

One advantage of the NBER price indexes used here over the UN unit value indexes and other representations of manufactured goods prices is that the price indexes here are transparent; the ingredients and how they were put together are known. The UN unit value indexes, on the other hand, are derived from a variety of national indexes, put together by national statistical offices in many different ways, and some of which, in fact, are not even based on unit values. The estimates here of the influence of various factors, such as weighting and quality change, on measures of manufactured goods prices are, therefore, derived from the NBER indexes.

The influence of each factor is measured in two ways. One is by its effect on the change from the initial year of the indexes, 1953, to the final year, expressed also as an annual rate of change. Since this method carries the risk that it may be excessively influenced by the circumstances of the first and last years, a linear logarithmic trend is also fitted to each of the series and the

estimated coefficient of time used as the average rate of change.

Exports to the World vs. Exports to Developing Countries

The composition of exports by developed countries (DCs) to developing countries (LDCs) is somewhat different from that of their exports to developed countries and to the world as a whole. An indication of the effect of that difference on price measures is given by comparisons of changes in the price indexes for the two destinations between 1953 and 1991 (Table 1):

Table 1

Comparison of Prices of Developed-Country Exports of Manufactures to the World and to Developing Countries

	1988/1953		
	DC exports to		LDC Relative to
Weights of	World	LDCs	World
1963	514	484	94.2
1975	485	454	93.5
1986	450	428	95.1

Source: Appendix Tables 1 and 2.

The prices of developed country exports of manufactures to developing countries declined by about 5 to 6 1/2 per cent over this period, depending on the base period used, relative to prices of exports to all destinations, or an average of between .13 and .18 per cent per year. If the average decline in prices for exports to developing countries relative to exports to the world is calculated from fitted equations in logs, the rate of decline is somewhat larger -- between .16 and .21 per cent per year, with the later weights indicating larger declines in the relative prices of exports to developing countries. Thus, an estimate of the terms of trade of developing countries based on data for developed-country exports to all countries would be biased downward slightly on this account.

The Effect of Changing Base Years

Price indexes have been calculated using several different base years, 1963, 1975, and 1986. The composition of trade in manufactures has, of course, changed substantially over this period. One way it has changed is that world trade has moved steadily toward more high-tech products, in the sense of products of industries in which R & D expenditures are important relative to value added or sales (Table 2).

Table 2

Distribution of Market Economy Exports by Technology Class

	Low Technology	Medium Technology	High Technology	Total
1966	48.4	37.2	14.4	100.0
1977	43.2	39.0	17.8	100.0
1982	41.2	39.4	19.4	100.0
1986	34.3	41.2	24.5	100.0
1990	34.2	39.8	26.1	100.0

Source: Lipsey and Kravis (1992) and later UN Trade Tapes.

Whether because of the shift over time to high-tech products or the more general tendency of consumers to shift to products declining in price, the export price indexes based on 1975 weights rise less than those based on 1963 weights and the indexes based on 1986 weights rise still less (Table 3):

Table 3

Effect on Export Price Index, 1991/1953, of Changing Weight Base Years
Index on Later Weights as Percent of Index on Earlier Weights

	1975 Weights / 1963 Weights	1986 Weights / 1975 Weights	1986 Weights / 1963 Weights
Developed Country Exports to World	94.47	92.84	87.71
Developed-Country Exports to Developing Countries	93.75	94.44	88.54

Source: Appendix Tables 1 and 2.

The shift in commodity and country weights from 1963 to 1975 reduced the estimate of the price increase for manufactured goods by about 5 or 6 per cent, or about .15 per cent per year. The shift to a 1986 base reduced the rate of price increase still further, by about .19 per cent per year. Thus, the difference between the growth in prices calculated on 1963 weights and that based on 1986 weights is about a third of a per cent per year.

The estimates from fitting logarithmic time trends are that the change from 1963 to 1975 weights reduces the growth in prices of exports to the world by about .11 per cent per year, and the change from 1975 to 1986 weights reduces it by about another .17 per cent or more per year, a total reduction by a little over a quarter of a per cent per year. For exports to developing countries the effect of the 1963 to 1975 weight shift is about .14 per cent per year and of the 1975 to 1986 shift, another .19 per cent, a total reduction of about a third of a per cent per year.

Within machinery and transport equipment, SITC 7, the effect of shifting weights was much larger. For exports to the world (Appendix Table 2), the index on a 1975 base rose more slowly than that on a 1963 base by more than a quarter of a per cent per year, as measured from a logarithmic regression, and the index on a 1986 base increased by about another third of a per cent less than that on

the 1975 base. Thus, the shift of 20 plus years in the base reduced the rate of growth in prices of machinery and transport equipment by roughly .6 per cent each year. Countries apparently shifted their imports toward the products that were declining relatively in price much more extensively in machinery and transport equipment than in manufacturing as a whole.

New and Rapidly Growing Countries

Two of the major changes that have taken place in the world market for exports of manufactures have been, first and most important, the rapid growth of Japanese production and exports, and second, the rapid growth of exports by the Asian NICs. That growth could affect the markets and world prices for manufactures in several ways, depending on the way in which entry into or expansion in the share of world markets was accomplished. The most readily observable method of entry would be entry into world markets at high prices and low market shares, followed by relative declines in the newcomers' prices as their productivity grew relative to others. Indexes with later country weights would decline in comparison with indexes based on earlier weights, because they would give more importance to the new countries with declining prices. A second method of entry would be that the new countries enter world markets by selling at low prices, gradually raising their market shares as buyers learn about and shift to the new sources of supply, but with no change in relative prices offered by old and new suppliers. Both of these assume that the "law of one price" does not hold. A third method would be, if the law of one price does operate, that the new entrants influence the market by driving down the price for all suppliers, forcing less efficient producers out of the market.

The various methods of market entry would show up in different ways in

measures of price competition and of world price changes. The first scenario, with declining relative prices of new entrants, is exactly what is envisaged in measures of relative prices and price competitiveness, which would therefore be suitable for explaining shifts in market shares. However, as long as separate export price indexes were constructed for each exporting country, the part of the price decline that consisted of a shift toward sources with declining relative prices would be missed in a fixed-weight world price index, although it would show up as a decline in indexes with later country weights relative to those with earlier weights.

The second method of entry would be difficult to observe without measures of relative price levels, as well as of price changes, as in Kravis and Lipsey (1971). In both the present indexes and the standard unit value or price indexes, the effective decline in price would be missed, because both export unit values and export prices are compiled separately for each country, in effect treating each country's export of a product as a separate product. These effects could be caught in import price or unit value indexes but their only mark on export indexes would be in the rise in market shares of the low-price countries.

Finally, in the third case, where new entrants bring down their rivals' prices there would be an indication of the change in country shares even in conventional export price indexes. A world export price index on Japanese weights, for example, would decline relative to an index based on world or other countries' weights because the Japanese weights would give greater importance to products that are declining relatively in price.

Some evidence for the existence of the third sequence of events is provided by a comparison of annual rates of growth of world manufactures export price indexes based on world weights with world export price indexes based on U.S.,

German, and Japanese weights.

Table 4

Effect on Price Indexes for Developed-Country Exports of Manufactured Goods of Weighting by Export Patterns of the U.S., Germany, and Japan
Average Annual Rate of Growth (Per Cent) of Price Index, 1953-1991

	Weights of		
	1963	1975	1986
Weights of			
Developed Countries	4.40	4.24	4.04
U.S.	4.41	4.26	4.03
Germany	4.39	4.18	4.20
Japan	4.00	3.95	3.80

Sources: Appendix Tables 2 and 3

World export price indexes for manufactures weighted by Japanese export weights rose less rapidly than indexes based on world, or U.S. or German, export weights, no matter what year's export composition is used, although Japan's advantage in this respect is smaller with the later year's weights. In other words, Japanese exports were more concentrated than, for example, U.S. exports on products for which prices were rising less rapidly than average or were even declining. Either Japan's exports were more heavily concentrated on products for which productivity was rising relatively fast everywhere or its rapid productivity growth was driving down world prices of the products in which its exports were concentrated, whether or not other countries' productivity was growing rapidly in these products.

That phenomenon of the impact of new suppliers appears even more strongly if we compare developed-country export price indexes for 1991 relative to 1981 based on developed-country weights with developed-country price indexes based on the weights of Hong Kong, Korea, Singapore, and Taiwan.

Table 5

Effect on Price Indexes for Developed-Country Exports of Manufactured Goods of Weighting by Export Patterns of Taiwan, Hong Kong, Korea, and Singapore Average Annual Rate of Growth (Per Cent) of Price Index with 1986 Weights, 1981-1991

Developed Countries	4.42
Hong Kong	3.68
Korea	3.54
Taiwan	3.97
Singapore	3.37

Source: Appendix Table 9

Even over this short period, developed-country export price indexes based on the weights of the fast-growing Asian exporters declined substantially relative to an index based on the developed countries' own export weights. The differences ranged from a half per cent per year to more than one per cent.

Quality Change

Our attempt to adjust manufactured goods price indexes for changes in quality is based on the idea that neither unit value indexes nor price indexes based on specification pricing have captured the effects of changes in the quality of manufactured goods, particularly those that are complex or one-of-a-kind. Many such products are simply omitted from most price indexes and, when they are included, the prices tend to be list, rather than transactions prices, because the actual products sold differ substantially from one transaction to another.

There are virtually no studies of the relation of quality change to price measures that refer specifically to exported or imported goods aside from the studies mentioned above attempting to measure quality change from unit value

data. A partial exception is a set of hedonic price indexes in Kravis and Lipsey (1971) as part of a much broader attempt to measure prices in world trade, but even there, most of the data for the hedonic price indexes actually referred to domestic markets. For years since 1982, there are also recent calculations by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce for exports and imports of computers.

Most of the literature on the adjustment of the price quotations for quality change involves the calculation of hedonic price indexes to replace the standard specification-based price measures. There are other types of corrections, such as the cost of improvement calculations used for automobiles by the U.S. Bureau of Labor Statistics, calculations based on prices in second hand markets, and corrections for the bias resulting from the slow introduction of new products into price indexes. However, what is used here are hedonic price indexes that have been calculated in various studies of domestic technological change and prices. The specific series we have used are listed in the notes to Appendix Table 5.

What we did was to collect studies of quality change that had been carried out by others. All referred to domestic prices in the United States, and all the products were in SITC Division 7, Machinery and Transport Equipment. Within Division 7, they were confined to 9 four digit subgroups and 2 three-digit groups and drew heavily on Gordon (1990) and two or three papers on individual products. We had to assume, in effect, that the quality adjustments applied equally to domestically used and exported products. Since only some products were covered, and since most of the quality corrections did not go beyond 1983, we felt that the adjustments we made were minimal even for SITC Division 7 for the United States, and must surely understate what a comprehensive quality correction would

show.

For the export prices of the United States, based on the weights of developed-country exports of manufactures to developing countries, the effect of the quality adjustments is as follows, for all manufactures and for SITC 7:

Table 7

Effect of Quality Corrections on Price Indexes for Manufactured Exports from the United States, 1991/1953 1975, and 1986 Weights of Developed-Country Exports to Developing Countries

	Weights of	
	1975	1986
SITC 7		
Unadjusted Index	4.353	3.516
Adjusted Index	3.134	2.545
Ratio: Adjusted/Unadjusted	.720	.724
All Manufactures		
Unadjusted Index	4.165	3.700
Adjusted Index	3.511	3.079
Ratio: Adjusted/Unadjusted	.843	.832

Source: Appendix Tables 4 and 5

For SITC 7, the group in which the quality adjustments were carried out, the rise in U.S. export prices was considerably less with the quality adjustment, by about one quarter, or .86 per cent per year. And that quality adjustment in SITC 7 alone results in a reduction in the estimated price increase for all U.S. manufactured exports, assuming no omitted quality change in other groups, of almost a half of one per cent per year. In other words, the estimated upward bias from the omission of quality change is about a third for U.S. exports of machinery and transport equipment and almost 20 per cent for U.S. exports of all manufactures.

If we estimate the average quality correction from an equation rather than

from the change from beginning to end years, the relative decline in the adjusted price index for the U.S. is around .4 per cent per year for all manufactures and .7 or .8 per cent per year for SITC 7.

There are several possible ways to calculate the implication of these quality adjustments for world price changes, of which we show two here. The most conservative is to adjust only the U.S. price index and combine the adjusted U.S. price index with the conventional indexes for the other countries. That calculation, referred to below as "adjusted for U.S. only," must understate the quality change bias in our conventional indexes.

The other adjustment is performed by assuming, in effect, that for these products the law of one price holds in time-to-time form. It involves substituting the U.S. hedonic price index for a subgroup for whatever is reported by each country and also using that U.S. hedonic price index where no conventional price index is reported. The assumption flies in the face of the strong evidence that the law of one price is frequently violated. But it is more reasonable than the alternative assumption that the prices of these goods move as indicated by conventional indexes or, since most of these products are not covered by most countries' price indexes, the assumption that these prices move in the same way as those of all covered products. Some support for our assumption of common worldwide price changes is that the price index for U.S. imports of computers and parts falls by about as much as the domestic and export prices.

The effects of these quality change adjustments over the 1953 to 1991 period as a whole, calculated from indexes with 1975 weights, is shown in Table 7, for SITC 7 and for all manufactures.

Table 7

Effect of Quality Corrections on Price Indexes for Total Exports of Manufactures by Developed Countries to the World and to Developing Countries, 1991/1953, 1975 Weights

	World	Developing Countries
SITC 7		
Unadjusted Index	488.0	484.6
Adjusted for U.S. only	446.4	377.2
Adjusted for all countries	340.8	264.9
All Manufactures		
Unadjusted Index	485.2	453.6
Adjusted for U.S. only	458.4	407.8
Adjusted for all countries	397.4	332.9

Source: Appendix Tables 1, 2, 6, and 7.

The most conservative adjustment, assuming no quality change outside the U.S., indicates an upward bias in the price indexes for developed-country exports to the world of about .15 per cent per year for all manufactures and .23 per cent per year for machinery and transport equipment (SITC 7) alone. If we adopt the assumption that in the 11 products with quality adjustments prices in other countries followed those of the U.S., the adjustment is much larger: over half of one per cent per year for all manufactures and almost one per cent per year for machinery and transport equipment. The adjustment is even larger for price indexes of exports to developing countries.

The average declines in the adjusted indexes relative to the unadjusted ones for exports to the world estimated from equations are, when the adjustment is made to all countries' indexes, more than a half per cent per year for all manufactures and a little over 1 per cent per year for SITC 7, slightly higher than the estimates from beginning to end years. The same relationship holds for exports to developing countries.

Given the rough nature of these adjustments and the incompleteness of

coverage, these estimates must be subject to a considerable range of error. However, it seems as if quality adjustments could well be large enough to offset the supposed long-run deterioration in the terms of trade of primary products, as it has been estimated by supporters of the thesis that there has been such deterioration.

It is worth mentioning that these quality adjustments are much too gradual to offset the large short-term or medium term cycles in terms of trade, where the year-to-year movements are far greater than any conceivable offsetting changes in quality on the manufactures side. Thus they do little to alter the picture of deteriorating terms of trade for primary products during the 1980s.

Comparison with UN Unit Value Index for Exports of Manufactures

If we want to get some idea of what difference the use of these manufactures price indexes would make in comparison with the movement of commodity prices over the same period, we can start by comparing the UN unit value index to the price index for all manufactured exports to the world by developed countries, without the adjustment for quality change. That difference

	1991/1953
UN Unit Value Index	4.804
NBER Index for Exports of Manufactures by Developed Countries, Unadjusted for Quality Change, 1986 Weights	4.505
NBER/UN	.938

Source: Appendix Tables 2 and 8.

of almost .4 per cent per year measured from beginning to end years, or .35 per cent estimated from an equation, might be the result of many factors, some possibly offsetting, but in any case, hard to identify. The difference between

unit values and specification prices is there, as well as differences in weights, in country coverage, and in index number formulas.

It is impossible to explain the differences between these price indexes and the unit value series reliably because the commodity composition of the individual-country unit value series is not known. The country indexes are combined into a world index using Paasche (current-year) weights, and many of the country indexes are of the same type. However, some important countries use other types of index numbers such as Laspeyres (United Kingdom) or Fisher (The Netherlands and, until recently, the U.S.). In addition, for eight countries, price indexes, rather than unit value indexes, are used to produce the world unit value indexes (United Nations, 1991, p. 42).

As can be seen in the most recent description of the UN indexes (United Nations, 1991a), the unit value indexes cover more countries than those presented here. They include 25 developed countries, instead of the 8 in the price indexes here. However, these 8 countries included here accounted for about three quarters of the total exports by the 25 in 1989.

To judge by the unit value data, the use of the 8 countries in our list produces an index that is biased upward to some degree, as compared with that for the full list of developed countries, at least during the 1980s. For 1980-89, a unit value index with 1989 export value weights for the 8 countries rose by 2 per cent, or about .2 per cent per year relative to the 25-country unit value series.

Conclusions

It seems likely that certain characteristics of the UN export unit value index for manufactures cause it to be biased upward as a measure of the prices of manufactured goods exported by developed countries to developing countries. It also appears that these biases could be large enough to offset the long-term deterioration in export prices of commodities relative to the UN unit value index for manufactured exports that has been calculated by proponents of the belief that there has been such a deterioration. Thus, the case is weak that there has been a long-term deterioration in commodity prices in general relative to a price index, adjusted for quality change, of manufactured exports from developed countries to developing countries.

The main ingredient in this conclusion is the adjustment for quality change, which we estimate to be at least .5 per cent per year, just about enough by itself to offset the reported deterioration in relative commodity prices. We find an additional "bias" of about .35 or .40 per cent per year from the difference between our unadjusted index for exports by developed countries to all countries and the UN Unit Value Index, possibly, but not necessarily, due to the use by the UN of unit value data rather than specification price data. The country selection for our index might bias it upward relative to a more comprehensive index by about another .2 per cent per year, although we have evidence for this only for the 1980s and the direction of the effect could be opposite, if it even exists, in earlier years. The use of an index weighted by exports to developing countries rather than to all countries amounts to about another .1 per cent or more per year. The sum of these items implies that the true rate of growth of manufactured goods prices may be lower than that in the UN unit value index by as much as 1 per cent per year.

Although there is certainly room for disagreement with the assumption used here, there are grounds for judging that the adjustments are conservative. In particular, the assumption is made, in effect, that there are no overlooked failures to correct for quality improvements outside of the eleven groups for which hedonic measures are used here. While some of the obvious cases are covered in the adjustments included here, there are other likely candidates for adjustment. Even within SITC 7, there are products for which quality adjustments may be desirable, such as aircraft engines, agricultural machinery other than tractors, office machinery other than computers, such as copiers and fax machines, all non-electrical machinery for special industries, radio and television receivers, electrical apparatus for medical purposes, such as diagnostic equipment, motor vehicles and parts except passenger cars, and ships. In groups other than SITC 7, where we made no quality adjustments, pharmaceuticals price indexes are almost certainly biased upward, and to a substantial degree, and prices of plastics may also be subject to quality adjustments. This listing is not proof that there are any quality improvement overlooked in specification price indexes, but it suggests that we have not exhausted the possibilities for such adjustment.

A further reason for considering our estimates of quality adjustment conservative is that the ones we have used, with the exception of two, are not available after 1983. We are therefore, in effect, assuming that there was no further unaccounted for quality change outside of computers and semiconductors after 1983, an unlikely story.

The conclusion here is that the estimate of long term increases in world prices of manufactured goods derived from the UN unit value index is too high by at least one per cent per year. Furthermore, the overestimate could be

considerably greater if the quality corrections made here have counterparts in other manufactured products, even if there would be few, if any, on the scale of the corrections for computers and semiconductors.

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Appendix Table 1

Price Indexes For Manufactured Exports
by Developed Countries to Developing Countries
All Manufactures (SITC 5-8) and
Machinery and Transport Equipment (SITC 7), U.S. Dollars
(Annual Averages, 1975=100)

	All Manufactures			SITC 7		
		Weights of			Weights of	
YEAR	1963	1975	1986	1963	1975	1986
1953	50.6	51.9	54.0	48.1	50.1	54.6
1954	50.3	51.3	53.2	48.0	49.9	54.2
1955	50.9	51.4	53.1	48.6	50.1	54.1
1956	52.5	53.5	55.2	50.7	52.1	56.3
1957	54.0	55.2	56.9	52.7	54.2	58.6
1958	53.7	53.8	55.6	53.2	54.1	58.1
1959	53.6	53.5	55.6	53.4	53.9	57.9
1960	53.6	53.5	55.5	53.3	53.7	57.8
1961	53.9	53.5	55.1	54.0	54.1	57.4
1962	53.4	52.7	54.2	53.9	53.8	56.8
1963	53.4	52.5	53.7	54.1	53.8	56.0
1964	54.1	53.0	53.9	54.7	54.1	56.1
1965	54.9	53.5	54.3	55.6	54.9	56.7
1966	56.0	54.3	54.8	56.9	56.1	57.5
1967	56.2	54.6	55.2	57.6	56.8	58.1
1968	55.7	54.9	55.2	56.9	57.5	58.2
1969	57.1	56.3	56.5	58.5	59.1	59.7
1970	60.0	59.0	59.1	62.0	62.3	62.5
1971	63.3	61.6	62.0	66.4	66.1	66.3
1972	68.3	66.8	66.9	71.5	71.6	71.1
1973	76.2	77.1	77.1	78.0	80.1	79.9
1974	89.3	91.4	91.2	87.5	89.4	90.0
1975	100.0	100.0	100.0	100.0	100.0	100.0
1976	102.3	103.2	102.1	102.6	103.8	101.6
1977	110.8	110.5	109.3	111.8	112.0	109.1
1978	126.4	127.2	125.8	128.5	127.8	126.1
1979	143.0	139.7	138.8	144.3	139.8	134.8
1980	161.1	151.8	152.0	162.2	151.3	145.4
1981	159.7	152.9	151.3	161.1	151.3	145.8
1982	156.0	149.0	145.8	160.2	149.2	142.2
1983	152.4	145.8	143.6	158.1	148.0	141.4
1984	148.7	142.5	141.2	154.0	144.4	138.8
1985	150.4	143.4	141.2	156.4	146.2	139.4
1986	176.6	169.9	167.3	184.1	176.9	168.0
1987	196.8	190.4	186.7	205.4	198.9	186.5
1988	213.8	208.9	203.0	219.1	212.8	198.6
1989	215.5	208.7	201.5	218.7	211.9	195.5
1990	233.8	222.9	212.6	240.5	231.2	207.4
1991	244.8	235.4	231.3	251.1	242.8	227.5

Sources: Lipsey, Molinari, and Kravis (1991), Tables 5B.3 and 5B.4, and extensions to 1991 and indexes with 1986 weights constructed in the same way.

Appendix Table 2

Price Indexes For Manufactured Exports by Developed Countries to the World
All Manufactures (SITC 5-8) and Machinery and Transport Equipment (SITC 7),
U.S. Dollars, 1963, 1975, and 1986 Weights
(Annual Averages, 1975=100)

YEAR	All Manufactures			SITC 7		
	Weights of			Weights of		
	1963	1975	1986	1963	1975	1986
1953	47.8	49.4	50.9	45.8	49.5	53.4
1954	47.4	48.9	50.2	45.7	49.1	52.7
1955	48.2	49.3	50.1	46.3	49.4	52.6
1956	49.5	50.6	51.3	47.9	51.0	54.1
1957	50.7	51.8	52.6	49.5	52.8	55.8
1958	50.3	51.1	52.1	50.0	52.8	55.7
1959	50.1	50.8	52.0	50.0	52.4	55.4
1960	50.3	50.8	51.9	50.0	52.2	55.0
1961	50.8	51.2	52.1	50.9	52.8	55.0
1962	50.4	50.7	51.8	51.0	52.6	54.8
1963	50.6	50.6	51.7	51.3	52.5	54.4
1964	51.4	51.2	52.0	51.9	53.0	54.4
1965	52.3	51.9	52.5	52.9	53.8	55.0
1966	53.4	52.9	53.1	54.1	55.0	55.6
1967	53.5	53.1	53.4	54.7	55.6	56.2
1968	53.0	52.8	53.3	54.1	55.5	56.1
1969	54.6	54.2	54.5	55.7	57.1	57.5
1970	58.0	57.6	57.7	59.6	60.6	60.8
1971	61.4	61.0	61.1	64.4	65.2	65.0
1972	66.7	66.4	66.6	70.0	70.9	70.5
1973	76.0	76.2	77.0	77.9	79.2	79.9
1974	89.6	90.0	90.3	87.2	88.5	89.1
1975	100.0	100.0	100.0	100.0	100.0	100.0
1976	102.3	102.4	101.8	102.3	102.7	102.3
1977	110.7	110.3	109.5	111.8	111.1	110.4
1978	125.7	125.9	125.4	128.7	127.7	127.4
1979	143.8	142.7	140.5	145.3	141.3	139.0
1980	161.5	158.5	154.1	162.3	155.3	149.8
1981	155.4	152.5	148.9	156.6	151.6	147.1
1982	151.4	148.3	143.9	155.2	149.4	143.7
1983	142.3	144.6	140.9	152.4	147.7	142.6
1984	142.4	139.8	136.6	147.0	143.1	138.6
1985	143.3	140.4	137.0	148.8	144.4	139.1
1986	171.6	170.4	167.8	180.1	176.3	170.5
1987	194.9	193.1	190.3	204.8	199.3	192.1
1988	212.6	209.1	205.1	218.1	211.7	204.2
1989	214.3	208.7	202.0	217.9	210.9	200.7
1990	233.8	229.5	218.6	232.7	230.0	216.6
1991	245.5	239.7	229.3	245.7	241.5	230.9

Sources: Lipsey, Molinari, and Kravis (1991), Tables 5B.1 and 5B.2 and indexes with 1986 weights constructed in the same way.

Appendix Table 3

Price Indexes for Manufactured Exports by Developed Countries
Based on Weights of Different Countries and Years
1975=100

	Export Weights of								
	1963			1975			1986		
Year	Japan	Germany	U.S.A.	Japan	Germany	U.S.A.	Japan	Germany	U.S.A.
1953	51.2	48.1	47.1	51.4	50.4	49.2	54.2	49.9	50.8
1954	50.7	47.9	46.8	50.5	50.2	48.8	53.3	49.1	50.2
1955	51.2	48.4	47.2	51.0	50.3	49.1	53.3	49.1	50.2
1956	52.2	50.1	48.5	52.6	52.1	50.5	54.4	50.4	51.3
1957	53.3	51.6	49.7	53.8	53.6	51.8	55.6	51.7	52.6
1958	52.7	51.3	49.7	52.8	52.8	51.5	55.0	51.2	52.3
1959	52.3	51.3	49.5	52.3	52.6	51.3	54.6	51.1	52.2
1960	52.4	51.3	49.7	52.0	52.6	51.4	54.2	51.0	52.3
1961	52.6	51.6	50.7	51.9	52.7	52.3	54.1	51.3	52.6
1962	51.8	51.2	50.4	51.1	51.9	51.8	53.3	51.1	52.2
1963	51.7	51.1	50.7	50.7	51.6	52.0	52.9	51.0	52.0
1964	52.5	51.9	51.5	51.2	52.4	52.6	53.1	51.3	52.3
1965	53.2	52.7	52.4	51.8	53.0	53.5	53.4	51.9	52.8
1966	54.1	53.8	53.6	52.6	54.0	54.6	53.8	52.5	53.5
1967	54.0	54.1	53.9	52.6	54.4	55.0	54.0	52.8	53.9
1968	53.5	53.2	53.5	52.3	53.9	54.8	53.8	52.7	53.8
1969	54.8	55.0	55.0	53.8	55.4	56.2	55.1	54.0	55.1
1970	58.2	58.3	58.4	57.4	58.4	59.3	58.4	57.4	58.1
1971	61.6	61.8	62.3	61.1	61.5	63.0	61.7	60.8	61.5
1972	67.0	66.9	67.9	66.3	66.8	68.6	66.9	66.2	67.0
1973	76.8	75.3	76.8	75.6	75.9	77.9	77.4	76.8	77.3
1974	90.9	89.0	89.0	90.3	90.0	89.5	90.8	90.4	90.1
1975	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1976	101.5	101.9	102.4	101.1	102.7	102.5	101.4	102.0	101.6
1977	109.1	110.3	111.0	107.3	110.4	110.9	108.2	110.1	109.3
1978	124.1	126.2	126.2	122.9	126.1	126.0	123.8	126.6	124.6
1979	139.6	145.8	145.2	137.5	143.4	142.9	138.4	142.3	139.0
1980	149.5	164.0	163.6	152.4	159.3	158.7	150.7	156.1	152.4
1981	150.4	157.8	154.6	146.1	153.9	151.4	144.7	150.9	147.1
1982	146.9	154.7	151.1	142.7	151.4	147.8	140.0	146.5	142.2
1983	142.7	151.1	147.6	138.6	147.3	145.1	136.8	143.6	139.3
1984	137.8	146.0	142.0	134.0	142.5	140.0	132.6	139.2	135.2
1985	139.0	147.5	142.4	135.1	144.3	141.0	133.0	139.7	135.4
1986	165.4	176.6	172.3	162.7	172.9	171.1	162.1	171.1	164.3
1987	186.3	199.9	197.2	183.7	194.6	194.8	183.7	194.4	186.3
1988	201.3	217.1	215.2	198.7	209.9	210.8	197.8	210.0	200.3
1989	202.3	217.1	214.8	197.7	208.9	209.5	195.2	207.5	197.7
1990	221.9	239.0	236.3	215.1	228.5	229.6	211.0	225.1	214.5
1991	227.7	246.6	243.2	224.1	239.0	240.4	223.9	238.1	227.8

Appendix Table 4

Price Indexes for Manufactured Exports by the U.S., U.S. Dollars,
Weights of OECD Exports to Developing Countries
(Annual Averages, 1975=100)

	1963 Weights		1975 Weights		1986 Weights	
	All Manufactures	SITC 7	All Manufactures	SITC 7	All Manufactures	SITC 7
1953	51.2	49.8	50.7	50.7	55.8	57.2
1954	51.8	50.2	51.4	51.2	56.5	57.9
1955	53.0	51.4	52.5	52.3	57.5	59.1
1956	55.2	54.5	54.9	55.4	59.8	62.3
1957	57.6	57.5	57.4	58.3	62.4	65.6
1958	58.4	58.9	58.3	59.7	63.2	67.1
1959	59.2	60.0	59.1	60.9	64.0	68.4
1960	59.4	59.9	59.3	60.8	64.1	68.4
1961	59.2	59.7	58.9	60.5	63.4	67.2
1962	59.0	59.5	58.5	60.1	62.8	66.5
1963	59.0	59.9	58.5	60.4	62.4	66.1
1964	59.3	60.3	58.8	60.8	62.4	66.3
1965	60.0	60.9	59.4	61.5	62.9	66.7
1966	61.0	62.2	60.4	62.7	64.1	68.1
1967	62.3	64.1	61.8	64.6	65.5	70.0
1968	63.8	65.8	63.3	66.5	67.2	71.9
1969	65.4	67.6	64.9	68.5	69.1	74.1
1970	67.8	70.6	67.3	71.1	70.8	75.6
1971	70.4	74.2	70.0	74.5	72.9	78.4
1972	72.3	76.1	71.7	76.1	74.2	79.4
1973	75.6	78.5	74.6	78.7	77.2	81.8
1974	88.6	88.3	87.6	88.8	89.7	91.3
1975	100.0	100.0	100.0	100.0	100.0	100.0
1976	105.5	105.9	105.3	105.8	105.4	105.1
1977	112.1	112.7	111.7	112.4	110.9	110.4
1978	120.1	121.8	119.9	121.1	117.5	117.1
1979	132.5	132.3	132.0	131.2	130.2	125.4
1980	147.5	146.6	146.6	145.3	144.2	138.2
1981	162.8	160.9	162.0	159.7	158.9	150.4
1982	170.6	171.8	168.2	170.4	166.7	160.1
1983	173.0	176.5	169.3	175.3	169.8	164.9
1984	177.7	181.1	173.9	180.4	174.1	169.7
1985	179.6	184.7	176.0	184.8	174.8	172.9
1986	181.2	187.8	177.4	188.5	176.7	175.0
1987	185.8	191.0	182.4	192.2	182.3	178.0
1988	196.6	196.9	195.0	199.3	192.4	182.6
1989	204.7	205.4	203.2	209.1	198.5	189.2
1990	209.4	211.7	206.4	214.1	201.9	194.1
1991	215.2	219.8	211.2	220.7	206.3	201.1
1992	217.8	224.4	212.5	224.3	207.8	204.3

Appendix Table 5

Price Indexes for Manufactured Exports by the U.S.,
With Quality Corrections for SITC 7 Using Hedonic Price Indexes
U.S. Dollars, 1975, and 1986 Weights of OECD Exports
to Developing Countries and to the World
(Annual Averages, 1975=100)

Year	Weights of Exports to Developing Countries				Weights of Exports to the World			
	All Manufactures		SITC 7		All Manufactures		SITC 7	
	1975	1986	1975	1986	1975	1986	1975	1986
1953	57.6	63.5	64.8	72.8	59.9	66.2	68.0	80.9
1954	58.2	63.6	64.8	72.4	60.1	65.8	68.2	79.0
1955	59.0	64.4	65.3	73.0	61.2	66.9	69.2	80.2
1956	61.2	66.5	68.2	75.9	63.1	68.6	71.7	82.6
1957	63.6	68.8	70.7	78.5	65.3	70.7	74.0	84.9
1958	63.6	68.3	70.4	77.6	64.7	69.6	72.7	82.1
1959	63.5	67.6	69.9	75.9	64.8	69.1	72.3	80.7
1960	63.0	67.2	68.4	74.6	64.4	68.7	71.1	79.1
1961	62.4	66.3	67.6	73.1	63.9	67.8	70.3	77.5
1962	62.1	65.8	67.4	72.7	63.6	67.3	70.2	76.8
1963	61.6	65.1	66.7	71.7	63.2	66.8	69.6	76.2
1964	61.5	64.8	66.6	71.3	63.0	66.2	69.3	75.1
1965	61.3	64.2	65.7	69.4	63.0	65.8	68.6	73.6
1966	61.8	64.5	65.9	69.1	63.5	65.9	68.5	72.4
1967	62.7	65.3	66.9	69.9	64.5	66.7	69.5	72.9
1968	64.0	66.3	68.2	70.7	65.8	67.7	70.7	73.5
1969	65.4	67.4	69.9	71.6	67.1	68.5	71.8	73.7
1970	67.8	70.2	72.7	75.1	69.6	71.0	74.7	76.7
1971	70.1	72.7	75.3	78.7	71.8	73.3	77.7	79.8
1972	71.6	73.9	76.6	79.6	73.3	74.3	78.8	80.3
1973	74.4	75.5	78.7	79.5	75.8	76.3	80.2	80.8
1974	87.1	87.5	87.8	87.8	87.9	87.6	87.9	87.3
1975	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1976	105.2	105.0	105.6	104.9	105.3	105.1	105.5	105.2
1977	110.8	109.4	110.6	108.1	110.3	109.4	109.3	107.8
1978	118.4	116.1	118.2	115.1	117.6	116.1	116.9	114.7
1979	128.8	125.6	125.0	119.2	128.0	125.3	122.2	118.1
1980	145.0	140.0	142.1	132.8	143.0	139.2	137.2	130.8
1981	159.8	153.4	155.4	144.4	157.3	152.9	149.8	142.5
1982	167.5	161.5	165.0	153.5	164.2	159.9	158.9	151.1
1983	167.6	161.5	167.8	154.7	165.8	161.2	161.6	152.8
1984	171.8	165.2	172.2	157.8	169.6	164.4	164.9	155.2
1985	173.5	166.9	175.8	160.4	170.4	165.0	167.3	156.6
1986	175.0	169.5	179.5	164.9	171.8	166.7	170.0	159.2
1987	180.3	173.3	182.8	167.6	176.8	170.9	172.7	161.2
1988	192.1	182.2	189.3	173.1	187.0	180.3	176.9	164.6
1989	197.1	189.9	194.6	177.8	191.9	185.0	181.7	169.0
1990	199.6	192.8	198.6	181.4	194.5	187.5	185.4	172.2
1991	202.3	195.5	203.1	185.3	197.3	190.2	189.1	175.3

Notes to Appendix Table 5

The hedonic price indexes for the commodities listed below were substituted for the conventional U.S. export or domestic price series used for the indexes covering SITC 7, and All Manufactures in Appendix Table 3. The hedonic indexes were also inserted in a few cases for which no conventional price indexes had been available, so that the commodity coverage in Appendix Table 4 is slightly higher than in Appendix Table 3.

SITC	Group or Subgroup	Source	Period
711.1	Steam generating boilers	Gordon (1990)	1953-83
712.5*	Tractors, other than road tractors for tractor-trailer combinations	"	"
714.3	Statistical machines	Cartwright & Scott (1988)	1983-88 (Average of three quarters)
		Cartwright (1986)	1970-82
		Gordon (1990)	1953-69
719.1	Heating and cooling equipment	Gordon (1990)	1953-83
719.4	Domestic appliances, non-electrical	"	"
722.1	Electric power machinery	"	"
724.9	Telecommunications equipment, n.e.s.	"	"
725	Domestic electrical equipment	"	"
729.3	Thermionic, etc. valves and tubes, photocells, transistors, etc.	Norsworthy & Jang (1993)	1969-86
732.1	Passenger motor cars (other than buses or special vehicles) whether or not assembled	"	"
734	Aircraft	"	"

*With wheel tractors weighted 1/6 and crawler tractors 5/6 in accordance with U.S. export weights.

Appendix Table 6

Price Indexes for Manufactured Exports by Developed Countries with Quality Corrections for SITC 7 Using Hedonic Prices Indexes U.S. Dollars, 1975 Weights of OECD Exports to the World (Annual Averages, 1975=100)

	All Manufactures		SITC 7	
	Adjusted for U.S. Only	Adjusted for All Countries	Adjusted for U.S. Only	Adjusted for All Countries
1953	51.0	57.6	53.5	67.2
1954	50.4	56.7	52.8	66.1
1955	50.7	57.0	53.0	66.2
1956	52.0	58.3	54.4	67.7
1957	53.1	59.4	56.0	69.2
1958	52.2	57.7	55.3	66.9
1959	51.7	56.9	54.6	65.4
1960	51.6	56.3	54.1	64.0
1961	52.0	56.5	54.6	64.1
1962	51.4	55.9	54.5	64.0
1963	51.3	55.6	54.3	63.3
1964	51.8	55.9	54.5	63.1
1965	52.4	56.1	55.1	62.7
1966	53.3	56.5	56.0	62.6
1967	53.4	56.4	56.4	62.5
1968	53.1	56.0	56.2	62.3
1969	54.4	57.2	57.5	63.3
1970	57.8	60.6	61.1	66.9
1971	61.1	63.4	65.5	70.5
1972	66.5	68.2	71.2	74.7
1973	76.2	76.8	79.3	80.6
1974	89.8	89.6	88.2	87.7
1975	100.0	100.0	100.0	100.0
1976	102.3	102.8	102.7	103.5
1977	109.9	109.1	110.5	109.1
1978	125.4	122.6	126.8	121.5
1979	141.7	136.5	139.2	129.7
1980	157.7	153.0	153.6	145.0
1981	151.7	150.1	149.7	146.6
1982	147.1	147.2	147.3	147.3
1983	143.2	143.6	145.2	145.6
1984	138.4	138.5	140.4	140.4
1985	138.7	138.4	141.3	140.7
1986	168.2	167.4	172.6	170.8
1987	190.7	189.3	194.9	192.0
1988	206.8	204.9	206.9	203.0
1989	204.9	202.8	204.6	200.6
1990	224.0	220.3	225.1	218.1
1991	233.8	228.9	238.8	229.0

Notes to Appendix Table 6

For the indexes labeled "Adjusted for U.S. Only," the U.S. indexes for SITC 7 adjusted for quality change are combined with the indexes for other countries as described in the text.

For the indexes labeled "Adjusted for All Countries," each U.S. hedonic price index was substituted for the conventional price index for that particular SITC subgroup or group at the three or, usually, four digit SITC level (or inserted where there had been no conventional index) in the index for every country. The individual country indexes for all manufactures and the world indexes were then aggregated, as in earlier tables. To prevent the hedonic adjustment from affecting uncovered groups and subgroups, the substitution was performed by subtracting the unadjusted indexes from the SITC aggregate and adding back the adjusted indexes with the same weights. Where no unadjusted index existed for a group or subgroup, the subtraction was done assuming that the uncovered items had the same price index as SITC 7 as a whole.

Appendix Table 7

Price Indexes for Manufactured Exports by Developed Countries with Quality Corrections for SITC 7 Using Hedonic Prices Indexes U.S. Dollars, 1975 Weights of OECD Exports to Developing Countries (Annual Averages, 1975=100)

	All Manufactures		SITC 7	
	Adjusted for U.S. Only	Adjusted for All Countries	Adjusted for U.S. Only	Adjusted for All Countries
1953	56.4	66.0	60.2	79.2
1954	55.6	64.8	59.3	77.6
1955	55.4	64.3	58.9	76.6
1956	57.0	66.1	60.7	78.7
1957	58.3	67.4	62.6	80.8
1958	56.5	64.8	61.1	77.9
1959	55.9	63.2	60.0	74.5
1960	55.7	62.4	59.3	72.5
1961	55.5	61.8	59.1	71.6
1962	54.7	60.9	58.7	71.0
1963	54.2	60.0	58.1	69.5
1964	54.6	60.1	58.1	69.0
1965	54.9	59.5	58.3	67.4
1966	55.5	59.6	59.0	67.1
1967	55.6	59.4	59.3	66.7
1968	55.5	59.1	59.2	66.3
1969	56.6	60.1	60.4	67.1
1970	59.4	62.8	63.4	70.1
1971	62.3	65.3	67.3	73.3
1972	67.5	69.5	72.9	76.9
1973	77.0	77.6	80.5	81.8
1974	91.2	91.1	89.9	89.8
1975	100.0	100.0	100.0	100.0
1976	102.4	102.6	102.2	102.6
1977	109.7	108.5	109.7	107.6
1978	126.4	122.4	127.5	120.5
1979	139.6	133.3	135.6	125.1
1980	153.7	147.7	147.1	137.1
1981	153.2	148.7	148.0	140.5
1982	148.0	145.6	143.9	139.4
1983	144.9	141.9	141.9	136.3
1984	142.0	138.6	138.7	132.9
1985	142.0	138.1	139.1	132.6
1986	169.6	164.5	167.2	158.5
1987	188.0	181.9	185.1	174.9
1988	203.1	196.1	197.1	185.6
1989	202.9	195.7	196.3	184.7
1990	216.7	207.9	214.2	199.4
1991	230.0	219.7	227.1	209.8

Appendix Table 8

UN Unit Value Index for Exports of Manufactures by Developed Countries
(1980=100)

1953	28.1	1975	63
1954	27.5	1976	64
1955	27.8	1977	69
1956	29.0	1978	79
1957	29.3	1979	90
1958	29.0	1980	100
1959	29.0	1981	94
1960	29.6	1982	92
1961	29.9	1983	89
1962	29.9	1984	86
1963	29.9	1985	86
1964	30.5	1986	103
1965	31.1	1987	116
1966	31.6	1988	124
1967	31.6	1989	123
1968	31.4	1990	136
1969	32.2	1991	135
1970	34.0	1992	140
1971	36.1		
1972	38.8		
1973	46.9		
1974	56.7		

Sources:

1986-92: United Nations (1993), Special Table F.

1975-85: United Nations (1990), Vol. 1, Special Table G.
United Nations (1991b), Vol. 1, Special Table C.

1953-74: Extrapolated from 1975 by Series MUV from Grilli & Yang (1988).

Appendix Table 9

Price Indexes for Manufactured Exports by Developed Countries, U.S. Dollars, based on 1986 Commodity Export Weights for the Developed Countries and Four East Asian Countries, 1981-1991 (Annual Averages, 1981=100)

Year	Export Weights of				
	Developed Countries	Taiwan	Hong Kong	S.Korea	Singapore
1981	100.0	100.0	100.0	100.0	100.0
1982	96.7	96.1	95.9	96.0	95.3
1983	94.7	93.6	93.0	93.1	92.3
1984	91.8	90.4	89.5	89.8	88.8
1985	92.0	90.1	88.8	89.4	88.3
1986	112.7	109.1	108.0	107.3	105.9
1987	127.8	122.7	121.8	120.8	118.9
1988	137.8	131.2	130.0	128.6	126.5
1989	135.7	127.9	125.9	125.8	123.7
1990	146.9	138.3	136.4	135.0	132.7
1991	154.1	145.0	143.5	141.6	139.3