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Irving B. Kravis
NBER and University of Pennsylvania

Robert E. Lipsey
NBER and Queens College, CUNY

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# EXPORT AND DOMESTIC PRICES UNDER INFLATION AND EXCHANGE RATE MOVEMENTS*

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## Introduction

It is almost invariably taken for granted in theoretical descriptions of the international price mechanism and in the construction of trade models that a country's export price for a particular product is identical to its domestic price. Any impact of foreign or domestic events on prices is expected to fall identically on the export and the domestic price for a good.

In contrast to these conventional assumptions, the few empirical studies of international prices have shown that there are fairly substantial and long-lasting divergences between export and domestic price changes for the same or closely related products.[1] If that evidence is accepted, the

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[1] See, for example, "The Economic Situation: Annual Review," National Institute Economic Review, National Institute of Economic and Social Research, No. 27, Feb. 1964, pp. 47-48; Irving B. Kravis and Robert E. Lipsey [1971], Chapter 8; and [1974].

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We are indebted to Mary Boger, Daniel Gottlieb, Marianne Rey, and Judy Rosenzweig for data collection and programming and to Eliot Kalter of the University of Pennsylvania for the matching of U.S. export and domestic price data for the latter part of the period.

mechanisms of response and adjustment to changes in foreign and domestic economic conditions and to exchange rate changes become more complex than those usually hypothesized.

If there is specialization or if the law of one price does not hold immediately or exactly, two sets of relative price changes are usually expected from an inflation or a devaluation. One involves country to country relative price changes; for example, the prices of a depreciating country's exportables relative to those of other countries should decrease. The other involves within-country changes in the prices of tradable goods (both exportables and import-type goods) relative to nontraded goods; a depreciation, for example, should raise the country's tradable goods prices relative to prices of nontradable goods. The first price change should involve a gain in a country's price competitiveness and therefore in its share of world markets; the second should involve a shift in production to exportables from nontraded goods.

If there can be divergences between export and domestic prices, another type of relative price mechanism may be at work: the depreciating country should find export prices rising relative to domestic prices of the same goods. Thus any tendency for exports to increase will reflect not only the reduction in foreign-currency prices of the country's exports, which makes its products more attractive to foreign buyers, but also the rise in own-currency prices of its exports relative to domestic prices of the same goods, which raises margins on export sales and thus makes exporting a more profitable activity for its own producers. Even for a small country whose foreign-currency prices of its exports and imports are fixed by world markets, the relative rise in profit margins on exports may occur if there is a sufficient degree of separation between home and foreign markets. Thus

there is a supply side aspect to the adjustment, operating through changes in profit margins on export sales relative to domestic sales, as well as the more familiar demand effects. That is not to say that there will not also be changes in the domestic prices of exportables relative to home goods, and shifts in production in response to such relative price changes. However, since a producer can shift more easily from domestic to export sales of a product than from production of home goods to production of export goods we should expect the changes within commodities between domestic sales and exports to occur more rapidly.

What we expect to find, if export and domestic prices of the same products need not be identical or move identically, is something like the following sequence of events from inflation in country A relative to country B:

1. A's domestic prices rise more than, or sooner than, A's export prices of the same products.
2. Exporters in A, enjoying an increase in profit margins on domestic sales relative to exports, tend to shift their sales to the home market.
3. The rise in A's domestic and export prices relative to B's prices will mean an increase in demand for B's exports of the same products and a shift of buyers in A and elsewhere from A's products to B's products.
4. The increase in export demand will raise B's export prices but not by as much as the rise in A's prices.
5. The rise in B's export prices relative to its domestic prices of the same goods will induce a shift by B's producers from home to foreign markets.

6. B's domestic prices will rise, as a result of the decrease in supply, but not by as much as B's export prices did.

A depreciation in country A's exchange rate relative to country B, arising perhaps from speculative or capital movements, might produce the following sequence of events:

1'. A's export prices in A's currency rise relative to domestic prices.

2'. Exporters in A finding export margins higher relative to domestic margins shift sales from domestic to export markets.

3'. The shift to export markets causes an increase in domestic prices in A but by less than the increase in export prices.

4'. The decline in A's export prices in foreign currency, relative to B's prices, produce a shift of buyers from B to A.

5'. The fall in demand for B's exports brings about a decline in B's export prices, a reduction in export margins relative to domestic margins, and a shift from export to domestic sales.

6'. The rise in domestic supply causes a decline in B's domestic price, but not by as much as the decline in B's export price.

Under a system of floating exchange rates both sequences could disappear if exchange rate changes immediately and completely offset relative movements of domestic prices. For example, steps 1' and 3' would cancel step 1 of the first sequence, step 2' would cancel step 2, step 4' would cancel step 3, etc. As we point out below, that is not what actually took place: there were substantial fluctuations in relative dollar prices as well as in domestic currency prices. While some of the domestic price movements were offset by exchange rate changes, in other cases the exchange rate changes themselves produced relative domestic price movements that

were not present in, or smaller in the indexes based on own-currency prices. Thus we must consider the possibility of treating exchange rate changes as an independent variable affecting relative prices.

Since the evidence is strong that there are divergences between export and domestic prices, we wish to trace through the effects of foreign price changes and exchange rate changes on export and domestic prices and see whether a mechanism of the hypothesized type exists. In this paper we concentrate our attention on price movements, but offer some evidence that the response of exports to these price divergences is in the expected direction.

Data

The origin of this study is in the data collected for the original Price Competitiveness study.[2] The price indexes published originally for

[2] Kravis and Lipsey [1971].

U.S., U.K., German, and Japanese international trade in metals and machinery for 1953, 1957, and 1961-64 were based on a substantial amount of original price collection and form the foundation for our later work. These indexes were interpolated for the intervening years by whatever data were available[3]

[3] As described for the German indexes in Kravis and Lipsey [1972].

and those for Germany, Japan, and, partly, the United States extrapolated to 1975 using publicly available data. In addition, the published data for Germany and Japan have been used to construct indexes outside the metals and machinery groups originally covered. For these two countries our indexes cover all manufactured products except foods and fuel through 1974.

To match the international trade price indexes we constructed domestic price indexes for the same three countries and the U.K. The U.S., German, and Japanese domestic price indexes cover all manufactures for 1953 to 1974, while the U.K. indexes cover all manufactures for 1968-74 and only SITC 67 through 73 before that. For SITC 7, however, the domestic price indexes for all the countries have been extended through 1975.

In calculating these indexes we have started with the price data for individual commodities or the most detailed categories for which indexes were available from the sources cited in the Appendixes. We constructed unweighted indexes at the 4-digit SITC level,[4] assuming

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[4] United Nations, Standard International Trade Classification, Revised, Statistical Papers, Series M, No. 34 (United Nations, N.Y., 1961).

in effect that all commodities in a 4-digit subgroup were closely related, and then aggregated these to broader group indexes. Each 4-digit subgroup index was weighted by the particular country's exports of that subgroup in 1963; this weighting scheme was applied alike in the aggregation of export price indexes and domestic price indexes and to the ratios of export to domestic price changes.

Results for U.S. Prices

Our examination of U.S. export and domestic price behavior is confined to those subgroups of machinery and transport equipment for which the BLS has published export price indexes covering the years since 1964. The most recent BLS release[5] includes 61 four- and

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[5] "U.S. Export and Import Price Indexes, Fourth Quarter 1976," Bureau of Labor Statistics, February 2, 1977.

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five-digit SITC product categories, accounting for 40 per cent of U.S. exports in 1974, but we are not able to use, in time series analyses, those commodities for which BLS price collection began only recently. We were able to extend nine of the BLS series back to 1953 and four others part of the way back using the Kravis-Lipsey price indexes. In addition, we have indexes for 1953-64 based on the full set of data from the Price Competitiveness volume.

As was clear from some earlier analyses,[6] export and domestic prices

[6] See footnote 1.

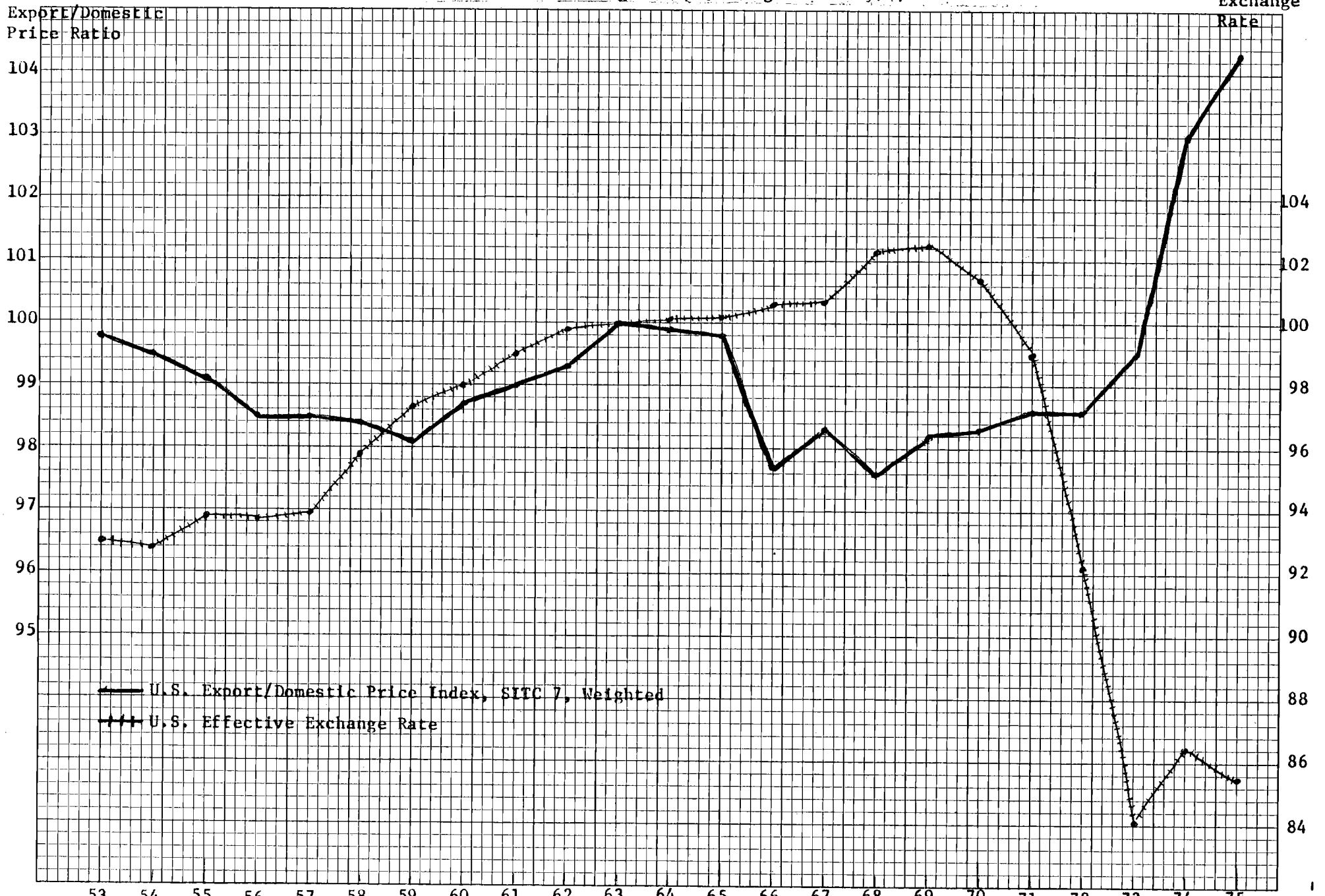
are not identical, do not move identically, and sometimes are not even very highly correlated. However, the correlation is higher for the United States than for the other three countries for which comparisons were made, and high enough that each type of price would usually be significant in an equation for the other type. Since some part of the correlation between the two sets of prices may represent not an impact of one on the other, but the fact that common factors operate on both, there is some advantage in concentrating on the ratio of export to domestic prices.

If, as we hypothesized above, export prices are more sensitive, and/or more quickly sensitive to foreign economic developments than are domestic prices, we should find that a rise in foreign prices, other things equal, increases the ratio of export to domestic prices. An increase in foreign income should have the same effect. Similarly, a devaluation of the U.S. dollar relative to other currencies should produce a relative rise in U.S. export prices even if foreign prices, in foreign currency, do not increase.

The course of the ratio of U.S. export to domestic prices of machinery and transport equipment (SITC 7) over the period from 1953 through 1975 is described in Chart 1, along with the movement of U.S.

CHART 1

U.S. Export/Domestic Price Ratios, SITC 7, and
U.S. Effective Exchange Rate (Foreign Currency/$)




Source: Appendix Tables A-1 and D-1.

exchange rates. The rise in U.S. exchange rates until 1969 reflects depreciations in other currencies--France in the late 1950's, Canada in the early 1960's and the U.K. at the end of the 1960's. The fall between 1969 and 1971 reflects currency appreciations, principally that of the Deutschmark.[7] After 1971, of course, the depreciation of the dollar is

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[7] The change in the effective exchange rate of the U.S. dollar against other major currencies as a group (see Appendix Table D-1) during the period of "fixed rates" up to 1971 is not atypical of major currencies. The constancy of exchange rates under the Bretton-Woods system may easily be exaggerated.

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the main constituent of this average exchange rate movement.

The depreciation of the dollar from the late 1960's to the mid-1970's (about 17 per cent) was accompanied, or followed, by a substantial upswing in the rate of U.S. export to domestic prices (amounting to almost 7 per cent). The earlier long appreciation of the dollar from 1954 to 1968 or 1969, by about 10 per cent, was accompanied by a 2 per cent decline in the price ratio (or about 5 per cent if the more complete, but less consistent B Series of Appendix Table A-1 is used).[8] Thus there is some indication

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[8] As can be seen from the columns in Appendix Table A-1 showing unweighted average and median export/domestic price ratios and the series on the diffusion of relative price changes (the per cent of increases in the export/domestic price ratio among four-digit sub-groups), the movement of the price ratio for SITC 7 did almost always

represent a consensus among the subgroups, with the aggregate price ratio rising when more than 50 per cent of the subgroup ratios were rising. There were only three exceptions to this agreement in the 22 years.

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here that the export/domestic price ratio may have been influenced by exchange rate changes, although the relationship is certainly not close.

Aside from questions of causation, it is clear that U.S. export prices in foreign currency did not fall as much in the 1970's or rise as much in the 1950's and 1960's as one might have inferred from the movements of domestic prices and the U.S. exchange rate. In other words, even if U.S. domestic prices were not affected by depreciations or appreciations of the dollar, 20 to 50 per cent of the effect of appreciations up to 1968 and almost half of the effect of the later depreciations on foreign currency prices of U.S. exports was offset, after a few years, by declines or rises in U.S. export prices relative to domestic prices. If U.S. domestic prices were decreased by the appreciation and increased by the depreciation, the offset was even larger.

The changes in the export/domestic price ratio mean that there must have been changes in margins on export sales as compared with those on domestic sales. Producers' margins on export sales must have declined relative to those on domestic sales for most of the period, particularly from 1953 to 1957, and 1964 to 1966 or 1968 and then must have risen substantially after 1972.

We would expect the U.S. export/domestic price ratio to be affected not only by exchange rates but also by foreign price movements, if they are different from those in the United States. The relative

price movements are measured in two ways. One is the relative rate of inflation, which is a comparison of price indexes in each country's own currency. The second is the index of domestic price competitiveness, which is the comparison of price indexes translated into a single currency. For example, to examine effects on the United States, we translate foreign prices into dollars. The measure of domestic price competitiveness is intended to reflect domestic rates of inflation and cyclical pressures, plus the effects of changes in exchange rates, rather than the ability of each country to sell abroad in competition with others. That we measure by a price competitiveness index based on international prices.

If we were not confining our attention in this paper to the price movements themselves, an obvious extension would be to substitute, for the inflation rates, some of the factors that account for the rate of inflation, such as the growth in the money supply of each country. Except to the extent that the money supply is itself dependent on the balance of payments, the use of a money supply variable would avoid the problem that our "independent" variables, such as foreign prices and exchange rates, could be thought of as depending to some degree on the home country's prices.

The movements of the U.K. and German relative inflation rates, in Chart 2, appear to offer a possible explanation for some of the fluctuations in the U.S. export/domestic price ratio up to the early 1960's.[9]

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[9] The strong downward trend of Japanese relative prices seems to be reflected more strongly in the B Series of Appendix Table A-1 than in the A Series shown in the chart.

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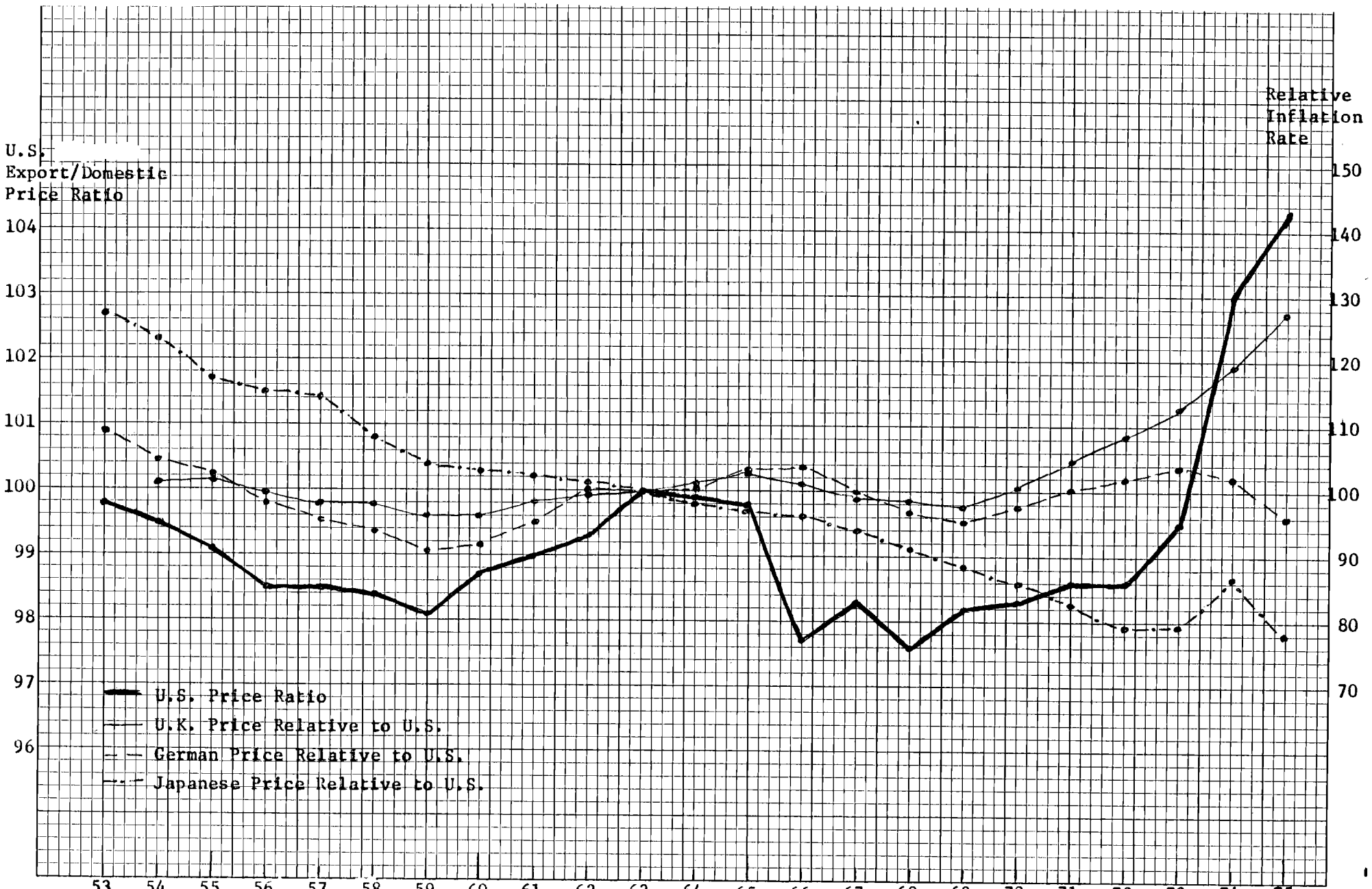
CHART 2

U.S. Export/Domestic Price Ratio and Inflation Rates in Germany, Japan, and the U.K. Relative to the U.S., SITC 7, as Measured by Domestic Prices in DM, Yen, £, and $




Source: Appendix Tables A-1 and A-3.

After that, the changes in U.S. domestic price competitiveness, particularly relative to Germany, which reflect the sharp exchange rate changes of the 1970's, seem more closely related to the price ratio (Chart 3).

Although the timing is not exact, each broad movement in German and U.K. prices relative to U.S. prices, in their own currencies or translated into dollars, is matched by a corresponding change in the U.S. export/domestic price ratio. That is, if we divide the period into phases according to relative price movements (Table 1) we find that during each period of relatively falling German and U.K. prices the export/domestic price ratio for the United States declined, and during each period of rising German and U.K. prices the U.S. export/domestic price ratios increased. The change in Japanese relative prices involved only a long decline through 1971 and then an increase but there was no close match with the U.S. export/domestic price ratios.

The swings in the export/domestic price ratio appear fairly small compared with the changes in domestic price competitiveness. However, if the effect of these changes on the export/domestic price ratio is mainly via changes in margins on exports compared to those on domestic sales, even a small swing in the price ratio could strongly influence the supply of exports. For example, if the margin on both domestic and export sales was initially 5 per cent[10] and the export price then rose by one per cent

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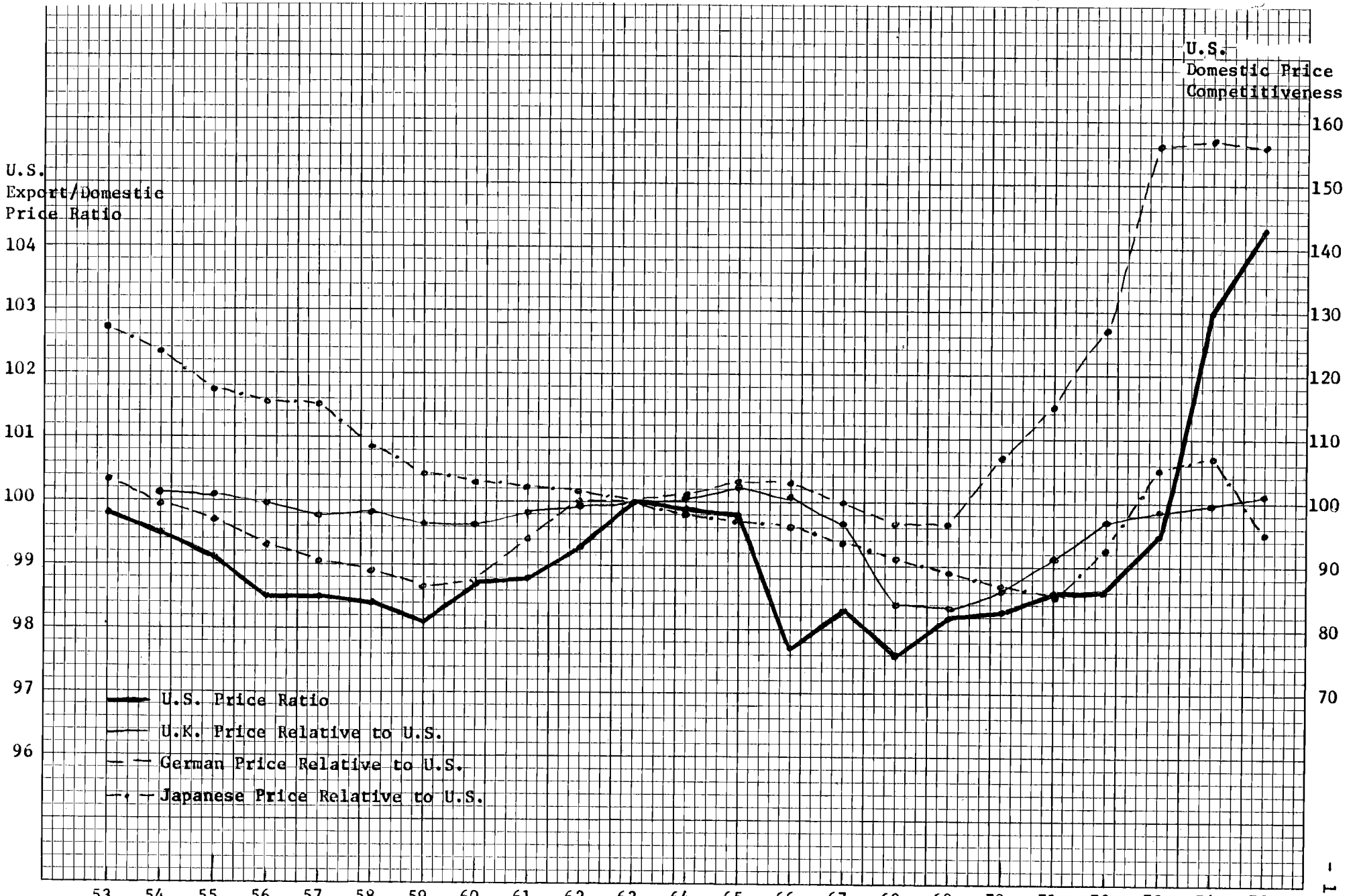
[10] For the U.S. domestic corporations roughly approximating SITC 7 the ratio of net income before tax to sales was about 4 per cent in 1970. After tax income was less than 2 per cent of sales (Statistics of Income, 1970: Corporate Income Tax Returns, p. 18, Industries 25 through 28).

CHART 3

U.S. Export/Domestic Price Ratio and U.S. Domestic Price Competitiveness Relative to Germany, Japan, and the U.K., SITC 7, as Measured by Domestic Prices in $




Source: Appendix Tables A-1 and A-3.

TABLE 1

Changes in U.S. Export/Domestic Price Ratio Compared with Changes in Relative Rates of Inflation and in U.S. Domestic Price Competitiveness Relative to Germany and the U.K.

Machinery and Transport Equipment: SITC 7

| | Per Cent Change in | | | | |
|---|---|---|---|---|---|
| | Inflation Rate Relative to U.S.[a] | | U.S. Domestic Price Competitiveness[b] Relative to | | U.S. Export/Domestic Price Ratio |
| Period | Germany | U.K. | Germany | U.K. | |
| 1953-59[c] | -16.8 | -5.0 | -16.4 | -5.0 | -1.7 |
| 1959-65 | +13.5 | +6.9 | +18.6 | +6.3 | +1.7 |
| 1965-69 | -7.5 | -4.8 | -5.8 | -18.5 | -1.6 |
| 1969-74 | +7.2 | +22.0 | +62.7 | +19.4 | +4.9 |

Source: Appendix Tables A-1 and A-3.

a Measured by ratios of German and U.K. domestic price indexes, in own currency, to the U.S. domestic price index, in dollars.

b Measured by ratios of German and U.K. domestic price indexes, in dollars, to U.S. domestic price index.

c 1954-59 for the U.K.

relative to the domestic price, the margin on export sales would become 20 per cent higher than that on domestic sales, giving a strong inducement to producers to shift from domestic to export markets.

The effect of any inducement to U.S. producers to shift to export markets should be evident in the ratio of exports to domestic shipments. As can be seen in Chart 4, there were comparatively small swings in this ratio before the early 1970's, but the sharp rise in the export/domestic price ratio after 1972 was accompanied by a similarly sharp increase in the ratio of export to domestic sales. Thus the record of these last years conforms to the hypothesis of a high elasticity of response, on the supply side, to a change in margins on export relative to domestic sales, although it presumably also reflects the effects of relative changes in demand, which could produce a similar relationship.

One problem of the analysis of price and exchange rate changes is clear from a comparison of Charts 1 and 3. That is that the major swings in German, and later British prices, expressed in dollars, took place in the years after 1969, at the same time as the major changes in the exchange rate of the dollar, and it will therefore be difficult to distinguish statistically between the two variables. In fact the depreciation of the dollar relative to the DM was a significant part of the change in the U.S. exchange rate vis-a-vis all countries after 1969, plotted in Chart 1.

The effects of exchange rate changes can be seen in a comparison between the two parts of Appendix Table A-4, summarized in Table 2. Over the period as a whole, exchange rate changes for the U.K. and Japan tended to offset relative price changes, almost completely for the U.K. and partially for Japan. However, in the case of Germany, the rise in the

CHART 4

U.S. Export/Domestic Price Ratio and Ratio of Exports to Total Manufacturing Shipments
Machinery and Transport Equipment: SITC 7

1963=100

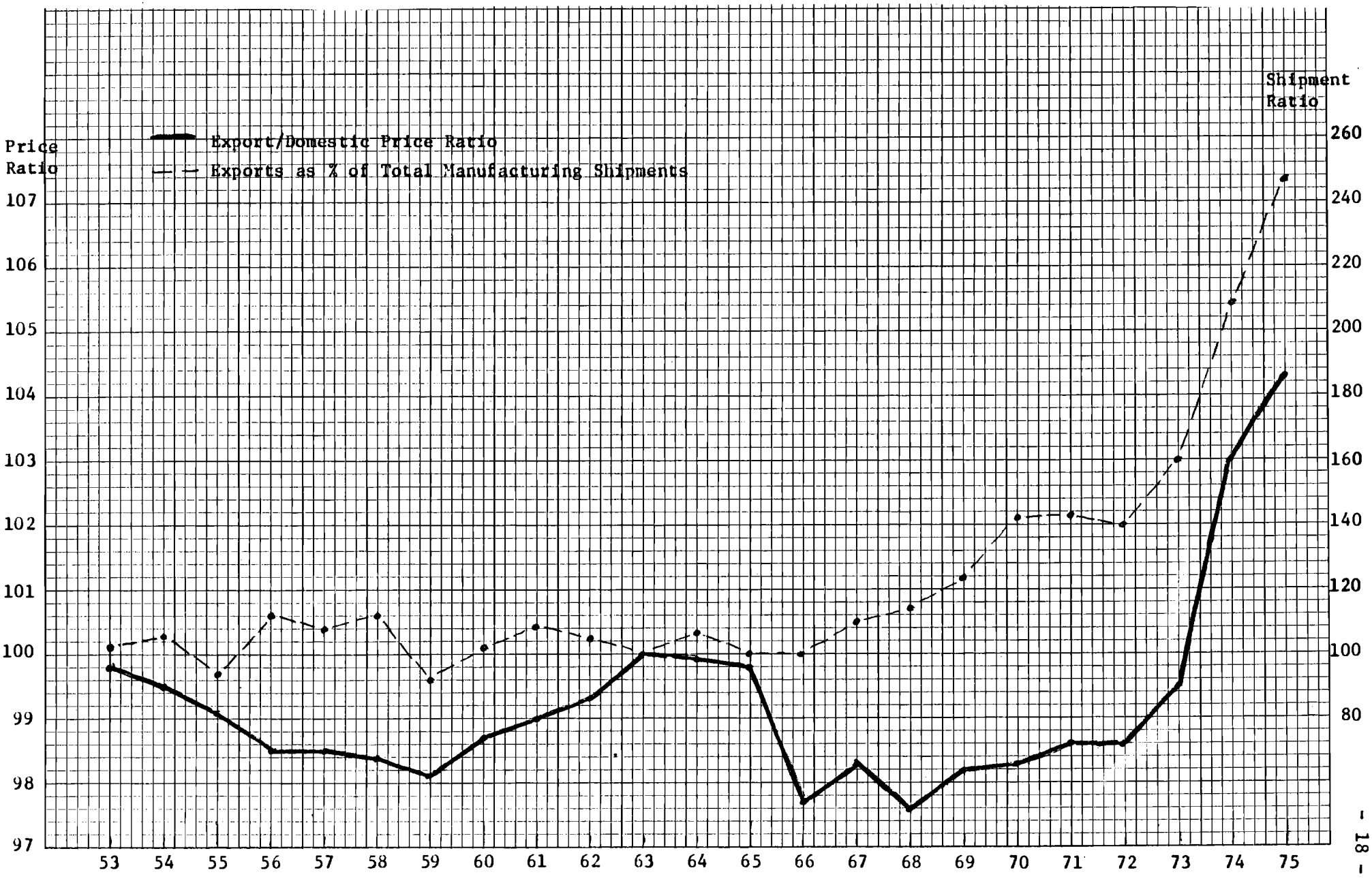


TABLE 2

Measures of Relative Domestic Price Change in Own Currencies and in Dollars, Germany, U.K., and Japan Relative to the U.S.

Machinery and Transport Equipment: SITC 7

| | Relative Price Change Own Currency | | | U.S. Domestic Price Competitiveness Dollars Relative to | | |
|---|---|---|---|---|---|---|
| | Germany | U.K.[a] | Japan | Germany | U.K.[a] | Japan |
| 1969/1953 | 87.3 | 96.6 | 69.7 | 93.3 | 82.3 | 70.0 |
| 1975/1969 | 100.9 | 130.3 | 88.1 | 161.4 | 121.1 | 106.5 |
| 1975/1953 | 88.2 | 125.9 | 61.4 | 150.7 | 99.6 | 74.6 |

Source: Appendix Table A-3.

[a] Periods are 1969/1954 and 1975/1954.

exchange rate, while it was in the direction opposite to that of price movements, went so far in the other direction as to produce a large change in domestic price competitiveness. In the flexible exchange rate period taken by itself two out of the three exchange rate movements produced changes in domestic price competitiveness instead of simply offsetting changes brought about by differences in rates of inflation. In the case of Germany, the rise in value of the DM resulted in a large increase in U.S. price competitiveness, in a period when the U.S. and Germany had almost identical rates of inflation. A relative fall in Japanese own-currency prices was reversed and turned into a relative rise in Japanese prices in dollars.

We are thus led to suspect that changes in exchange rates play some partially independent role and are not simply offsets to differences in inflation rates. For that reason we treat them separately in analyzing movements in prices and in the export/domestic price ratio.

Since we are looking here for measures of pressure on each country's domestic economy we also experimented with non-price measures of business cycle conditions. They proved significant only for Japan, however, and we therefore reserve discussion of them to the section on factors influencing Japanese prices.

Any analysis of one variable at a time is subject to the difficulty that several variables are likely to be acting simultaneously on prices. We have therefore explored several combinations of variables with a few multiple regressions in which we attempt to explain the movements of export and domestic prices and the export/domestic price ratio by changes in some of the obvious variables. In particular we wish to consider the effects of foreign relative inflation rates, U.S. exchange rates, and the combination of the two: U.S. domestic price competitiveness relative to each country. We have somewhat biased the results against our hypotheses by taking one country at a time relative to the United States, when presumably all have some influence. We were not able to include more than one foreign country in an equation because we quickly ran short on degrees of freedom.

Looking first at the movement of the U.S. export/domestic price ratio we examine the influence of relative inflation rates and exchange rates separately in the first six equations of Table 3 and then their combined influence as the domestic price competitiveness variable in the next four equations.[11]

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[11] The exchange rate variable in the equations is the change in price of foreign currency, rather than the change in price of the dollar, as in Chart 1. Thus the effect of a U.S. devaluation in the equations is in the same direction as that of a rise in foreign prices.

TABLE 3

Regressions of U.S. Export/Domestic Price Ratio on Relative Foreign Prices and Exchange Rates, Current and Lagged[a]

Machinery and Transport Equipment: SITC 7

| Eq. No. | Constant | Price Variable | | | Exchange Rate ($/Foreign Currency) | | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|
| | | Current | Lagged 1 Year | Lagged 2 Years | Current | Lagged 1 Year | Lagged 2 Years | | |
| | | | | Price Variable: Relative Rate of Inflation | | | | | |
| Germany (1953-75) | | | | | | | | | |
| 1 | -0.1889 (.97)[b] | -.0440 (.66) | -.0190 (.26) | | -.0111 (.30) | .1754 (4.51) | | .52 | 2.21 |
| 2 | -.1905 (.90) | .0262 (.30) | -.0822 (.81) | .0203 (.25) | -.0358 (.84) | .1623 (3.87) | .0584 (1.22) | .51 | 2.63 |
| U.K. (1954-75)[c] | | | | | | | | | |
| 3 | -.0467 (.21) | .2996 (2.34) | -.0952 (.66) | | -.0102 (.17) | -.0438 (.72) | | .27 | 2.44 |
| 4 | -.0273 (.12) | .3406 (2.56) | -.2643 (1.52) | .2096 (1.34) | .0233 (.39) | -.0785 (1.27) | .0815 (1.31) | .33 | 2.58 |
| Japan (1953-75) | | | | | | | | | |
| 5 | 0.4745 (1.03) | -.0001 (.00) | .1375 (2.16) | | -.0603 (1.18) | .1482 (1.62) | | .41 | 2.05 |
| 6 | -0.3087 (.59) | .1030 (.88) | -.0734 (.59) | -.1098 (.87) | -.0035 (.07) | -.0196 (.19) | .2379 (2.58) | .57 | 2.64 |
| | | | | Price Variable: U.S. Price Competitiveness | | | | | |
| Germany (1953-75) | | | | | | | | | |
| 7 | .0417 (.22) | -.0306 (.97) | .1177 (3.79) | | | | | .40 | 1.87 |
| 8 | .0106 (.05) | -.0284 (.86) | .1012 (2.76) | .0306 (.95) | | | | .38 | 1.98 |
| U.K. (1954-75) | | | | | | | | | |
| 9 | 0.2995 (1.31) | .1086 (1.61) | -.0998 (1.30) | .1366 (2.02) | | | | .12 | 1.69 |
| Japan (1953-75) | | | | | | | | | |
| 10 | 0.3896 (2.20) | -.0460 (1.30) | .1664 (4.32) | | | | | .47 | 2.15 |
| 11 | 0.4437 (2.17) | -.0321 (.62) | .1423 (2.18) | .0270 (.45) | | | | .44 | 2.19 |

Notes to TABLE 3

[a] Arithmetic regressions with all variables in the form $100\frac{t_1-t_0}{t_0}$.

[b] t-ratios in parentheses.

[c] Dates indicate coverage of data. The equation with a one-year lag will use observations for the dependent variable starting one year later. Thus equation 3 is calculated from data that extend from 1954 through 1975, but since the independent variable is used with a one-year lag, the time range of the dependent variable is actually 1955-75.

For Germany it is changes in the exchange rate (the price of the DM) which affect the U.S. export/domestic price ratio, with a one-year lag. In the case of the U.K., the only significant influence on the U.S. price ratio is the expected positive one of relative inflation rates in the same year. For Japan there is some indication of both price and exchange rate influences with a one-year lag in equation 5 while the exchange rate with a two-year lag is the significant variable once it is entered.

When we combine exchange rates and relative inflation rates for Germany and Japan the results are quite consistent in showing a significant impact of changes in domestic price competitiveness acting with a one-year lag. Equations 8 through 11 mostly explain less of the variability in the U.S. export/domestic price ratio than equations 3 through 6, but they are also less affected by serial correlation. In the British case, however, little relation to U.S. price ratios is visible, perhaps because there was little overall change in domestic price competitiveness.

On the whole, then, the evidence suggests that the U.S. price ratio is influenced in the expected direction by foreign price and exchange rate changes, mostly with a lag of about a year. The German influence was mostly through exchange rate changes, not surprisingly because U.S. price competitiveness relative to Germany was dominated by exchange rates; relative inflation rates were similar.

In Tables 4 through 6 we break down the effects of foreign prices and exchange rates on the U.S. export/domestic price ratio into the separate influences on U.S. export and domestic prices. The analysis is crude in several respects. In particular, of the many domestic influences on prices we have selected only one, unit labor costs, as a way of

summarizing the effects of any domestic monetary and fiscal developments as well as those of changes in labor productivity. Unfortunately, the unit labor cost variable applies to manufacturing as a whole rather than to machinery and transport equipment. Thus the variable is only really appropriate in the equations for all manufacturing.

The equations for German price and exchange rate influences on U.S. prices (Table 4) consist of three sets: four equations for an aggregate of those subgroups of SITC 7 for which both export and domestic prices are available, two equations for domestic prices of SITC 7 as a whole, including those commodities for which we have no export price data, and two equations for all manufactured products, SITC 5 through 8. They suggest some lagged effects of German prices, at least in the machinery and transport equipment area, and lagged effects of exchange rate changes on U.S. domestic prices of manufactures as a whole. As we expect from the results for the export/domestic price ratio, the rate of inflation in Germany did not affect U.S. export and domestic prices very differently, although there were significant lagged effects on both of them. The exchange rate coefficients are unexpectedly negative for the current year, but again of roughly the same size for U.S. export and domestic prices. They are also of about the same size as, but opposite in sign to, the price coefficients, and most of the current year impact therefore washes out in the equations in which German prices in dollars are used. In the case of the exchange rate lagged one year, however, the coefficient for export prices was positive while that for domestic prices was negative, although neither was statistically significant. It is this difference in sign that produces the lagged relationship of foreign prices in

TABLE 4

Regressions of U.S. Export and Domestic Price Indexes on German Prices and Exchange Rates, Current and Lagged[a]

Machinery and Transport Equipment: SITC 7; and All Manufactures: SITC 5-8

| Eq. No. | Dependent Variable | Currency of Foreign Price Variable | Constant | U.S. Unit Labor Cost | Price Variable | | Exchange Rate ($/DM) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| Subset of SITC 7[b] (1953-75)[c] | | | | | | | | | | |
| 1 | XPI | DM | .4500 (.66)[d] | .7308 (5.31) | .1882 (.72) | .3741 (1.97) | -.1858 (1.76) | .0767 (.56) | .81 | 1.61 |
| 2 | DPI | DM | .5615 (.89) | .6563 (5.17) | .2578 (1.08) | .3672 (2.10) | -.1604 (1.65) | -.1015 (.81) | .78 | 1.79 |
| 3 | XPI | $ | 1.0812 (1.77) | .7766 (5.79) | -.1029 (1.13) | .2293 (2.29) | | | .79 | 1.64 |
| 4 | DPI | $ | 1.3906 (2.24) | .7014 (5.13) | -.0648 (.70) | .1203 (1.18) | | | .71 | 1.84 |
| Total SITC 7[e] (1953-75) | | | | | | | | | | |
| 5 | DPI | DM | 1.3637 (2.10) | .6918 (5.29) | .1434 (.58) | .2476 (1.37) | -.1917 (1.91) | -.0025 (.02) | .76 | 1.25 |
| 6 | DPI | $ | 1.9066 (3.34) | .7327 (5.84) | -.1174 (1.38) | .1326 (1.42) | | | .75 | 1.44 |
| SITC 5-8 (1953-74) | | | | | | | | | | |
| 7 | DPI | DM | 1.6449 (3.76) | .4974 (5.06) | .0806 (.42) | -.2249 (1.42) | -.1793 (2.86) | .4431 (3.25) | .89 | 1.43 |
| 8 | DPI | $ | 1.2026 (2.70) | .6347 (5.56) | -.1204 (1.74) | .2592 (3.33) | | | .82 | 1.51 |

Notes to TABLE 4

[a] Arithmetic regressions with all variables in the form $100\frac{t_1-t_0}{t_0}$.

[b] An aggregate covering only those subgroups for which both export and domestic price data are available.

[c] Dates indicate coverage of data. The equation with a one-year lag will use observations for the dependent variable starting one year later. Thus equation 1 is calculated from data that extend from 1953 through 1975, but since the independent variable is used with a one-year lag, the time range of the dependent variable is actually 1954-75.

[d] t-ratios in parentheses.

[e] An aggregate of all those subgroups for which domestic price data are available.

dollars to the export/domestic price ratio. Thus our comparisons of equations for matched sets of export and domestic prices indicate that German own-currency prices or rates of inflation affect both U.S. export and U.S. domestic prices by a year later. German prices in dollars significantly affect only U.S. export prices, also after a year.

The equations for SITC 7 as a whole can only be calculated for domestic prices but they suggest results fairly similar to those for the subgroups: a lagged foreign inflation or foreign currency price effect and a perverse current exchange rate effect. The equations for all manufacturing, SITC 5-8, indicate a strong lagged positive effect of exchange rate changes, more than offsetting the unexpected current year negative coefficient, and a corresponding strong effect for German domestic prices in dollars, also lagged one year. For all manufacturing then, the equations suggest that 10-15 per cent of the effect of, say, a rise in German domestic prices or exchange rates is offset, after a year, by a corresponding rise in U.S. domestic prices, apart from any additional offsetting that would occur from a rise in the U.S. export/domestic price ratio, such as we found for machinery.

British prices (Table 5) also showed a larger impact on U.S. export prices than on domestic prices over two years, as we would expect. The impact on export prices was in the current year, as was that on the U.S. export/domestic price ratio, while that on U.S. domestic prices showed some tendency to be delayed until the next year. There was no visible effect of exchange rates and that of U.K. prices measured in dollars was only marginally significant, although the coefficients were substantial. We can observe a similar, but even stronger relation of current British

TABLE 5

Regressions of U.S. Export and Domestic Price Indexes on U.K. Prices and Exchange Rates, Current and Lagged[a]

Machinery and Transport Equipment: SITC 7; and All Manufactures: SITC 5-8

| Eq. No. | Dependent Variable | Currency of Foreign Price Variable | Constant | U.S. Unit Labor Cost | Price Variable | | Exchange Rate ($/£) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| Subset of SITC 7[b] (1954-75)[c] | | | | | | | | | | |
| 1 | XPI | £ | .1284 (.32)[d] | .3046 (2.19) | .4543 (3.24) | .1106 (.87) | -.0850 (.97) | .0499 (.56) | .92 | 1.96 |
| 2 | DPI | £ | .2562 (.70) | .3190 (2.48) | .2176 (1.68) | .2926 (2.49) | -.1329 (1.64) | -.0144 (.17) | .91 | 1.40 |
| 3 | XPI | $ | .5990 (1.02) | .7487 (5.52) | .1982 (1.64) | .1031 (.89) | | | .81 | 1.77 |
| 4 | DPI | $ | .7892 (1.45) | .6417 (5.07) | .1129 (1.00) | .1622 (1.50) | | | .78 | 1.83 |
| Total SITC 7[e] (1954-75) | | | | | | | | | | |
| 5 | DPI | £ | .6477 (1.53) | .4689 (3.16) | .1969 (1.31) | .1896 (1.39) | -.0858 (.92) | .0239 (.25) | .88 | 1.50 |
| 6 | DPI | $ | 1.0180 (2.09) | .7092 (6.27) | .0966 (.96) | .1230 (1.27) | | | .83 | 2.05 |
| SITC 5-8 (1955-74) | | | | | | | | | | |
| 7 | DPI | £ | 0.2229 (.46) | .4063 (3.19) | .4298 (3.84) | .0000 (.00) | -.0059 (.65) | .0042 (.51) | .91 | 1.94 |
| 8 | DPI | $ | .6660 (1.30) | .7480 (6.00) | .1697 (1.69) | .0202 (.11) | | | .82 | 2.52 |

Notes to TABLE 5

[a] Arithmetic regressions with all variables in the form $100\frac{t_1-t_0}{t_0}$.

[b] An aggregate covering only those subgroups for which both export and domestic price data are available.

[c] Dates indicate coverage of data. The equation with a one-year lag will use observations for the dependent variable starting one year later. Thus equation 1 is calculated from data that extend from 1954 through 1975, but since the independent variable is used with a one-year lag, the time range of the dependent variable is actually 1955-75.

[d] t-ratios in parentheses.

[e] An aggregate of all those subgroups for which domestic price data are available.

inflation to U.S. domestic prices in the equation for all manufactured products. Again there is little or no effect of exchange rates or of British prices measured in dollars.

Japanese prices appear to have a somewhat larger impact on U.S. export prices than on U.S. domestic prices (Table 6). No exchange rate effects are visible, but the combination of inflation rates with exchange rates in the dollar price equations produces some very different results from those in the equations in which the variables are separated. In the latter case (own-currency prices) there seem to be positive current and lagged price effects, but in the former case (dollar prices) the current year coefficients are generally negative, and all the expected positive price effect is concentrated in the second year. We tend to discount the equations in yen prices because the coefficients for U.S. unit labor cost seem suspiciously low. Presumably the current-year relative inflation effect becomes entangled with the current-year labor cost effect.

Results for German Prices

For Germany we are able to extend our study beyond machinery and transport equipment, which has been the focus of our attention until now, and to examine the behavior of prices of all manufactured goods (SITC 5-8) except foods and fuel. One advantage of the broadness of the German coverage is that we can more appropriately use variables for total manufacturing, such as unit labor cost. These aggregate variables are still not ideal for our purposes, since the weighting is generally by the domestic importance of each industry, but they may nevertheless provide some insights into price behavior.

TABLE 6

Regressions of U.S. Export and Domestic Price Indexes on Japanese Prices and Exchange Rates, Current and Lagged[a]

Machinery and Transport Equipment: SITC 7; and All Manufactures: SITC 5-8

| Eq. No. | Dependent Variable | Currency of Foreign Price Variable | Constant | U.S. Unit Labor Cost | Price Variable | | Exchange Rate ($/Yen) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| Subset of SITC 7[b] (1953-75)[c] | | | | | | | | | | |
| 1 | XPI | Yen | 2.7472 (7.07)[d] | .1588 (1.13) | .4873 (3.16) | .4270 (4.13) | -.0137 (.13) | .1678 (.94) | .93 | 1.70 |
| 2 | DPI | Yen | 2.5766 (7.81) | .2115 (1.77) | .4151 (3.25) | .3469 (4.20) | .0806 (1.00) | -.2905 (.14) | .93 | 2.32 |
| 3 | XPI | $ | 1.9318 (3.59) | .5362 (3.02) | -.2352 (2.13) | .4878 (2.97) | | | .82 | 2.16 |
| 4 | DPI | $ | 1.9432 (3.66) | .5116 (2.92) | -.2251 (2.07) | .3671 (2.27) | | | .76 | 2.16 |
| Total SITC 7[e] (1953-75) | | | | | | | | | | |
| 5 | DPI | Yen | 2.8516 (6.43) | .2725 (1.70) | .4459 (2.60) | .2330 (2.10) | .0549 (.51) | -.3111 (1.71) | .87 | 1.06 |
| 6 | DPI | $ | 2.1493 (4.04) | .5957 (3.40) | -.1799 (1.65) | .2656 (1.64) | | | .76 | 1.70 |
| SITC 5-8 (1953-74) | | | | | | | | | | |
| 7 | DPI | Yen | 1.9979 (4.64) | .2221 (1.25) | .2219 (1.41) | .2321 (1.80) | -.1400 (1.32) | .0107 (.04) | .84 | 1.49 |
| 8 | DPI | $ | 1.7433 (3.98) | .3976 (2.49) | -.0481 (.90) | .2619 (3.12) | | | .81 | 1.79 |

Notes to TABLE 6

[a] Arithmetic regressions with all variables in the form $100\frac{t_1-t_0}{t_0}$.

[b] An aggregate covering only those subgroups for which both export and domestic price data are available.

[c] Dates indicate coverage of data. The equation with a one-year lag will use observations for the dependent variable starting one year later. Thus equation 1 is calculated from data that extend from 1953 through 1975, but since the independent variable is used with a one-year lag, the time range of the dependent variable is actually 1954-75.

[d] t-ratios in parentheses.

[e] An aggregate covering all those subgroups for which domestic price data are available.

As is true for the United States, there have been substantial movements in the ratio of German export to domestic prices (Chart 5). For all manufactures the peak ratio, in 1954, was about 8 per cent above the lowest, in 1972. Between those two years the change in this ratio offset roughly 20 per cent of the effect of exchange rate changes on German export prices in foreign currency. The trend of the ratio was down, just as the trend in exchange rates was up, and the largest decline in the ratio was from 1960 to 1962, at the time of and after the 1961 revaluation.[12]

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[12] The fall in the export/domestic price ratio was quite general among the classes of German manufactured goods, particularly from 1960 to 1962.

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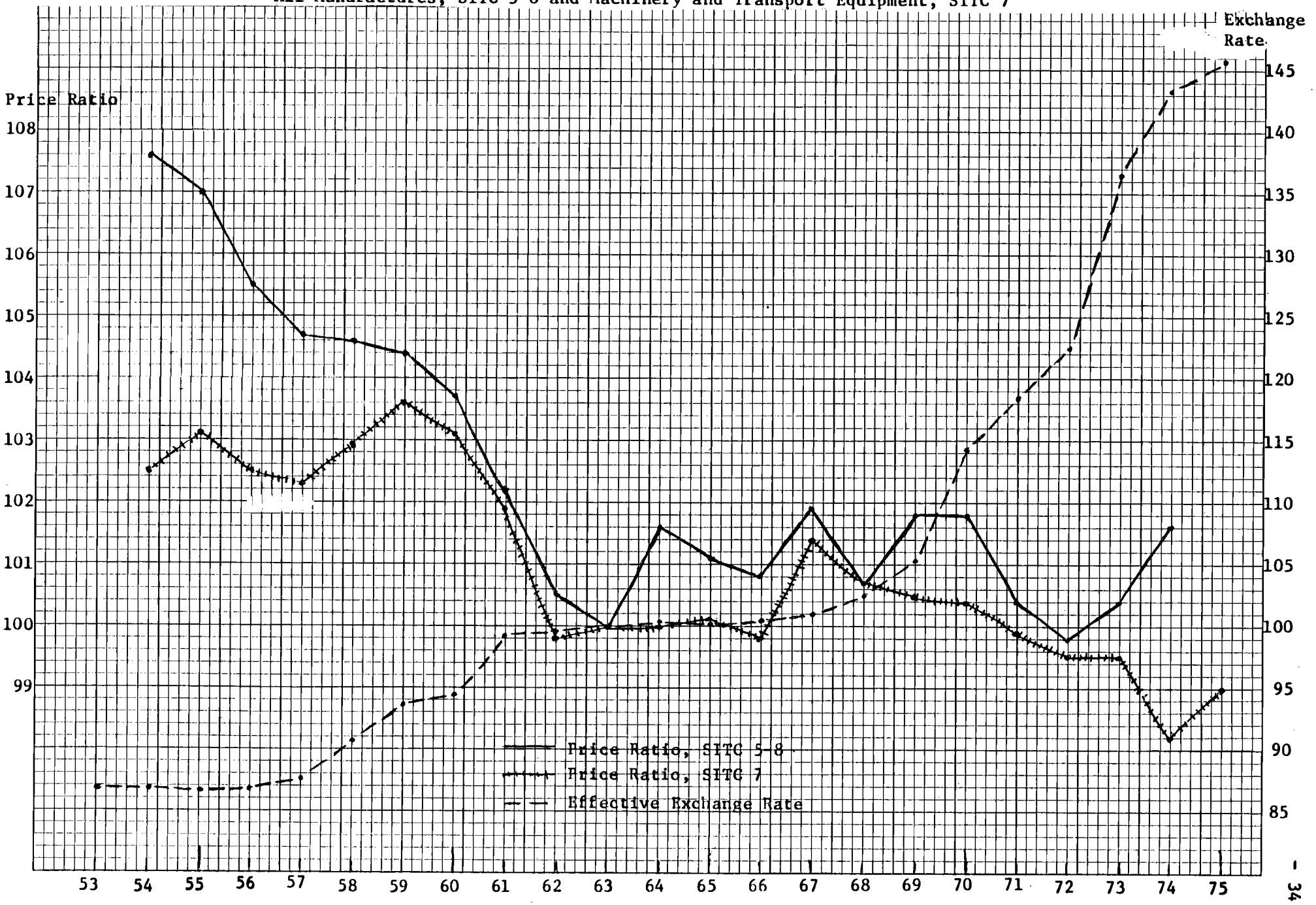
Contrary to our expectations regarding the effect of exchange rates, however, the ratio rose from 1972 to 1974 despite large upward revaluations in those years, and it also fell sharply in 1954-57, when the exchange rate was stable. Clearly, then, the exchange rate was not the sole influence on the export/domestic price ratio.

The decline in the price ratio in 1960-62 was over 3 per cent, while the upward revaluation of the DM was 5 per cent. Thus more than 60 per cent of the effect of the revaluation on export prices in foreign currency (assuming no effect on domestic prices) was offset by the fall in the export/domestic price ratio. If domestic prices were reduced by the revaluation, of course, the offset was even greater. In 1970-72 the offset was much smaller--only 2 per cent against a revaluation of 7 per cent, or of 16 per cent if we take the change from 1969 to 1972.

CHART 5

German Export/Domestic Price Ratio and German Effective Exchange Rate
All Manufactures, SITC 5-8 and Machinery and Transport Equipment, SITC 7



In 1972-74 the change in the price ratio reinforced the effect of the revaluation on German export prices.

The machinery and transport equipment group, which was the one analyzed for the United States, is shown separately in Chart 5. Here the relation of exchange rate changes to the price ratio seems stronger, with the price ratio declining from 1959 to 1962 and 1967 through 1974 while the price of German currency was rising in both periods. When the currency price was relatively stable, in the mid-1950's and the mid-1960's, the price ratio also had a period of stability. The 1959-62 fall in the price ratio by almost 4 per cent offset almost three quarters of the upward revaluation of the DM in 1961 (spread over two years in the annual averages shown on the chart). In 1967-74 the fall in the price ratio, again over 3 per cent, offset less than 8 per cent of the large upward revaluation of the DM.

Of course, the fact that changes in the export/domestic price ratio do not go far toward offsetting a more than 40 per cent revaluation is not surprising. Even a 3 per cent change in the export/domestic price ratio is large relative to typical sales margins in manufacturing, as was pointed out earlier. The fact that the ratio for Germany could fall as much as the 7 per cent shown for all manufacturing or the 5 per cent for machinery and transport equipment suggests that German manufacturers' margins on exports may have been greatly inflated by the undervaluation of the DM in the late 1950's.

Another possible influence on the German export/domestic price ratio is, of course, foreign prices, shown in Chart 6.[13] The decline in

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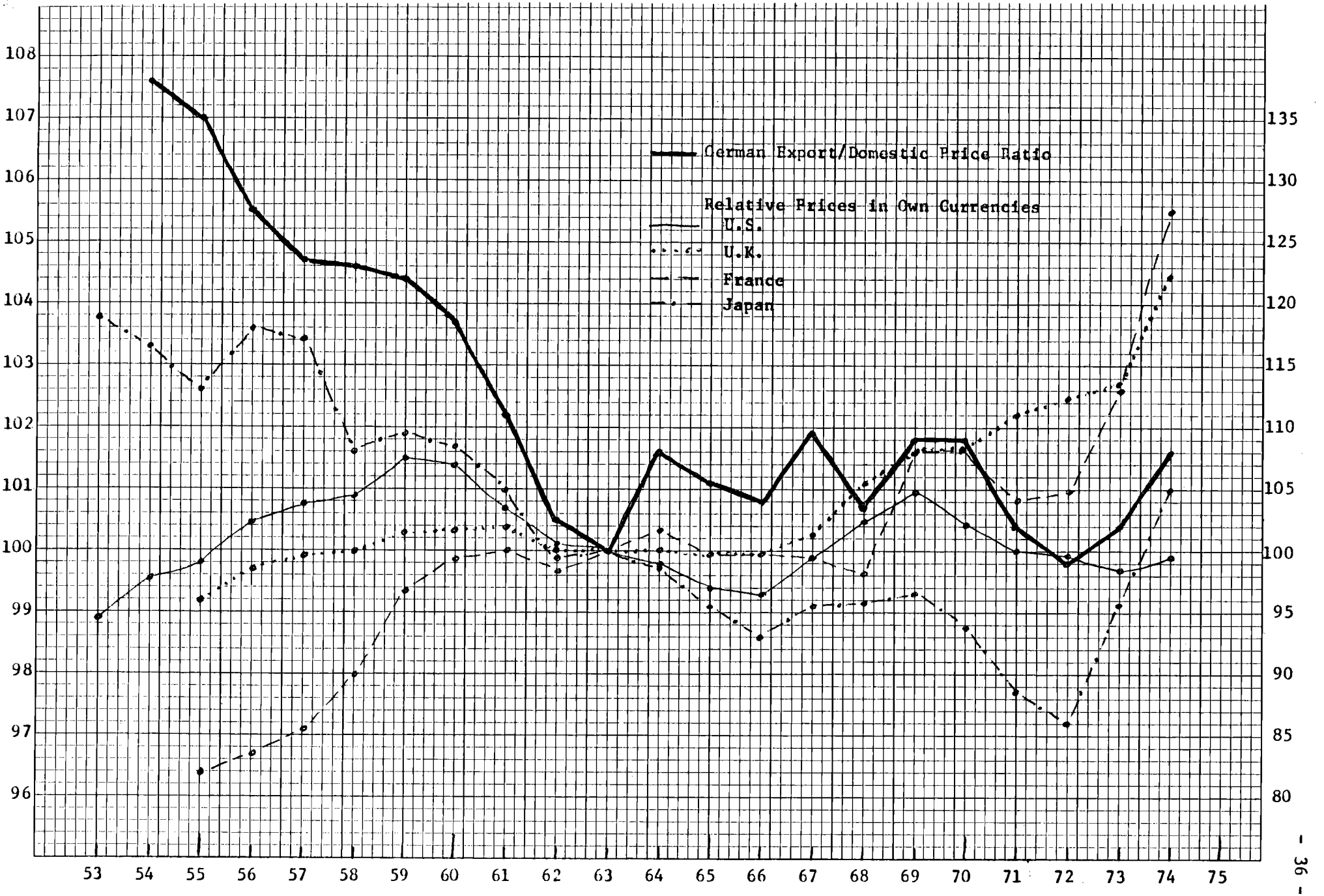
[13] These are imperfect measures for a number of reasons, but particularly because the indexes for different countries are weighted

CHART 6

German Export/Domestic Price Ratio, SITC 5-8, and Ratio of U.S., U.K., French, and Japanese to German Domestic Prices of Manufactures, in Own Currencies



by domestic trade weights, which are different for each country, and because they differ substantially in coverage.

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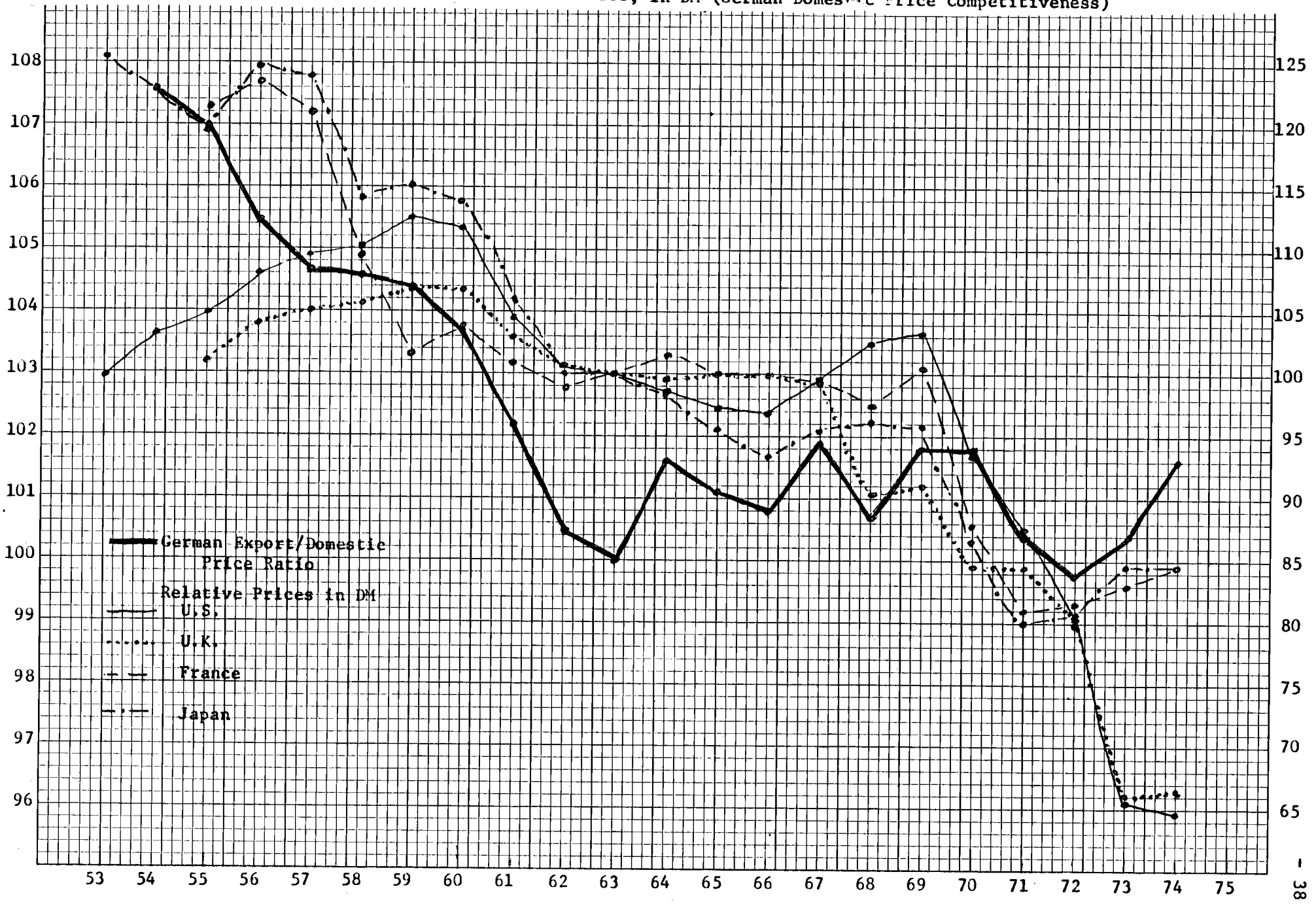
the German export/domestic price ratio before 1963 and some of the fluctuations after that followed fairly well the movements of relative Japanese prices. The French relative price level, rising from 1971 through 1974 and the sharp increase in British and Japanese prices a year later may provide a reason for the increase in the German export/domestic price ratio after 1972, which seemed to be inexplicable in terms of exchange rate changes. Thus some of the movements in the export/domestic price ratio seem to be related to inflation in other countries, as we hypothesized.

German domestic price competitiveness relative to the other countries (relative prices in DM), particularly France and Japan, show a closer relationship with the export domestic price ratio than the own-currency indexes (Chart 7). They match in the long decline to the earlier 1960's, the rough stability through that decade, the sharp decline until 1971 (for prices) or 1972 (for the price ratio), and then the rise after that date. Thus there is some suggestion here that the German export/domestic price ratio responds to the combination of relative inflation rates and exchange rates represented by these measures of domestic price competitiveness.

Since we think of the relative inflation rates as indicators of pressure on domestic economies, we experimented also with measures of business cycle conditions. We found these less satisfactory than the relative price measures, however, in explaining changes in the German export/domestic price ratio.

CHART 7

German Export/Domestic Price Ratio, SITC 5-8, and Ratio of U.S., U.K., French, and Japanese to German Domestic Prices of Manufactures, in DM (German Domestic Price Competitiveness)



Fluctuations in the German export/domestic price ratio for all manufacturing seem to be related to those in the share of German production of manufactured goods that is exported. The trends are very different, but the deviations from trend show similar broad movements, although sometimes with different timing. On the whole, when the export/domestic price ratio was above its trend, the export/domestic shipments ratio also tended to be above its trend, and the years when both were below their trends also tended to coincide (Chart 8). Aside from 1955-57 and 1968-70, there was also a rough matching between the broad movements in the two series relative to their trends, although not between year-to-year fluctuations. Taking deviations from straight line trends for both series we find a relationship between them as follows:

$$X/0 = \underset{(.00)}{.00} + \underset{(2.70)}{1.09}\ P_X/P_D \qquad \bar{R}^2 = .24 \qquad DW = 1.04$$

where X/0 is the deviation from trend of the ratio of manufactured exports to output of manufactures and $P_X/P_D$ is the deviation from trend of the export/domestic price ratio.

We attempt to explain the fluctuations of the German export/domestic price ratio for all manufactures by exchange rates and foreign prices in the equations listed in Table 7, although the charts did not suggest much, if any, relation to exchange rates. On the whole, the explanatory power of the equations is poor. The exchange rates are never statistically significant, as Chart 5 suggested. If there is any effect, it is with a lag of one year. French prices, the only ones that were significant, had their impact in the current year, although there is some indication in the case of Japanese prices of a delayed effect on the German price ratio.

CHART 8

Germany, All Manufacturing: Deviations from Trend of Export/Domestic Price Ratio and Deviations from Trend of Ratio of Exports to Total Shipments

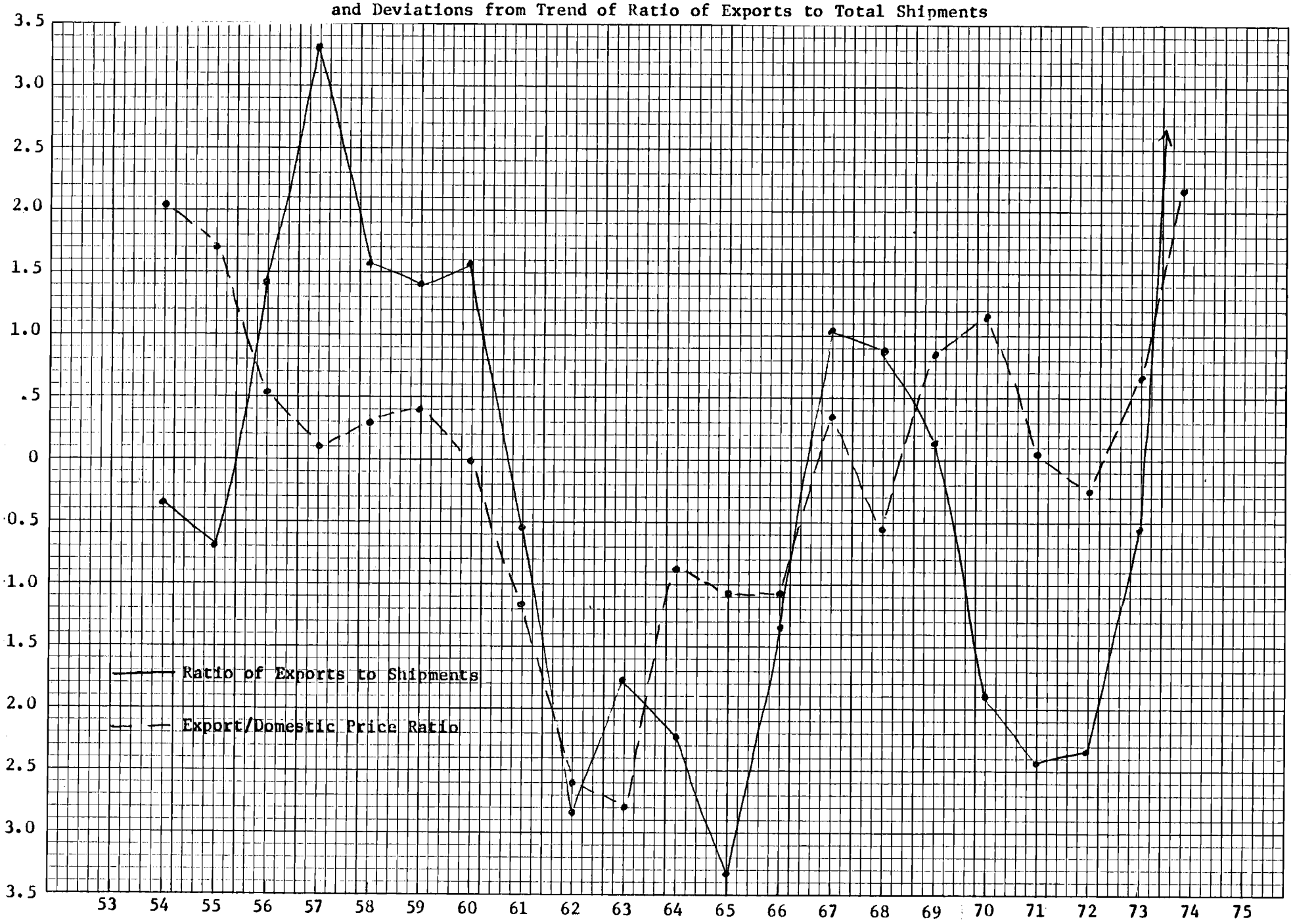


TABLE 7

Regressions of German Export/Domestic Price Ratio on Relative Foreign Prices and Exchange Rates

All Manufactures: SITC 5-8

| Eq. No. | Foreign Country | Constant Term | Foreign Price Variable | | Exchange Rate (DM/Foreign Currency) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|
| | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| | | Foreign Price Variable: Relative Rate of Inflation | | | | | | |
| 1 | U.S. (1953-74) | -.4954 (1.81) | .1563 (1.15) | .0032 (.02) | -.0392 (.60) | -.0472 (.72) | -.07 | 1.87 |
| 2 | U.K. (1955-74) | -.4036 (1.23) | .0861 (.51) | .0144 (.07) | .0117 (.23) | -.0416 (.63) | -.13 | 2.09 |
| 3 | France (1955-74) | -.3142 (1.16) | .1424 (2.63) | .0486 (.68) | .0251 (.44) | .0619 (1.31) | .31 | 1.79 |
| 4 | Japan (1953-74) | -.1804 (.66) | .0606 (1.07) | .0526 (.82) | -.0344 (.36) | -.0842 (.82) | .09 | 2.08 |
| 5 | Japan (1953-74) | -.0864 (.37) | | .0933 (1.71) | | .1236 (1.32) | .08 | 1.94 |
| | | Foreign Price Variable: German Domestic Price Competitiveness | | | | | | |
| 6 | U.S. (1953-74) | -.3225 (1.30) | .0121 (.24) | -.0329 (.68) | | | -.09 | 1.89 |
| 7 | U.K. (1955-74) | -.3500 (1.26) | .0057 (.11) | -.0715 (1.49) | | | .01 | 2.03 |
| 8 | France (1955-74) | .0556 (.22) | .0603 (1.20) | .0712 (1.41) | | | .10 | 1.91 |
| 9 | Japan (1953-74) | -.0254 (.11) | .0505 (.96) | .0909 (1.71) | | | .11 | 1.97 |
| 10 | Japan (1953-74) | -.1003 (.45) | | .0988 (1.89) | | | .12 | 1.96 |

The combined effect of relative inflation and exchange rates, as German price competitiveness, was again weak. As was true for the U.S. export/domestic price ratio, there is some hint of a delayed impact of foreign relative prices, but only the coefficient for Japanese prices is close to significance at the 5 per cent level.

The results for the machinery and equipment group are a little stronger (Table 8). Here there are significant exchange rate coefficients for the U.S. and the U.K., with a lag of one year, and several significant or almost significant price coefficients, current for the U.S. and the U.K. and lagged for Japan. When we combine the price and exchange rate effects, the explanatory power of the equations is weaker for the most part, but there is a bit of a consensus that these domestic price competitiveness effects take a year to work through.

On the whole, then, we have not been able to explain much of the variation in the German export/domestic price ratio, but what influence foreign prices and exchange rates had seemed to operate largely with a lag of one year.

The separate equations for German export and domestic prices of all manufactures (Table 9) confirm some of our expectations about the mechanism of transmission. In every case German domestic prices are more strongly influenced by domestic costs, in the form of unit labor cost, than are export prices. Foreign own-currency prices appear to have a strong current year impact on both domestic and export prices but in every case the impact on export prices is larger, as hypothesized earlier. French and Japanese prices appear to have also a lagged impact on German prices, even larger than the current year effect in the case of France, and again the coefficients are larger for export prices than

TABLE 8

Regressions of German Export/Domestic Price Ratio on Relative Foreign Prices and Exchange Rates

Machinery and Transport Equipment: SITC 7

| Eq. No. | Foreign Country | Constant Term | Foreign Price Variable | | Exchange Rate (DM/Foreign Currency) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|
| | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| | | Foreign Price Variable: Relative Rate of Inflation | | | | | | |
| 1 | U.S. (1953-75) | -.1718 (.99) | .1855 (3.22) | -.0625 (.97) | -.0703 (1.81) | .1015 (2.49) | .40 | 2.22 |
| 2 | U.K. (1955-75) | -.0947 (.47) | .1339 (1.89) | -.0123 (.35) | .0121 (.35) | .0941 (2.51) | .19 | 2.27 |
| 3 | Japan (1953-75) | .1980 (.68) | -.0248 (.48) | .1155 (2.14) | .0397 (.60) | .0921 (1.35) | .07 | 2.20 |
| 4 | Japan (1953-75) | .1946 (.78) | | .1016 (2.03) | | .1004 (1.60) | .13 | 2.15 |
| | | Foreign Price Variable: German Domestic Price Competitiveness | | | | | | |
| 5 | U.S. (1953-75) | -.0443 (.25) | .0172 (.48) | .0468 (1.34) | | | .08 | 2.11 |
| 6 | U.S. (1953-75) | -.0618 (.36) | | .0558 (1.93) | | | .12 | 2.02 |
| 7 | U.K. (1955-75) | .0002 (.00) | .0290 (.78) | .0659 (1.79) | | | .10 | 1.99 |
| 8 | U.K. (1955-75) | -.0569 (.31) | | .0680 (1.87) | | | .12 | 2.03 |
| 9 | Japan (1953-75) | .1701 (.61) | -.0042 (.09) | .1042 (2.16) | | | .12 | 2.14 |
| 10 | Japan (1953-75) | .1849 (.83) | | .1038 (2.22) | | | .16 | 2.16 |

TABLE 9

Regressions of German Export and Domestic Price Indexes on Foreign Prices and Exchange Rates

All Manufactures: SITC 5-8

| Eq. No. | Dependent Variable | Foreign Price | Constant | German Unit Labor Cost | Foreign Price | | Exchange Rate | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| | | | | Foreign Price Variable: Relative Rate of Inflation | | | | | | |
| 1 | XPI | U.S. (1953-74) | -.0094 | .1100 | .7392 | -.4351 | -.1293 | -.2348 | .85 | 2.56 |
| | | | (.01) | (.98) | (3.79) | (1.59) | (1.16) | (1.36) | | |
| 2 | DPI | U.S. (1953-74) | 0.0954 | .3694 | .3727 | -.2970 | -.0512 | -.3164 | .93 | 1.82 |
| | | | (.23) | (5.38) | (3.12) | (1.77) | (.75) | (2.99) | | |
| 3 | XPI | U.K. (1955-74) | -.0992 | .0197 | .5159 | -.0641 | .0156 | -.2603 | .86 | 1.86 |
| | | | (.15) | (.16) | (3.84) | (.32) | (.21) | (2.30) | | |
| 4 | DPI | U.K. (1955-74) | -.6379 | .3305 | .5392 | .0342 | -.0054 | .0649 | .93 | .97 |
| | | | (1.51) | (4.36) | (6.43) | (.28) | (.12) | (.92) | | |
| 5 | XPI | France (1955-74) | -.2694 | .1292 | .5346 | .2013 | .2965 | .0584 | .90 | 1.29 |
| | | | (.55) | (1.16) | (8.20) | (1.30) | (3.71) | (.70) | | |
| 6 | DPI | France (1955-74) | -.3601 | .3609 | .2285 | .4580 | .1853 | .1529 | .88 | 1.85 |
| | | | (.72) | (3.21) | (3.46) | (2.92) | (2.29) | (1.80) | | |
| 7 | XPI | Japan (1953-74) | .8669 | .1083 | .3385 | .2497 | .0140 | -.1636 | .85 | 2.26 |
| | | | (1.66) | (.87) | (4.28) | (2.18) | (.07) | (.85) | | |
| 8 | DPI | Japan (1953-74) | 0.4878 | .3314 | .1954 | .1529 | -.0919 | -.3171 | .90 | 1.82 |
| | | | (1.24) | (3.53) | (3.26) | (1.76) | (.61) | (2.17) | | |

(cont.)

TABLE 9 (concl.)

| Eq. No. | Dependent Variable | Foreign Price | Constant | German Unit Labor Cost | Foreign Price: Current | Foreign Price: Lagged 1 Year | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|
| | | Foreign Price Variable: German Domestic Price Competitiveness | | | | | | |
| 9 | XPI | U.S. (1953-74) | 1.3662 | .2703 | .1885 | -.6142 | .71 | 1.52 |
| | | | (1.73) | (1.85) | (2.03) | (4.59) | | |
| 10 | DPI | U.S. (1953-74) | .9534 | .4646 | .1103 | -.4681 | .88 | 1.49 |
| | | | (2.07) | (5.44) | (2.03) | (6.22) | | |
| 11 | XPI | U.K. (1955-74) | 1.0455 | .3820 | .1201 | -.5305 | .65 | .70 |
| | | | (1.17) | (2.34) | (1.03) | (3.73) | | |
| 12 | DPI | U.K. (1955-74) | .3647 | .6265 | .1034 | -.2271 | .67 | 1.15 |
| | | | (.47) | (4.44) | (1.03) | (1.85) | | |
| 13 | XPI | France (1955-74) | .5578 | .3891 | .4445 | .1167 | .72 | 1.39 |
| | | | (.72) | (2.75) | (4.37) | (.89) | | |
| 14 | DPI | France (1955-74) | .1897 | .6155 | .2099 | .1744 | .77 | 1.91 |
| | | | (.30) | (5.38) | (2.55) | (1.64) | | |
| 15 | XPI | Japan (1953-74) | .6117 | .3636 | .3692 | .3323 | .76 | 2.19 |
| | | | (.93) | (3.02) | (3.48) | (2.47) | | |
| 16 | DPI | Japan (1953-74) | .2426 | .5803 | .2139 | .2148 | .77 | 2.07 |
| | | | (.42) | (5.48) | (2.30) | (1.82) | | |

for domestic prices. The lagged effect of U.S. prices in dollars, on the other hand, is negative, partly reversing the current year impact. However, the net result of the two years is still much more strongly positive on export prices than on domestic prices.

There are fewer significant coefficients for exchange rates, and only those for France match our expectations, all being positive and at least slightly larger for export prices than for domestic prices. The exchange rate coefficients for the United States and Japan are all negative, although only three of the eight are statistically significant. They suggest, paradoxically, that a rise in the price of the dollar or the yen, and thus of U.S. or Japanese exports, tends to reduce German export and domestic prices. More likely the results reflect our difficulty in distinguishing the effects of foreign price movements from those of exchange rates.

The equations using German domestic price competitiveness as the price variable mostly support our expectations but contain a few puzzles. As expected, German unit labor costs influence domestic prices more than they do export prices and foreign prices affect German export prices more than they do German domestic prices. However, the lagged effect of U.S. and U.K. prices on German prices is negative and larger than the current effect, a relationship that is difficult to explain. All the equations for U.S. and U.K. prices show substantial serial correlation. The equations that do not, for Japan and France, also do not have the paradoxical negative price coefficients, and suggest that these countries' prices influence German prices both currently and with a one-year lag.

The equations for SITC 7 in Table 10 are of interest partly because they cover the same range of products as the U.S. equations. They suffer from the same drawback as the U.S. equations, in the fact that the unit labor cost variable is not really applicable to the particular commodity group. On the whole, however, the results conform to those of Table 9, with German unit labor costs affecting domestic prices more than export prices and some strong Japanese price impacts on German prices, particularly export prices (no data are available for French prices). The relationships of exchange rates to German prices, especially German domestic prices, are comparatively weak and often perverse.

Results for Japanese Prices

The range of the Japanese export/domestic price ratio for all manufactures was 11 per cent: the greatest among the three countries. Although there were substantial year-to-year fluctuations in the price ratio there was a clear downward trend through the whole period, and on the whole an upward trend in the effective exchange rate (Chart 9). The rise in the exchange rate through the 1950's and 1960's was gradual and could not account for the sharp fluctuations in price ratios. However, the jump of over 20 per cent in the exchange rate from 1970 to 1973 and the following fall were mirrored by a decline of more than 5 per cent in the export/domestic price ratio and then a rise after 1973, as we would expect. Thus the major changes in the exchange rate did appear to influence the price ratio.

Of the roughly 30 per cent rise in the exchange rate from 1953 to the peak in 1973 almost a quarter was offset by the reduction in the price ratio. The degree of offsetting was substantial even in the wide

TABLE 10

Regressions of German Export and Domestic Price Indexes on Foreign Prices and Exchange Rates

Machinery and Transport Equipment: SITC 7

| Eq. No. | Dependent Variable | Foreign Price | Constant | German Unit Labor Cost | Foreign Price | | Exchange Rate | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| | | | | Foreign Price Variable: Relative Rate of Inflation | | | | | | |
| 1 | XPI | U.S. (1953-75) | 1.2504 | .2115 | -.0140 | -.0932 | -.0299 | -.3242 | .67 | 1.61 |
| | | | (2.48) | (2.16) | (.08) | (.50) | (.30) | (2.71) | | |
| 2 | DPI | U.S. (1953-75) | -.0347 | .4856 | .1470 | .0350 | -.0202 | -.2209 | .86 | 1.59 |
| | | | (.08) | (5.69) | (1.01) | (.21) | (.23) | (2.13) | | |
| 3 | XPI | U.K. (1955-75) | 1.0780 | .2764 | -.0380 | -.0676 | -.0041 | -.2723 | .59 | 1.38 |
| | | | (1.98) | (2.50) | (.28) | (.49) | (.06) | (2.98) | | |
| 4 | DPI | U.K. (1955-75) | .1180 | .4593 | .1865 | -.0009 | -.0212 | -.0703 | .86 | 1.91 |
| | | | (.27) | (5.33) | (1.73) | (.01) | (.39) | (.99) | | |
| 5 | XPI | Japan (1953-75) | 1.1909 | .2963 | .2391 | -.1180 | .0541 | -.0461 | .59 | 1.93 |
| | | | (2.38) | (2.49) | (2.89) | (1.30) | (.31) | (.28) | | |
| 6 | DPI | Japan (1953-75) | .6925 | .4727 | .1452 | .0322 | -.0408 | -.2607 | .89 | 1.74 |
| | | | (1.92) | (5.51) | (2.44) | (.49) | (.33) | (2.19) | | |

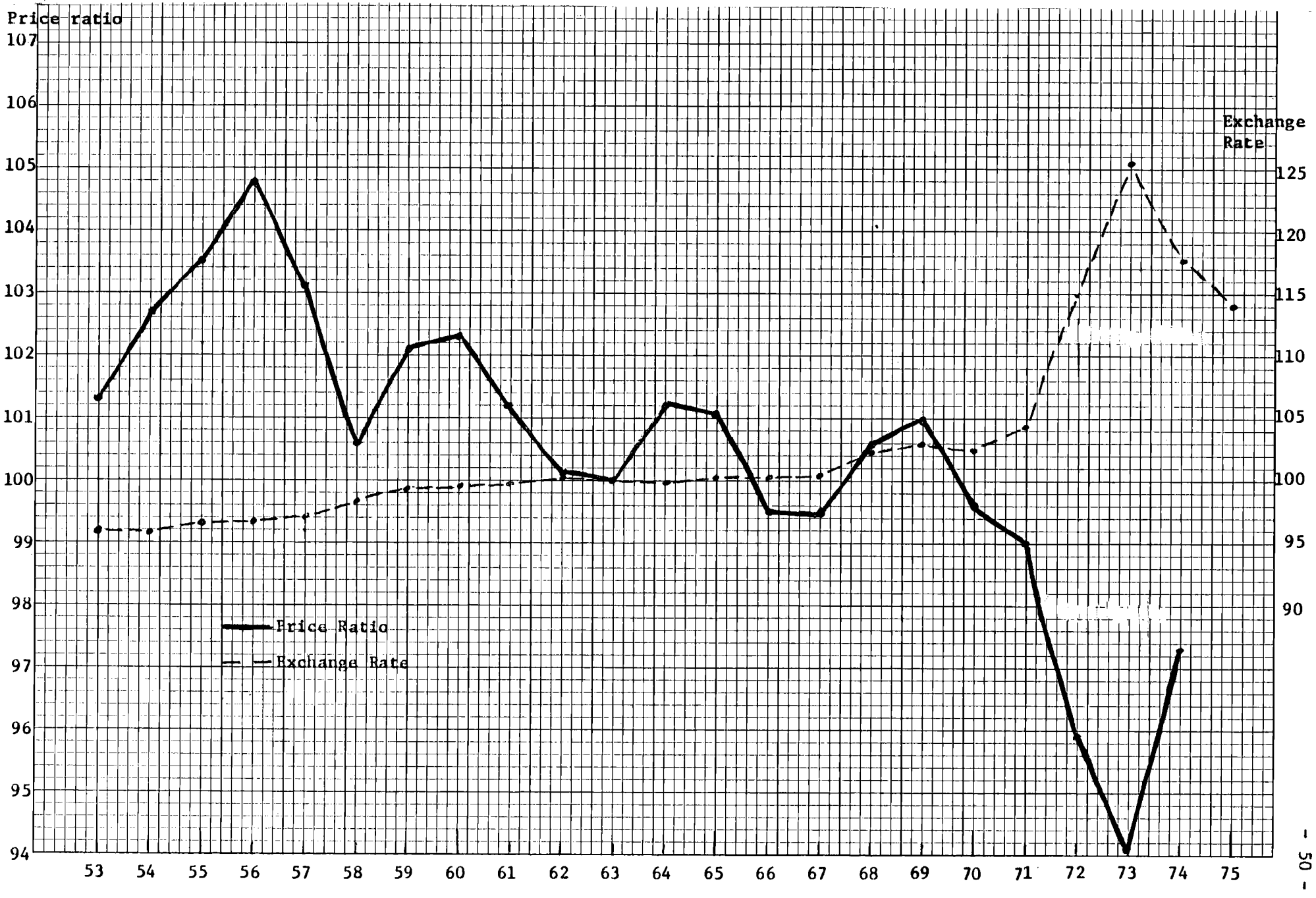
(cont.)

TABLE 10 (concl.)

| Eq. No. | Dependent Variable | Foreign Price | Constant | German Unit Labor Cost | Foreign Price: Current | Foreign Price: Lagged 1 Year | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|
| | | Foreign Price Variable: German Domestic Price Competitiveness | | | | | | |
| 7 | XPI | U.S. (1953-75) | 1.5567<br>(3.23) | .2908<br>(3.57) | .0052<br>(.09) | -.2383<br>(3.75) | .65 | 1.55 |
| 8 | DPI | U.S. (1953-75) | .4768<br>(.91) | .6493<br>(7.35) | .0853<br>(1.38) | -.1259<br>(1.82) | .78 | 1.55 |
| 9 | XPI | U.K. (1955-75) | 1.2450<br>(2.37) | .3466<br>(3.68) | .0263<br>(.41) | -.2066<br>(3.22) | .59 | 1.12 |
| 10 | DPI | U.K. (1955-75) | .4813<br>(.84) | .6328<br>(6.18) | .0912<br>(1.32) | -.0354<br>(.51) | .73 | 1.35 |
| 11 | XPI | Japan (1953-75) | 1.1076<br>(2.21) | .3739<br>(4.41) | .2509<br>(2.82) | -.0735<br>(.82) | .58 | 2.16 |
| 12 | DPI | Japan (1953-75) | .5911<br>(1.24) | .6710<br>(8.34) | .1903<br>(2.25) | .1113<br>(1.31) | .80 | 2.03 |

CHART 9

Japanese Export/Domestic Price Ratio, SITC 5-8, and Effective Exchange Rate, 1963=100



swings in the exchange rate that took place between 1970 and 1974. A quarter of the 1970-73 increase in the price of the yen and about half of the drop in 1974 were offset by changes in the export/domestic price ratio.

Changes in relative foreign prices do not appear to have been related at all to the fluctuations in the Japanese export/domestic price ratio, as can be seen from the data in Appendix C. The price ratio fell substantially over the period as a whole while relative foreign prices rose relative to Japanese prices--the opposite to what we would expect if foreign prices were influencing the ratio. The same was true of the shorter fluctuations: they were unrelated to or even in the opposite direction from foreign price changes instead of the same direction, as would seem logical. Thus we cannot expect to explain the export/domestic price ratio well by either exchange rate or relative price variables, except for the apparent relation of exchange rates to price ratios after 1971.

We are thus left, as far as these variables are concerned, without any explanation for the wide fluctuations in the Japanese export/domestic price ratio between 1953 and 1971.

Given the timing of the swings in the price ratio one might guess that they were related to cyclical fluctuations in countries to which Japan exports. For U.S. and German prices we found that direct measures of cyclical conditions did not add substantially to the explanation of the price ratio. We can test the same possibility for Japan by comparing the price ratio to a measure of foreign cyclical conditions, as in

Chart 10.[14] The fluctuations do seem related, with almost every swing

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[14] The measure of cyclical fluctuations in Chart 10 is a composite of deflated, detrended leading indicators for six countries: France, Germany, Italy, the U.K., Canada, and Japan. It would have been preferable, of course, to use an index which excluded Japan.

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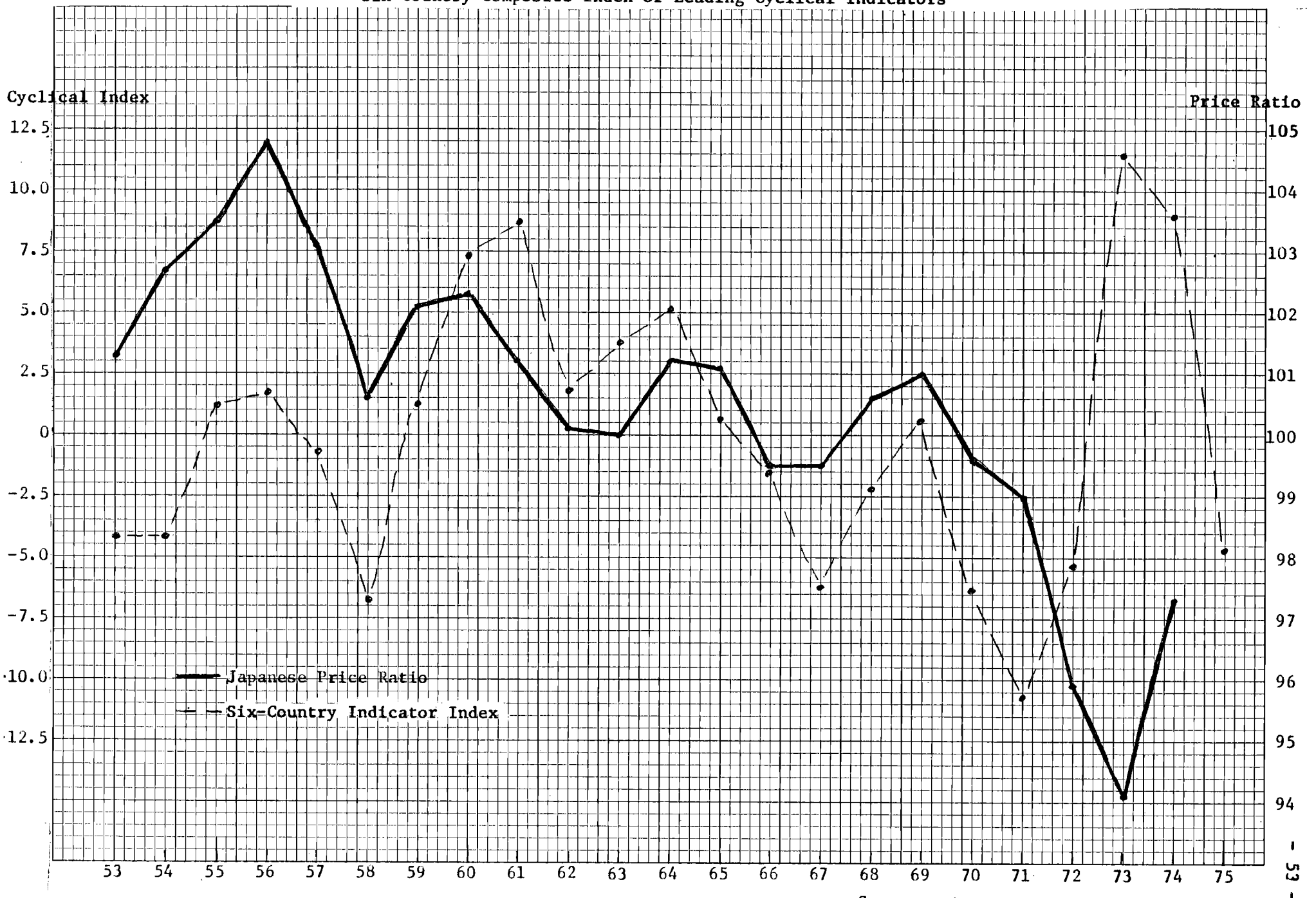
in the cyclical index matched by a corresponding change in the Japanese price ratio, at least through 1971. The implication of the chart is that in the rising phase of foreign business cycles Japanese export prices rise relative to domestic prices while in the downward phase Japanese export prices tend to fall relatively. While export prices thus responded to foreign cyclical conditions they also acted as something of a buffer between foreign economies and the domestic Japanese economy.

The equations relating the Japanese export/domestic price ratio for all manufactures to relative foreign prices and exchange rates are listed in Table 11. As was suggested by a look at the data themselves, these two variables explain comparatively little of the variation in the price ratio. Many of the price coefficients and several of the exchange rate coefficients are negative. The only reasonable exchange rate coefficient is that for the dollar/yen rate, an outcome that is not surprising in view of the large importance of the U.S. market for Japanese exports and the movements of the price ratio and exchange rates in 1970-74.

The results for machinery and transport equipment are again weak, but not quite as eccentric (Table 12). Most of the current year price

CHART 10

Japanese Export/Domestic Price Ratio, SITC 5-8, and Deviations from Trend of Six-Country Composite Index of Leading Cyclical Indicators




Source: Appendix Tables C-1 and D-3.

TABLE 11

Regressions of Japanese Export/Domestic Price Ratio on Foreign Prices and Exchange Rates

All Manufactures: SITC 5-8

| Eq. No. | Foreign Country | Constant Term | Foreign Price Variable | | | Exchange Rate (Yen/Foreign Currency) | | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Current | Lagged 1 Year | Lagged 2 Years | Current | Lagged 1 Year | Lagged 2 Years | | |
| | | Foreign Price Variable: Relative Rate of Inflation | | | | | | | | |
| 1 | U.S. (1953-74) | -.0168 | -.1749 | .1201 | | .3462 | -.0482 | | .53 | 2.03 |
| | | (.04) | (1.74) | (1.27) | | (4.47) | (.34) | | | |
| 2 | Germany (1953-74) | -.0523 | -.2073 | -.1001 | | -.1227 | .2312 | | .24 | 1.33 |
| | | (.13) | (2.45) | (1.07) | | (.93) | (1.62) | | | |
| 3 | Germany (1953-74) | .1119 | -.2344 | .0315 | .0025 | -.2104 | .2685 | -.4670 | .52 | 1.63 |
| | | (.25) | (2.76) | (.35) | (.02) | (1.79) | (2.31) | (2.79) | | |
| 4 | U.K. (1955-74) | .3145 | -.1161 | -.1984 | | .0435 | .0160 | | .14 | 1.96 |
| | | (.57) | (1.09) | (1.83) | | (.53) | (.18) | | | |
| | | Foreign Price Variable: Japanese Domestic Price Competitiveness | | | | | | | | |
| 5 | U.S. (1953-74) | .2345 | .0944 | -.0888 | | | | | .08 | 1.90 |
| | | (.70) | (1.61) | (1.55) | | | | | | |
| 6 | Germany (1953-74) | .1038 | -.1129 | -.0683 | | | | | .04 | 1.91 |
| | | (.26) | (1.35) | (.81) | | | | | | |
| 7 | Germany (1953-74) | .6176 | -.2154 | -.0300 | -.1891 | | | | .17 | 1.75 |
| | | (1.24) | (2.24) | (.37) | (1.83) | | | | | |
| 8 | U.K. (1955-74) | -.4793 | .0593 | -.1694 | | | | | .41 | 1.64 |
| | | (1.66) | (1.64) | (3.65) | | | | | | |

TABLE 12

Regressions of Japanese Export/Domestic Price Ratio on Foreign Prices and Exchange Rates

Machinery and Transport Equipment: SITC 7

| Eq. No. | Foreign Country | Constant Term | Foreign Price Variable | | | Exchange Rate (Yen/Foreign Currency) | | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Current | Lagged 1 Year | Lagged 2 Years | Current | Lagged 1 Year | Lagged 2 Years | | |
| | | Foreign Price Variable: Relative Rate of Inflation | | | | | | | | |
| 1 | U.S. (1953-75) | .6417 | -.0535 | -.1811 | | -.0691 | .1429 | | .10 | 1.83 |
| | | (.93) | (.33) | (1.88) | | (.85) | (.99) | | | |
| 2 | U.S. (1953-75) | .7341 | .1779 | -.2560 | -.1043 | .0234 | -.0909 | .1642 | .30 | 2.28 |
| | | (1.19) | (1.29) | (1.77) | (.74) | (.36) | (.67) | (1.38) | | |
| 3 | U.S. (1953-75) | .4192 | | -.1551 | | | .0897 | | .16 | 1.75 |
| | | (1.22) | | (1.77) | | | (1.39) | | | |
| 4 | Germany (1953-75) | -.5254 | .1337 | -.0886 | | .0770 | .0519 | | .01 | 1.55 |
| | | (1.12) | (1.58) | (.44) | | (.77) | (.50) | | | |
| 5 | U.K. (1955-75) | -.0742 | .1329 | -.1157 | | .0030 | -.0169 | | .26 | 2.09 |
| | | (.16) | (2.42) | (1.30) | | (.07) | (.37) | | | |
| 6 | U.K. (1955-75) | .6294 | .1543 | -.0982 | -.2369 | -.0138 | -.0749 | .0549 | .46 | 1.70 |
| | | (1.26) | (2.50) | (1.11) | (2.42) | (.34) | (1.59) | (1.06) | | |
| | | Foreign Price Variable: Japanese Domestic Price Competitiveness | | | | | | | | |
| 7 | U.S. (1953-75) | -.1703 | .0626 | -.0262 | | | | | -.05 | 1.62 |
| | | (.55) | (1.01) | (.38) | | | | | | |
| 8 | U.S. (1953-75) | .0935 | .0315 | .0582 | -.0877 | | | | .08 | 2.42 |
| | | (.35) | (.46) | (.64) | (1.05) | | | | | |
| 9 | Germany (1953-75) | -.5979 | .1256 | -.0021 | | | | | .09 | 1.56 |
| | | (1.39) | (1.97) | (.03) | | | | | | |
| 10 | U.K. (1955-75) | -.0218 | .0783 | -.0224 | | | | | .07 | 2.17 |
| | | (.09) | (1.87) | (.50) | | | | | | |

coefficients, and all that are close to statistical significance, are positive, although negative signs prevail among the lagged price coefficients. That is not an unreasonable result, as long as the negative coefficients do not exceed the positive ones, since it could imply a return to an earlier relationship between export and domestic prices after the initial disturbance arising from foreign developments. However, these equations are too crude to establish a sequence of this sort. None of the lagged foreign price coefficients are statistically significant.

When we examine the separate effects on the export and domestic price indexes for all manufactures in Table 13 we find the equations again unsatisfactory, although they do show large price effects and the variables included account for a large part of the variation in export and domestic prices. With only a few exceptions the coefficients for unit labor costs are negative in the equations based on relative rates of inflation and none of them are statistically significant. Probably because the unit labor cost variable works so poorly the coefficients of the current year foreign price variables are exaggerated. The lagged foreign price and exchange rate variables are mostly negative, however.

The equations based on Japanese domestic price competitiveness are not quite as outlandish, some containing reasonable coefficients for unit labor cost and positive coefficients on current price. However, there are again very large negative coefficients on lagged foreign price and some serious problems of serial correlation.

The equations for machinery and transport equipment that use Japanese domestic price competitiveness as the foreign price variable fit our expectations a little better than those for all manufactured products (Table 14). The coefficients on unit labor cost are positive and most

TABLE 13

Regressions of Japanese Export and Domestic Price Indexes on Foreign Prices and Exchange Rates

All Manufactures: SITC 5-8

| Eq. No. | Dependent Variable | Foreign Country | Constant | Japanese Unit Labor Cost | Foreign Price Variable | | Exchange Rate (Yen/Foreign Currency) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| | | Foreign Price Variable: Relative Rate of Inflation | | | | | | | | |
| 1 | XPI | U.S. (1953-74) | -.9442 | -.0209 | 1.4123 | -1.1195 | .2338 | -1.0458 | .92 | 1.64 |
| | | | (.94) | (.18) | (3.32) | (2.14) | (.95) | (2.78) | | |
| 2 | DPI | U.S. (1953-74) | .0282 | -.1647 | 1.2766 | -1.0916 | -.1341 | -1.2431 | .92 | 2.28 |
| | | | (.03) | (1.63) | (3.40) | (2.37) | (.62) | (3.75) | | |
| 3 | XPI | U.K. (1955-74) | -1.5462 | -.1503 | 1.7068 | -1.1256 | -.0787 | -.3448 | .83 | 1.93 |
| | | | (1.07) | (.58) | (4.48) | (2.45) | (.44) | (1.51) | | |
| 4 | DPI | U.K. (1955-74) | -1.5731 | -.1792 | 1.3382 | -.5904 | -.2978 | -.3795 | .74 | 1.86 |
| | | | (1.00) | (.64) | (3.23) | (1.13) | (1.52) | (1.53) | | |
| 5 | XPI | Germany (1953-74) | -2.3014 | .4671 | .8125 | -.2494 | .6380 | -.6121 | .58 | 1.87 |
| | | | (1.34) | (1.24) | (.88) | (.34) | (.91) | (.88) | | |
| 6 | DPI | Germany (1953-74) | -2.1257 | .1876 | 1.2219 | .3450 | .5126 | -1.2676 | .65 | 1.91 |
| | | | (1.52) | (.61) | (1.62) | (.58) | (.89) | (2.23) | | |

(cont.)

TABLE 13 (concl.)

| Eq. No. | Dependent Variable | Foreign Country | Constant | Japanese Unit Labor Cost | Foreign Price Variable: Current | Foreign Price Variable: Lagged 1 Year | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|
| | | Foreign Price Variable: Japanese Domestic Price Competitiveness | | | | | | |
| 7 | XPI | U.S. (1953-74) | 1.4055 | .1084 | .6229 | -1.3292 | .87 | 1.29 |
| | | | (1.50) | (.82) | (5.16) | (5.69) | | |
| 8 | DPI | U.S. (1953-74) | 3.1801 | .0240 | .3479 | -1.5306 | .79 | 1.19 |
| | | | (3.04) | (.16) | (2.58) | (5.86) | | |
| 9 | XPI | U.K. (1955-74) | -.2312 | .5068 | .2770 | -.7994 | .70 | 1.99 |
| | | | (.16) | (2.38) | (1.33) | (3.05) | | |
| 10 | DPI | U.K. (1955-74) | .4389 | .5547 | .0145 | -.6884 | .54 | 1.95 |
| | | | (.27) | (2.37) | (.06) | (2.39) | | |
| 11 | XPI | Germany (1953-74) | -2.0409 | .4375 | .7157 | -.3685 | .64 | 1.82 |
| | | | (1.44) | (1.28) | (2.44) | (.96) | | |
| 12 | DPI | Germany (1953-74) | -.9355 | .1825 | .8279 | -.3297 | .61 | 1.64 |
| | | | (.71) | (.58) | (3.04) | (.92) | | |

TABLE 14

Regressions of Japanese Export and Domestic Price Indexes on Foreign Prices and Exchange Rates

Machinery and Transport Equipment: SITC 7

| Eq. No. | Dependent Variable | Foreign Country | Constant | Japanese Unit Labor Cost | Foreign Price Variable | | Exchange Rate (Yen/Foreign Currency) | | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current | Lagged 1 Year | Current | Lagged 1 Year | | |
| | | | | Foreign Price Variable: Relative Rate of Inflation | | | | | | |
| 1 | XPI | U.S. (1953-75) | -2.7149 | .1570 | .8872 | -.1695 | .3531 | -.6474 | .90 | 1.23 |
| | | | (4.15) | (2.0) | (3.25) | (.49) | (2.12) | (3.59) | | |
| 2 | DPI | U.S. (1953-75) | -2.3044 | .1193 | 1.0585 | -.5841 | .1277 | -.5783 | .94 | 2.24 |
| | | | (4.74) | (2.05) | (5.21) | (2.28) | (1.03) | (4.32) | | |
| 3 | XPI | U.K. (1955-75) | -1.4124 | .0160 | 1.1434 | -.7966 | .0897 | -.2825 | .81 | 1.86 |
| | | | (1.72) | (.10) | (4.09) | (2.93) | (.67) | (1.84) | | |
| 4 | DPI | U.K. (1955-75) | -1.4880 | .0262 | 1.0233 | -.8023 | -.0008 | -.3257 | .81 | 1.52 |
| | | | (1.99) | (.18) | (4.01) | (3.23) | (.01) | (2.32) | | |
| 5 | XPI | Germany (1953-75) | -1.2286 | .5811 | -.0581 | -.3221 | .4384 | -.0839 | .59 | 1.91 |
| | | | (.88) | (2.63) | (.10) | (.80) | (1.09) | (.20) | | |
| 6 | DPI | Germany (1953-75) | -1.7929 | .5572 | .3625 | -.3863 | .2164 | -.4441 | .60 | 1.96 |
| | | | (1.45) | (2.84) | (.70) | (1.08) | (.61) | (1.16) | | |

(cont.)

TABLE 14 (concl.)

| Eq. No. | Dependent Variable | Foreign Country | Constant | Japanese Unit Labor Cost | Foreign Price Variable: Current | Foreign Price Variable: Lagged 1 Year | $\bar{R}^2$ | DW |
|---|---|---|---|---|---|---|---|---|
| | | Foreign Price Variable: Japanese Domestic Price Competitiveness | | | | | | |
| 7 | XPI | U.S. (1953-75) | -2.2278 | .3557 | .5672 | -.3307 | .76 | 2.24 |
| | | | (2.60) | (2.81) | (3.69) | (2.13) | | |
| 8 | DPI | U.S. (1953-75) | -1.7900 | .3638 | .5354 | -.4672 | .78 | 2.33 |
| | | | (2.39) | (3.30) | (4.00) | (3.46) | | |
| 9 | XPI | U.K. (1955-75) | -.8638 | .3712 | .3460 | -.3007 | .73 | 1.40 |
| | | | (1.00) | (3.00) | (2.61) | (2.74) | | |
| 10 | DPI | U.K. (1955-75) | -1.0033 | .3754 | .2516 | -.3164 | .69 | 1.45 |
| | | | (1.18) | (3.11) | (1.94) | (2.96) | | |
| 11 | XPI | Germany (1953-75) | -1.8189 | .5656 | .2539 | -.2578 | .61 | 1.92 |
| | | | (1.71) | (2.71) | (1.16) | (1.28) | | |
| 12 | DPI | Germany (1953-75) | -1.6603 | .5492 | .2710 | -.3759 | .65 | 1.96 |
| | | | (1.78) | (3.00) | (1.41) | (2.12) | | |

are statistically significant, and the same is true, as we expect, of the current foreign price coefficients. Among the price coefficients that are statistically significant, those for export prices are larger than those for domestic prices, as we expect. All the lagged foreign price coefficients are negative, indicating a reversal of the effect of foreign prices after a year, and the reversals are larger for domestic than for export prices.

On the whole, the variables that served to explain U.S. and German prices to some extent give more erratic results in explaining Japanese prices. In the few equations that do seem reasonable--those for SITC 7 based on price competitiveness--the net effect of foreign price changes is mostly erased after a year.

Since the earlier look at the fluctuations in the export/domestic price ratio suggested that foreign cyclical fluctuations may have had a substantial influence, we experimented with a few equations relating the price ratio to indexes of U.S. and other major countries' business cycle conditions. The cyclical indicators by themselves did not explain movements in the price ratio at all, as we could have expected from the contrary fluctuations during the period after 1971. However, when the cyclical variables were combined with Japanese effective exchange rates, the results were quite good. The cyclical indicator indexes had positive coefficients, showing that a foreign expansion raises Japanese export prices relative to domestic prices while a foreign contraction leads to a relative reduction in Japanese export prices. The positive coefficient on current exchange rate changes indicates that a rise in the price of foreign exchange increases Japanese export prices relative to domestic price

TABLE 15

Regressions of Japanese Export/Domestic Price Indexes
on Foreign Cyclical Indicators and Japanese Effective Exchange Rates

All Manufactures: SITC 5-8

| Eq. No. | Constant Term | U.S.: Index of 12 Leading Indicators | | Japanese Effective Exchange Rate | | $\bar{R}^2$ | DW | Dates |
|---|---|---|---|---|---|---|---|---|
| | | Current | Lagged 1 Year | Current | Lagged 1 Year | | | |
| | | Cyclical Indicator: U.S. Index of 12 Leading Indicators | | | | | | |
| 1 | -.4775 | .1372 | .0855 | .5168 | -.1706 | .68 | 1.71 | 1953-74 |
| | (1.94) | (3.63) | (2.34) | (6.50) | (2.01) | | | |
| | | Cyclical Indicator: Six-Country Composite Deflated Leading Index | | | | | | |
| 2 | -.4010 | .1433 | -.0187 | .4665 | -.0539 | .65 | 2.22 | 1953-74 |
| | (1.34) | (3.56) | (.44) | (5.60) | (.56) | | | |

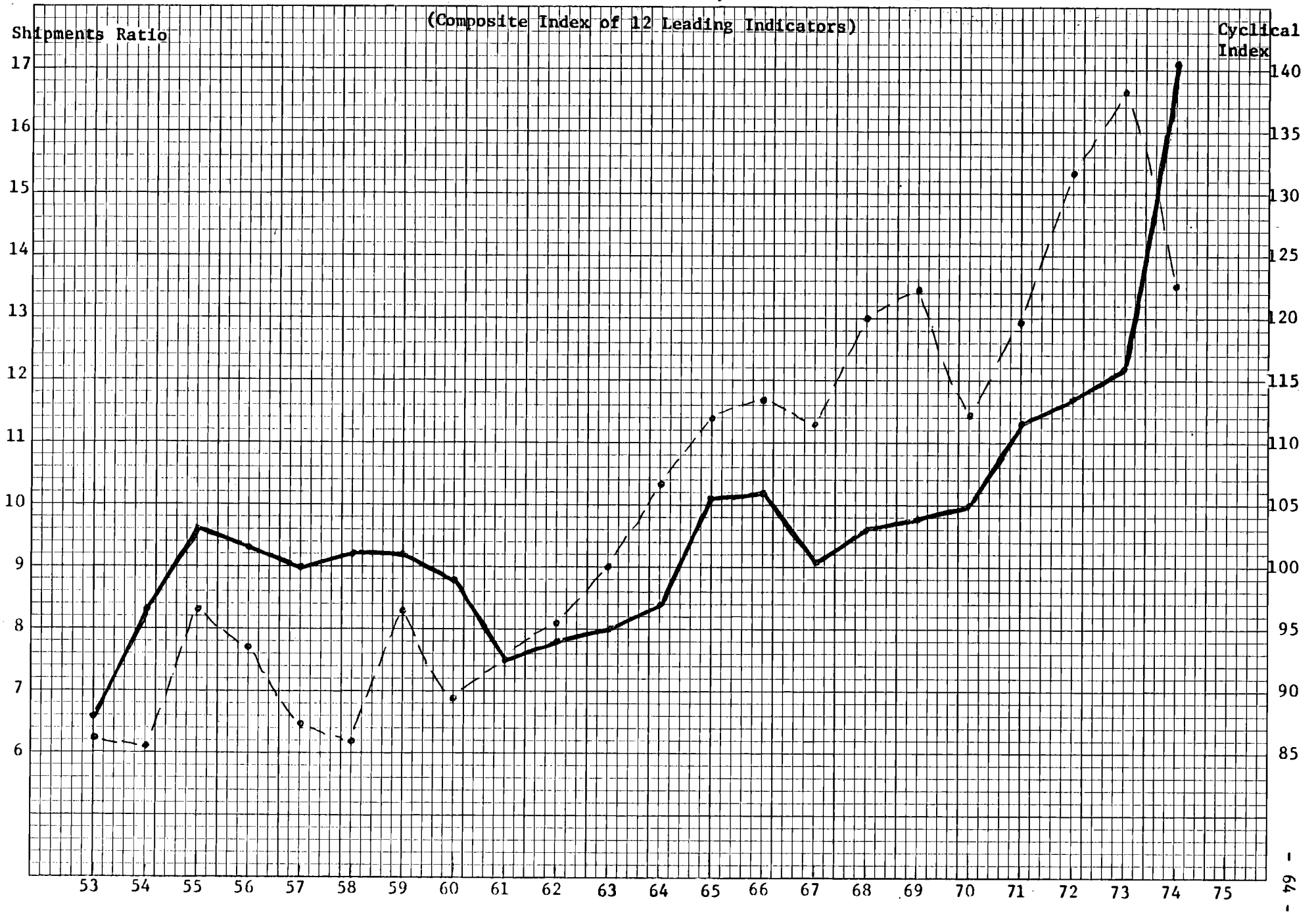
and a decline reduces the Japanese export price ratio, as we expect. The exchange rate effect seems to be partly offset a year later, but most of it remains even after two years, judging by other equations not shown here.

The success of foreign cyclical fluctuations in explaining the export/domestic price ratio suggests that the same variable might influence the ratio of exports to manufacturing production. Chart 11 indicates that there may have been such a connection, at least through the mid-1960's, although it is not close. The peaks in the U.S. leading indicators in 1955, 1959, and 1966 all had counterparts in the Japanese series, although the troughs did not match as well.

There were two swings in the Japanese price ratio in the earlier years but they seemed to lag a year or two behind the movements of the shipments ratio. Thus it does not seem reasonable to suggest that the movements of the export/shipments ratio were mainly responses on the supply side to shifts in the profitability of export as compared with domestic markets. It seems more likely, from the behavior of both the price ratio and the shipments ratio, that these short-term fluctuations largely reflected influences on the demand side, which Japanese exports responded to more actively than did U.S. and German exporters.

CHART 11

Japanese Export/Domestic Shipment Ratio, All Manufactures,
Compared with Indicator of U.S. Cyclical Fluctuations



Summary

1. Export price movements differ from those of domestic prices for substantial periods.

In all three countries, the United States, Germany, and Japan, the divergences between export and domestic price changes were substantial, and some were long-lasting. The range of the U.S. ratio for machinery and transport equipment (SITC 7) was 7 percentage points, that of the German and Japanese ratios for all manufactured products (SITC 5-8) almost 8 points and 11 points. For each country there were periods of comparative stability, when the ratio moved within a range of three percentage points or so, but even that range allows for large changes in relative margins between export and domestic sales. The major changes in the export/domestic price ratio were, in the United States, a rise after 1972, in Germany, a decline until 1963, and in Japan, two cycles, a rise from 1953-56 followed by an equal decline and a fall from 1969 to 1973, followed by a rise. Over the whole period the U.S. ratio for SITC 7 rose by between 1 1/2 and 4 1/2 per cent, depending on the series used as a measure. The German ratio fell by 6 per cent, and the Japanese ratio fell by 4 per cent. The long-term changes are compatible with an interpretation that the DM and the yen were undervalued at the beginning of the period, in the 1950's, and the dollar was overvalued, and that the realignment of currencies has reduced or eliminated, or even reversed these disparities.

2. Changes in export/domestic price ratios offset, to some degree, changes in exchange rates and in relative domestic prices.

If a country's export prices rise relative to its domestic prices when foreign inflation is more rapid than home inflation, or if they rise when the country devalues its currency, some of the competitive advantage that might otherwise be expected will be lost. On the other hand, if the price ratio falls in a rapidly inflating country or in a country revaluing its exchange rate upward, the decline in price competitiveness will be less than expected. These effects are in addition to any impact of exchange rate changes or foreign inflation on a country's domestic prices in general, or domestic prices of tradable goods, which are more frequently considered.

In the case of U.S. exports of machinery and transport equipment, 20 to 50 per cent of the appreciation of the dollar through 1968 and almost half of the depreciation after that was offset by first a decline and later a sharp rise in the export/domestic price ratio. Of the effects of major swings in the German rate of inflation relative to the U.S., apart from the effects of currency changes, between 10 and over 50 per cent were offset, with the larger proportions associated with the smaller differences in relative inflation. The offsets to relative U.K. inflation ranged between a quarter and a third.

For Germany, the fall in export/domestic price ratios for all manufactures was notable in the degree to which it offset the 1961 revaluation of the DM--the offset being about 60 per cent. In 1969

to 1972 the offset was only 16 per cent and after that the changes in the ratio reinforced the effects of revaluation instead of offsetting them. The large decline in German price ratios from 1954 to 1963 reinforced the German gains from slower inflation than the U.S., the U.K. and France, and offset almost 50 per cent of the relative decline in Japanese prices.

The Japanese effective exchange rate rose only gradually from 1953 through the late 1960's and most of that rise was offset by a decline in export/domestic price ratios. From 1970 to 1973, a large jump in the exchange rate was about 1/4 offset by a very sharp decline in price ratios and the fall in the exchange rate in 1974 was offset by about half. With respect to relative prices, however, the movement of the export/domestic price ratio did very little offsetting. The large gains in price competitiveness indicated by the domestic price indexes were enlarged by the change in export/domestic price ratios. In other words, the gains in Japanese price competitiveness were substantially larger measured from export prices than from domestic prices.

It is clear, then, that changes in the relationship between export and domestic prices of the same commodities must be taken into account in estimating the effects of differences in inflation rates or of changes in exchange rates. On the whole, the changes in the price ratio have tended to offset exchange rate movements and have sometimes offset and sometimes added to effects of differences in rates of inflation.

3. Export/domestic price ratios responded to foreign prices and exchange rates.

Although we are not able to explain all the fluctuations in export/domestic price ratios in each country we did find evidence that they responded to the two variables we hypothesized should affect them: relative rates of inflation in other countries compared to that of the home country, and changes in the rate of exchange. Thus we have evidence that the fluctuations in the ratio are not simply the result of chance or of defects in measurement.

We have separated the relative foreign price in own currency and the exchange rate on the possibility that they could have different effects. One reason might be that sellers would consider relative price changes less ephemeral than exchange rate fluctuations, or that the effect of exchange rates would depend on the currency in which prices are quoted or goods are invoiced. If the response is identical and foreign relative price and exchange rate changes are independent of each other we should find positive and equal coefficients for the two variables. If the price and exchange rate changes tend to offset each other, however, we will have difficulty separating their effects and we may find perverse coefficients as a result. In such a case, the variable which combines price and exchange rate effects, the relative price in home country currency, may be the only one we can relate to the export/domestic price ratio.

The U.S. price ratio, we found, was affected in the same year by changes in British prices and a year or more later by changes in German and Japanese exchange rates, and perhaps by Japanese prices as

well. When we put price and exchange rate effects together by measuring prices in dollars there was generally a one-year lag in the effect.

Changes in the German price ratio were less well explained by the two variables but there was some evidence of current year effects of U.S., British and French prices and lagged effects of Japanese prices. Exchange rate influences were slight, and they were mostly lagged effects.

Almost all the measured price and exchange rate effects for the United States and Germany were in the directions we originally hypothesized. A currency devaluation would raise the export/domestic price ratio and a more rapid rate of inflation than those of trading partners would tend to reduce it. Thus the first steps in the relative inflation and currency revaluation sequences described in the Introduction are confirmed by the U.S. and German data. The Japanese price ratios were least well explained and as many coefficients contradicted our hypotheses as confirmed them, particularly coefficients for foreign prices. The Japanese price ratio we found, at least before the major exchange rate changes, responded mainly to U.S. and European business cycle developments. The ratio rose in times of foreign prosperity and declined in times of foreign recession, a relationship we did not find for the U.S. or German price ratios. Thus while the U.S. and German price ratios responded to foreign price developments, the Japanese ratio seemed to respond to cyclical, probably income developments in other countries.

Once we took account of the foreign cyclical influence on the Japanese price ratio, changes in exchange rates produced the

expected effects, with the yen's upward revaluation lowering the ratio and the yen depreciation raising it. The Japanese results therefore also confirm the first step in the currency revaluation sequence.

4. Both export and domestic prices responded to changes in foreign prices and exchange rates, but the export price response was greater.

The coefficient for German price effects on U.S. domestic prices are mostly in the range of ten per cent to over one third, with a one-year lag, suggesting that over 10 per cent and probably more of a change in German domestic prices is transmitted to U.S. domestic prices by a year later. However, there are some offsetting negative exchange rate coefficients which suggest that we are mixing up price and exchange rate effects. When we combine the two and examine changes in German domestic price competitiveness in dollars we find an effect of almost 25 per cent on U.S. export prices but only about half that, and not statistically significant, on U.S. domestic prices after a year. Combining the current and lagged effects, mostly not significant, cuts both estimates in half.

U.K. relative inflation effects are large, more in the current year than in the following year, and twice as high for U.S. export as for U.S. domestic prices, where we can make the comparison. However, the effects are much reduced and not statistically significant, although still large, when we take U.K. relative prices in dollars. Some of the equations suggest the following pattern. The current year effect of British prices is stronger on U.S. export prices than on U.S. domestic prices. However, a year later, the

the effect on export prices is small, though still positive, while the U.K. price effect on U.S. domestic prices is larger than in the first year. By the end of the second year U.S. domestic prices have almost caught up with export prices. It is this catching up in the second year that accounts for the negative lagged coefficients in the equations for the U.S. export/domestic price ratio.

Japanese prices in yen are shown to have very large impacts on U.S. prices, in the current year and a year later, to an extent it is hard to believe. Probably the excessively high estimated effects for Japanese prices are related to the low coefficients for U.S. unit labor costs in these equations. Where the comparison can be made, we find that foreign price and exchange rate effects are greater on U.S. export prices than on domestic prices.

The response to Japanese prices in dollars is also large, but tends to be pushed into the next year, with some coefficients for the first year price change unexpectedly negative. The combination of current and lagged coefficients of Japanese prices in dollars ranges around 10-20 per cent, still surprisingly high.

The German data, which are by far the most complete, give the clearest and most reasonable results. Foreign prices strongly affect German export and domestic prices but always the export prices more than the domestic prices. The same greater effect on export prices is evident if we net out some negative exchange rate or lagged price coefficients. As a corollary to the stronger foreign price impact on German export prices, unit labor cost in every case has a stronger impact on domestic prices than on export prices. The price effects on

Germany are mostly in the current year, except for French and Japanese prices, the latter somewhat suspect because there are substantial negative exchange rate coefficients offsetting the lagged price effects.

The foreign effects on Japanese prices estimated by the equations are too large to be believable, all being close to or even above one. The unit labor cost coefficients, on the other hand, are extremely low, suggesting that the unit labor cost effects have been confounded with the price effects.

On the whole, there is strong evidence for Germany and the United States and some less clear evidence for Japan that foreign price changes influence both domestic and export prices within each country. Furthermore, at least for Germany, there is a clear pattern in which foreign prices have a larger impact on German export prices than on German domestic prices, as we hypothesized earlier.

5. Changes in the export/domestic price ratio are associated with shifts between exporting and selling at home.

Another test of the significance of the export/domestic price ratio, aside from its relation to foreign prices and exchange rates, is whether it is related to the share of exports in total production. We hypothesized earlier that a rise in the export/domestic price ratio should lead to a shift by producers from domestic to export markets, or, in other words, a rise in the ratio of exports to production, and a finding that it did would confirm the genuineness and importance of the movements in the export/domestic price ratio.

In the United States, the export/domestic price ratio for machinery and transport equipment changes little before the 1970's

but the sharp rise after 1972 was accompanied by a substantial shift to export markets. In Germany, there were large and unrelated trends in the two ratios but deviations from these trends seemed to have the expected relationship. That is, when the export/domestic price ratio was high relative to its trend, the export/domestic shipment ratio also tended to be high. For these two countries, therefore, the evidence supports the validity of the measurement of the export/domestic price ratio and its role in determining the division of sales. However, we could find no such relationship in the Japanese data.

We have not been able to test every link in the sequences of events resulting from inflation and exchange rate changes that we hypothesized earlier, and the tests we have made are crude because we are not able to attempt here a complete explanation of prices and trade. However, the tests we have been able to run fit well with our expectations in most cases and rarely contradict them. We thus feel that there is a substantial case for the existence of differences between export and domestic prices and for their playing a significant role in the international adjustment to differences in rates of inflation among trading countries and to changes in exchange rates.

We find that commodity markets for manufactured goods are sufficiently tied together so that a rise in one major country's price level tends to raise prices in other countries but that the reaction sometimes takes a year or even more and leaves the relation between the two countries' prices changed to some degree. Neither the links between different countries' export prices nor those between a country's export and its

domestic prices are perfectly tight, and as a result the connections between different countries' domestic prices are looser than is often supposed in theorizing about international monetary disturbances and adjustments.

APPENDIX TABLE A-1

Measures of Change in Export/Domestic Price Ratios for the U.S. Machinery and Transport Equipment: SITC 7
(1963=100)

| | Weighted Aggregate of 4-Digit Ratios | | Unweighted Average of 4-Digit Ratios | Median Ratio | Per Cent of Ratios > 1 (Change from preceding year) |
|---|---|---|---|---|---|
| | A | B | | | |
| 1953 | 99.8 | 103.7 | 100.6 | 99.4 | |
| 1954 | 99.5 | 103.1 | 99.9 | 98.8 | 38 |
| 1955 | 99.1 | 101.7 | 99.2 | 98.3 | 43 |
| 1956 | 98.5 | 101.4 | 98.2 | 97.2 | 33 |
| 1957 | 98.5 | 100.7 | 97.9 | 97.1 | 44 |
| 1958 | 98.4 | 100.7 | 98.1 | 97.3 | 50 |
| 1959 | 98.1 | 100.2 | 97.7 | 97.2 | 45 |
| 1960 | 98.7 | 99.9 | 98.3 | 97.8 | 67 |
| 1961 | 99.0 | 99.8 | 98.7 | 98.3 | 67 |
| 1962 | 99.3 | 99.4 | 99.2 | 99.2 | 69 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 62 |
| 1964 | 99.9 | 100.7 | 100.0 | 99.2 | 42 |
| 1965 | 99.8 | 100.6 | 99.7 | 99.2 | 50 |
| 1966 | 97.7 | 98.5 | 97.9 | 98.3 | 22 |
| 1967 | 98.3 | 99.1 | 98.7 | 99.1 | 74 |
| 1968 | 97.6 | 98.4 | 97.7 | 98.1 | 25 |
| 1969 | 98.2 | 99.0 | 97.9 | 97.8 | 47 |
| 1970 | 98.3 | 99.1 | 98.2 | 98.0 | 52 |
| 1971 | 98.6 | 99.4 | 98.0 | 97.5 | 43 |
| 1972 | 98.6 | 99.4 | 97.7 | 97.5 | 52 |
| 1973 | 99.5 | 100.3 | 98.5 | 98.7 | 62 |
| 1974 | 103.0 | 103.9 | 101.7 | 101.8 | 64 |
| 1975 | 104.3 | 105.1 | 102.9 | 101.4 | 38 |

## Notes to APPENDIX TABLE A-1

Domestic price data are BLS wholesale price indexes for specific commodities aggregated into 4-digit SITC classes. Export price data (A Series) are BLS export price indexes for SITC subgroups and items extended back to 1953, where possible, by indexes from Irving B. Kravis and Robert E. Lipsey, Price Competitiveness in World Trade, NBER, 1971, with interpolations for 1954-56 and 1958-60 as described in Kravis and Lipsey "International Trade Prices and Price Proxies" in The Role of the Computer in Economic and Social Research in Latin America, NBER, 1974. The number of series ranges from 8 in 1953 to 22 in 1975. We are indebted to Eliot Kalter for the selection and matching of export and domestic price series. The B Series adds to the A Series those 4-digit SITC subgroups covered in Price Competitiveness, for periods through 1964, even if they were not included in the BLS data after 1964. It is thus more complete for the pre-1964 period.

In calculating the weighted aggregate of export/domestic price ratios, each 4-digit subgroup was given its weight in U.S. exports in the calculation of 3-digit group indexes. Each 3-digit group was given its weight in U.S. exports in aggregating to 2-digit classes except when the coverage of 4-digit subgroups was less than 40 per cent of the value of exports in the 3-digit group, in which case only the weight of the covered 4-digit subgroups was used. The same procedure was used in aggregating from the 2-digit to the 1-digit level (SITC 7 as a whole).

The unweighted average of 4-digit ratios, the median ratio, and the per cent of ratios greater than one are all derived from the A series data.

Two 4-digit indexes available in the original sources were omitted in this calculation. One was the BLS series for SITC 729.3 and the other was the NBER series for SITC 722.1. In both cases the reason was that the ratio did not represent the movement of export prices relative to domestic prices for the same or similar products. In the case of SITC 729.3 the BLS export price index is dominated by semiconductors while the wholesale price index is heavily weighted with television tubes. In the case of SITC 722.1, from 1953 to 1964, the NBER "international price index" is constructed from domestic transactions prices while the BLS domestic price index is based on list prices which differed greatly (see Kravis and Lipsey, Price Competitiveness, pp. 408-421). Thus the ratio shows mainly the relationship of transaction to list prices rather than the ratio of export to domestic prices.

APPENDIX TABLE A-2

Measures of U.S. Export and Domestic Price Change

Machinery and Transport Equipment: SITC 7;
and All Manufactures: SITC 5-8
(1963=100)

| | SITC 7 | | | | | |
|---|---|---|---|---|---|---|
| | Export Price Subgroups | | Domestic Price Subgroups | | | SITC 5-8 Domestic Price |
| | A | B | A | B | Total | |
| 1953 | 85.3 | 83.3 | 85.7 | 80.0 | 79.7 | 83.7 |
| 1954 | 85.2 | 84.2 | 85.9 | 81.1 | 81.2 | 84.9 |
| 1955 | 85.1 | 85.0 | 86.0 | 82.6 | 83.4 | 87.2 |
| 1956 | 88.0 | 90.1 | 89.6 | 88.0 | 88.3 | 91.1 |
| 1957 | 92.2 | 94.5 | 93.8 | 93.4 | 93.5 | 95.6 |
| 1958 | 93.9 | 96.5 | 95.6 | 95.9 | 96.0 | 97.2 |
| 1959 | 95.9 | 98.1 | 97.9 | 98.2 | 98.4 | 98.9 |
| 1960 | 97.3 | 98.9 | 98.5 | 99.1 | 99.1 | 99.6 |
| 1961 | 97.6 | 99.3 | 98.6 | 99.2 | 99.2 | 99.7 |
| 1962 | 99.1 | 99.3 | 99.8 | 99.9 | 99.5 | 99.8 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 101.4 | 101.5 | 101.5 | 100.9 | 100.9 | 100.9 |
| 1965 | 102.8 | 102.9 | 103.0 | 102.4 | 101.9 | 102.3 |
| 1966 | 104.1 | 104.2 | 106.5 | 105.9 | 105.4 | 105.5 |
| 1967 | 107.8 | 107.9 | 109.7 | 109.1 | 109.5 | 108.5 |
| 1968 | 110.6 | 110.7 | 113.3 | 112.7 | 113.6 | 112.0 |
| 1969 | 114.8 | 114.9 | 116.9 | 116.2 | 117.4 | 115.4 |
| 1970 | 120.2 | 120.3 | 122.3 | 121.6 | 123.4 | 120.6 |
| 1971 | 125.5 | 125.6 | 127.5 | 126.7 | 129.6 | 125.0 |
| 1972 | 128.6 | 128.8 | 130.7 | 129.9 | 133.0 | 128.2 |
| 1973 | 133.5 | 133.6 | 134.5 | 133.7 | 136.5 | 133.4 |
| 1974 | 154.7 | 154.9 | 150.5 | 149.6 | 154.7 | 156.6 |
| 1975 | 181.8 | 182.0 | 175.1 | 174.1 | 177.6 | NA |

Source: For description of A and B Series see Appendix Table A-1. Other domestic price indexes are data from BLS price tapes formed into unweighted indexes at the 4-digit SITC level and then aggregated up from there using U.S. 1963 export weights.

APPENDIX TABLE A-3

Measures of Domestic Price Change: Foreign Countries Relative to U.S.

Machinery and Transport Equipment: SITC 7
(1963=100)

| | Relative Rate of Inflation (Own Currency) | | | U.S. Domestic Price Competitiveness ($) | | |
|---|---|---|---|---|---|---|
| | U.K. | Germany | Japan | U.K. | Germany | Japan |
| 1953 | NA | 109.0 | 126.9 | NA | 103.6 | 127.2 |
| 1954 | 101.2 | 104.6 | 123.2 | 101.5 | 99.5 | 123.4 |
| 1955 | 101.4 | 102.2 | 117.2 | 101.1 | 96.9 | 117.4 |
| 1956 | 99.8 | 97.9 | 114.9 | 99.7 | 92.9 | 115.4 |
| 1957 | 98.0 | 95.5 | 114.6 | 97.8 | 90.6 | 115.1 |
| 1958 | 97.9 | 93.7 | 108.1 | 98.3 | 89.1 | 108.5 |
| 1959 | 96.1 | 90.7 | 104.1 | 96.4 | 86.6 | 104.5 |
| 1960 | 96.0 | 91.5 | 102.8 | 96.3 | 87.5 | 103.2 |
| 1961 | 98.2 | 95.0 | 102.2 | 98.3 | 94.2 | 102.3 |
| 1962 | 99.2 | 100.2 | 101.2 | 99.5 | 99.9 | 101.4 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 101.0 | 100.5 | 98.0 | 100.7 | 100.8 | 97.9 |
| 1965 | 102.7 | 102.9 | 96.9 | 102.5 | 102.7 | 96.9 |
| 1966 | 101.3 | 103.6 | 96.2 | 101.0 | 103.2 | 96.0 |
| 1967 | 98.7 | 100.0 | 93.9 | 96.7 | 100.0 | 93.7 |
| 1968 | 98.4 | 96.6 | 91.1 | 84.1 | 96.5 | 91.3 |
| 1969 | 97.8 | 95.2 | 88.4 | 83.5 | 96.7 | 89.1 |
| 1970 | 100.5 | 97.6 | 85.8 | 86.0 | 106.8 | 86.6 |
| 1971 | 104.7 | 100.3 | 82.7 | 91.4 | 115.0 | 85.8 |
| 1972 | 108.3 | 101.7 | 79.0 | 96.8 | 127.2 | 92.7 |
| 1973 | 112.4 | 103.7 | 79.2 | 98.5 | 156.1 | 105.3 |
| 1974 | 119.3 | 102.1 | 86.4 | 99.7 | 157.3 | 107.0 |
| 1975 | 127.4 | 96.1 | 77.9 | 101.1 | 156.1 | 94.9 |

## Notes to APPENDIX TABLE A-3

The indexes for Germany and Japan through 1974 are aggregates of 4-digit relative price indexes. The individual-country 4-digit price indexes are themselves calculated from individual commodity price data classified into SITC subgroups by the NBER. Each German and Japanese domestic price index at the 4-digit level is divided by the corresponding U.S. index and the resulting relative price indexes are aggregated up to 3-digit, 2-digit, and 1-digit levels using as weights total OECD exports in 1963. The equations using Japanese prices reported in the text tables are mostly based on a Japan/U.S. relative price index that was constructed by comparing the Japanese price index for SITC 7 with that for the U.S. instead of aggregating up relative price indexes from the 4-digit level. The two methods produced results that were so similar that we did not consider it worthwhile to recompute the equations on the preferred basis.

The U.K. data were not available at the 4-digit level and were therefore derived by dividing the U.K. aggregate index for SITC 7 by that for the U.S. The U.K. aggregate indexes were provided to the NBER by the Department of Industry, Economics and Statistics Division. The indexes through 1971 were aggregated from the 4-digit level using 1963 OECD weights, as for the other countries, but those for later years are based on U.K. export weights for 1973.

For descriptions of the German and Japanese indexes see Appendix Tables B-1 and C-1. The U.S. extrapolating index for wholesale prices is a weighted average of group indexes for Transportation Equipment (.32805) and Machinery and Equipment (.67195). The weights are based on 1963 U.S. exports. Data for U.S. indexes are from BLS price tapes and the Monthly Labor Review.

APPENDIX TABLE B-1

Export/Domestic Price Ratios for Germany

All Manufactures: SITC 5-8; and
Machinery and Transport Equipment: SITC 7
(1963=100)

| | SITC 5-8 | SITC 7 |
|---|---|---|
| 1953 | NA | NA |
| 1954 | 107.6 | 102.5 |
| 1955 | 107.0 | 103.1 |
| 1956 | 105.5 | 102.5 |
| 1957 | 104.7 | 102.3 |
| 1958 | 104.6 | 102.9 |
| 1959 | 104.4 | 103.6 |
| 1960 | 103.7 | 103.1 |
| 1961 | 102.2 | 101.9 |
| 1962 | 100.5 | 99.8 |
| 1963 | 100.0 | 100.0 |
| 1964 | 101.6 | 100.0 |
| 1965 | 101.1 | 100.1 |
| 1966 | 100.8 | 99.8 |
| 1967 | 101.9 | 101.4 |
| 1968 | 100.7 | 100.7 |
| 1969 | 101.8 | 100.5 |
| 1970 | 101.8 | 100.4 |
| 1971 | 100.4 | 99.9 |
| 1972 | 99.8 | 99.5 |
| 1973 | 100.4 | 99.5 |
| 1974 | 101.6 | 98.2 |
| 1975 | NA | 99.0 |

## Notes to APPENDIX TABLE B-1

Indexes are aggregations from individual commodity export and domestic price series, as described for the United States in the Notes to Appendix Table A-1. The discontinuity in the export price indexes at the time of the shift to the value-added tax was treated by assuming no change in price for the month of the shift in the tax system. Extrapolations to 1975 for SITC 7 were based on combinations of published group indexes as follows:

Domestic price is a weighted index of the following group indexes of the "Index der Erzeugerpreise industrielle Produkte"

- Maschinenbauerzeugnisse
- Strassenfahrzeuge
- Elektrotechnische Erzeugnisse

with weights taken from the export price index.

Export price is a weighted index of the following group indexes of the "Index der Ausfuhrpreise"

- Maschinenbauerzeugnisse (einschl. Lokomotiven und Ackerschlepper)
- Strassenfahrzeuge (ohne Ackerschlepper)
- Elektrotechnische Erzeugnisse

with weights of .50637, .29078, and .20286 respectively. The weights are from the index on 1962=100.

Sources: Preise, Löhne, Wirtschaftsrechnungen, Reihe 1, Preise und Preisindizes für Aussenhandelsgüter; Reihe 3, Preise und Preisindizes für industrielle Produkte, Index der Erzeugerpreise; Reihe 8, Index der Grosshandelsverkaufspreise (Statistisches Bundesamt, Wiesbaden).

Statistisches Jahrbuch für die Bundesrepublik Deutschland, 1971, pp. 431, 432, 449; 1967, pp. 445, 446, 463 (Statistisches Bundesamt, Wiesbaden).

Wirtschaft und Statistik, Nov. 1976.

APPENDIX TABLE B-2

Measures of German Export and Domestic Price Change

All Manufactures: SITC 5-8; and
Machinery and Transport Equipment: SITC 7
(1963=100)

| | SITC 5-8 | | SITC 7 | |
|---|---|---|---|---|
| | Export Price Index | Domestic Price Index | Export Price Index | Domestic Price Index |
| 1953 | NA | 89.9 | NA | 87.0 |
| 1954 | 94.2 | 87.9 | 87.9 | 85.0 |
| 1955 | 95.0 | 88.7 | 88.6 | 85.0 |
| 1956 | 96.6 | 90.4 | 90.6 | 87.2 |
| 1957 | 98.7 | 92.6 | 92.7 | 89.6 |
| 1958 | 98.1 | 93.5 | 94.0 | 90.5 |
| 1959 | 97.3 | 92.9 | 94.1 | 89.9 |
| 1960 | 98.8 | 94.0 | 95.4 | 91.4 |
| 1961 | 99.4 | 96.1 | 97.4 | 94.1 |
| 1962 | 99.9 | 99.2 | 99.2 | 99.2 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 102.4 | 101.8 | 101.4 | 101.7 |
| 1965 | 105.0 | 104.7 | 104.4 | 104.8 |
| 1966 | 107.2 | 107.5 | 107.2 | 108.0 |
| 1967 | 107.3 | 106.7 | 108.1 | 107.9 |
| 1968 | 106.2 | 106.5 | 107.7[b] | 107.9 |
| 1969 | 108.2[a] | 107.1 | 108.9 | 109.8 |
| 1970 | 115.5 | 115.1 | 117.1 | 118.5 |
| 1971 | 120.2 | 122.1 | 125.1 | 127.3 |
| 1972 | 123.3 | 127.0 | 130.0 | 133.0 |
| 1973 | 132.1 | 135.0 | 136.8 | 139.8 |
| 1974 | 154.1 | 154.6 | 148.4 | 153.9 |
| 1975 | NA | NA | 161.7 | 166.4 |

[a] With export tax, 111.6.

[b] With export tax, 112.2.

## Notes to APPENDIX TABLE B-2

Indexes are aggregates of indexes for 4-digit SITC subgroups, as described in the Notes to Appendix Table A-1. For sources, see Notes to Appendix Table B-1.

The export tax, introduced at the end of 1968 and removed at the end of 1969, was tried as a variable in a number of equations not shown in the text tables. They did not change the results enough to warrant use of the equations that included them.

APPENDIX TABLE B-3

Measures of Price Change: Foreign Countries Relative to Germany

All Manufactures: SITC 5-8
(1963=100)

| | Relative Rate of Inflation (Own Currency) | | | | German Domestic Price Competitiveness (DM) | | | |
|---|---|---|---|---|---|---|---|---|
| | France | U.K. | U.S. | Japan | France | U.K. | U.S. | Japan |
| 1953 | NA | NA | 94.6 | 118.9 | NA | NA | 99.7 | 125.3 |
| 1954 | NA | NA | 97.8 | 116.6 | NA | NA | 103.1 | 122.9 |
| 1955 | 81.9 | 95.9 | 99.1 | 113.0 | 121.4 | 101.1 | 104.8 | 119.5 |
| 1956 | 83.4 | 98.5 | 102.3 | 117.9 | 123.4 | 104.0 | 108.1 | 124.8 |
| 1957 | 85.4 | 99.7 | 103.8 | 117.2 | 120.9 | 105.1 | 109.6 | 124.0 |
| 1958 | 90.0 | 100.0 | 104.6 | 108.1 | 109.4 | 105.7 | 110.1 | 114.1 |
| 1959 | 96.8 | 101.4 | 107.4 | 109.5 | 101.6 | 106.8 | 112.7 | 115.2 |
| 1960 | 99.3 | 101.7 | 106.9 | 108.5 | 103.8 | 106.8 | 111.8 | 113.9 |
| 1961 | 100.0 | 102.1 | 103.6 | 105.0 | 100.8 | 103.1 | 104.5 | 105.9 |
| 1962 | 98.3 | 100.1 | 100.4 | 99.6 | 98.7 | 100.8 | 100.8 | 100.1 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 101.8 | 100.1 | 99.0 | 98.7 | 101.5 | 99.5 | 98.7 | 98.3 |
| 1965 | 99.8 | 99.9 | 97.0 | 95.4 | 100.1 | 100.0 | 97.3 | 95.6 |
| 1966 | 99.8 | 99.8 | 96.5 | 93.1 | 100.0 | 99.9 | 96.9 | 93.3 |
| 1967 | 99.6 | 101.3 | 99.5 | 95.5 | 99.3 | 99.3 | 99.5 | 95.3 |
| 1968 | 98.2 | 105.5 | 102.4 | 95.8 | 97.4 | 90.3 | 102.6 | 96.1 |
| 1969 | 108.1 | 108.1 | 104.8 | 96.6 | 100.6 | 90.9 | 103.3 | 95.8 |
| 1970 | 108.2 | 108.2 | 102.2 | 93.8 | 87.8 | 84.7 | 93.5 | 86.6 |
| 1971 | 104.2 | 111.0 | 100.2 | 88.6 | 80.9 | 84.5 | 87.5 | 80.1 |
| 1972 | 104.8 | 112.3 | 99.7 | 86.1 | 81.5 | 80.3 | 79.8 | 80.8 |
| 1973 | 113.0 | 113.4 | 98.5 | 95.7 | 83.0 | 66.1 | 65.5 | 84.6 |
| 1974 | 127.6 | 122.2 | 99.6 | 105.1 | 84.4 | 66.4 | 64.7 | 84.5 |

U.S. indexes are aggregated from 4-digit relative price indexes while all the others are derived by dividing the aggregate foreign price indexes by the German price index.

APPENDIX TABLE B-4

Measures of Price Change: Foreign Countries Relative to Germany

Machinery and Transport Equipment: SITC 7
(1963=100)

| | Relative Rate of Inflation (Own Currency) | | | German Domestic Price Competitiveness (DM) | | |
|---|---|---|---|---|---|---|
| | U.S. | U.K. | Japan | U.S. | U.K. | Japan |
| 1953 | 91.8 | NA | 131.5 | 96.5 | NA | 138.6 |
| 1954 | 95.6 | 96.6 | 132.1 | 100.5 | 102.1 | 139.1 |
| 1955 | 97.8 | 99.4 | 128.4 | 103.2 | 104.8 | 135.7 |
| 1956 | 102.1 | 101.1 | 128.1 | 107.6 | 106.7 | 135.6 |
| 1957 | 104.7 | 102.3 | 128.0 | 110.4 | 107.8 | 135.4 |
| 1958 | 106.7 | 103.9 | 122.5 | 112.2 | 109.9 | 129.4 |
| 1959 | 110.2 | 105.3 | 118.7 | 115.5 | 110.9 | 124.9 |
| 1960 | 109.3 | 104.1 | 115.3 | 114.3 | 109.3 | 121.1 |
| 1961 | 105.3 | 103.5 | 109.4 | 106.1 | 104.6 | 110.3 |
| 1962 | 99.8 | 99.5 | 102.2 | 100.1 | 100.2 | 102.8 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 99.5 | 100.2 | 97.9 | 99.2 | 99.6 | 97.5 |
| 1965 | 97.1 | 99.9 | 95.3 | 97.4 | 100.0 | 95.5 |
| 1966 | 96 6 | 98.8 | 93.0 | 96.9 | 98.9 | 93.1 |
| 1967 | 100.0 | 100.1 | 92.4 | 100.0 | 98.1 | 92.2 |
| 1968 | 103.5 | 103.6 | 92.2 | 103.6 | 88.7 | 92.5 |
| 1969 | 105.1 | 104.5 | 90.4 | 103.4 | 87.9 | 89.7 |
| 1970 | 102.4 | 104.6 | 85.1 | 93.7 | 81.9 | 78.5 |
| 1971 | 99.7 | 106.6 | 79.3 | 87.0 | 81.2 | 71.7 |
| 1972 | 98.3 | 108.3 | 75.8 | 78.6 | 77.5 | 71.1 |
| 1973 | 96.5 | 109.8 | 75.2 | 64.1 | 64.0 | 66.4 |
| 1974 | 98.0 | 119.8 | 83.3 | 63.6 | 65.1 | 67.0 |
| 1975 | 104.1 | 135.9 | 79.9 | 64.1 | 66.6 | 59.9 |

U.S. indexes are aggregated from 4-digit relative price indexes while all the others are derived by dividing the aggregate foreign price indexes by the German price index.

APPENDIX TABLE C-1

Export/Domestic Price Ratios for Japan

All Manufactures: SITC 5-8; and
Machinery and Transport Equipment: SITC 7
(1963=100)

| | SITC 5-8 | SITC 7 |
|---|---|---|
| 1953 | 101.3 | 108.5 |
| 1954 | 102.7 | 105.7 |
| 1955 | 103.5 | 102.0 |
| 1956 | 104.8 | 101.6 |
| 1957 | 103.1 | 99.2 |
| 1958 | 100.6 | 100.1 |
| 1959 | 102.1 | 99.1 |
| 1960 | 102.3 | 98.6 |
| 1961 | 101.2 | 99.5 |
| 1962 | 100.1 | 99.9 |
| 1963 | 100.0 | 100.0 |
| 1964 | 101.2 | 101.1 |
| 1965 | 101.1 | 101.5 |
| 1966 | 99.5 | 101.4 |
| 1967 | 99.5 | 102.2 |
| 1968 | 100.6 | 102.5 |
| 1969 | 101.0 | 103.4 |
| 1970 | 99.6 | 103.3 |
| 1971 | 99.0 | 104.0 |
| 1972 | 95.9 | 103.0 |
| 1973 | 94.1 | 102.8 |
| 1974 | 97.3 | 101.6 |
| 1975 | NA | 103.7 |

## Notes to APPENDIX TABLE C-1

Indexes are aggregations from individual commodity export and domestic price series, as described for the United States in the Notes to Appendix Table A-1. Extrapolations to 1975 for SITC 7 were based on combinations of published group indexes for:

Electrical machinery
Transport equipment
General machinery and precision instruments

with weights taken from 1963 Japanese exports. The weights are .34690, .41820, and .23490.

Sources: Price Indexes Annual, Export and Import Price Indexes Annual, Wholesale Price Indexes Annual (Statistics Department, Bank of Japan), with some additional data supplied directly by the Bank of Japan.

APPENDIX TABLE C-2

Measures of Japanese Export and Domestic Price Change

All Manufactures: SITC 5-8; and
Machinery and Transport Equipment: SITC 7
(1963=100)

| | SITC 5-8 | | SITC 7 | |
|---|---|---|---|---|
| | Export Price Index | Domestic Price Index | Export Price Index | Domestic Price Index |
| 1953 | 105.0 | 106.9 | 118.6 | 114.5 |
| 1954 | 111.6 | 102.6 | 116.6 | 112.3 |
| 1955 | 108.7 | 100.3 | 111.2 | 109.1 |
| 1956 | 111.7 | 106.6 | 112.0 | 111.7 |
| 1957 | 110.7 | 108.5 | 113.9 | 114.7 |
| 1958 | 103.1 | 101.0 | 112.0 | 110.9 |
| 1959 | 105.7 | 101.6 | 111.5 | 106.7 |
| 1960 | 106.6 | 102.0 | 110.3 | 105.4 |
| 1961 | 102.6 | 100.9 | 104.6 | 103.0 |
| 1962 | 98.8 | 98.8 | 101.1 | 101.4 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 101.8 | 100.5 | 100.2 | 99.6 |
| 1965 | 100.9 | 99.8 | 100.5 | 99.8 |
| 1966 | 100.1 | 100.1 | 101.3 | 100.4 |
| 1967 | 100.8 | 101.9 | 101.6 | 99.7 |
| 1968 | 101.8 | 102.0 | 102.5 | 99.5 |
| 1969 | 104.2 | 103.5 | 104.0 | 99.3 |
| 1970 | 107.8 | 108.0 | 107.3 | 100.9 |
| 1971 | 108.0 | 108.2 | 111.3 | 101.0 |
| 1972 | 105.9 | 109.3 | 109.4 | 100.8 |
| 1973 | 117.7 | 129.2 | 112.2 | 105.1 |
| 1974 | 156.1 | 162.5 | 139.0 | 128.2 |
| 1975 | NA | NA | 147.2 | 132.9 |

Indexes are aggregates of indexes for 4-digit SITC subgroups, as described in the Notes to Appendix Table A-1. For sources, see Notes to Appendix Table C-1.

APPENDIX TABLE C-3

Measures of Price Change: Foreign Countries Relative to Japan

All Manufactures: SITC 5-8
(1963=100)

| | Relative Rate of Inflation (Own Currency) | | | | Japanese Domestic Price Competitiveness (Yen) | | | |
|---|---|---|---|---|---|---|---|---|
| | U.S. | France | Germany | U.K. | U.S. | France | Germany | U.K. |
| 1953 | 78.3 | NA | 84.1 | NA | 78.1 | NA | 79.8 | NA |
| 1954 | 82.8 | NA | 85.8 | NA | 82.7 | NA | 81.4 | NA |
| 1955 | 86.9 | 72.5 | 88.5 | 84.8 | 86.7 | 101.3 | 83.7 | 84.4 |
| 1956 | 85.4 | 70.7 | 84.8 | 83.6 | 85.1 | 98.7 | 80.1 | 83.1 |
| 1957 | 88.1 | 72.9 | 85.3 | 85.0 | 87.8 | 97.3 | 80.6 | 84.5 |
| 1958 | 96.2 | 83.3 | 92.5 | 92.5 | 95.8 | 95.7 | 87.7 | 92.5 |
| 1959 | 97.3 | 88.4 | 91.3 | 92.6 | 96.9 | 88.1 | 86.8 | 92.5 |
| 1960 | 97.7 | 91.5 | 92.2 | 93.7 | 97.3 | 91.1 | 87.8 | 93.6 |
| 1961 | 98.8 | 95.2 | 95.2 | 97.2 | 98.7 | 95.0 | 94.4 | 97.2 |
| 1962 | 101.0 | 98.7 | 100.4 | 100.5 | 100.8 | 98.5 | 99.9 | 100.6 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 100.4 | 103.1 | 101.3 | 101.4 | 100.5 | 103.2 | 101.7 | 101.2 |
| 1965 | 102.5 | 104.6 | 104.9 | 104.8 | 102.5 | 104.6 | 104.6 | 104.6 |
| 1966 | 105.4 | 107.2 | 107.4 | 107.2 | 105.6 | 107.1 | 107.2 | 107.1 |
| 1967 | 106.5 | 104.4 | 104.7 | 106.1 | 106.7 | 104.2 | 104.9 | 104.2 |
| 1968 | 109.8 | 102.6 | 104.4 | 110.1 | 109.6 | 101.3 | 104.1 | 93.9 |
| 1969 | 111.4 | 111.9 | 103.5 | 111.9 | 110.6 | 104.9 | 104.3 | 94.8 |
| 1970 | 111.7 | 115.3 | 106.6 | 115.3 | 110.7 | 101.4 | 115.5 | 97.8 |
| 1971 | 115.6 | 117.5 | 112.8 | 125.2 | 111.4 | 100.8 | 124.8 | 105.3 |
| 1972 | 117.3 | 121.7 | 116.2 | 130.5 | 99.9 | 100.8 | 123.8 | 99.4 |
| 1973 | 103.3 | 118.0 | 104.5 | 118.5 | 77.6 | 98.0 | 118.3 | 78.1 |
| 1974 | 96.4 | 121.3 | 95.1 | 116.2 | 77.8 | 99.7 | 118.3 | 78.5 |

U.S. indexes are aggregated from 4-digit relative price indexes, while all the others are derived by dividing the aggregate foreign price indexes by the Japanese price indexes.

APPENDIX TABLE C-4

Measures of Price Change: Foreign Countries Relative to Japan

Machinery and Transport Equipment: SITC 7
(1963=100)

| | Relative Rate of Inflation (Own Currency) | | | Japanese Domestic Price Competitiveness (Yen) | | |
|---|---|---|---|---|---|---|
| | U.S. | U.K. | Germany | U.S. | U.K. | Germany |
| 1953 | 69.7 | NA | 76.0 | 69.5 | NA | 72.2 |
| 1954 | 72.3 | 73.1 | 75.7 | 72.1 | 73.2 | 71.9 |
| 1955 | 76.4 | 77.4 | 77.9 | 76.2 | 77.0 | 73.7 |
| 1956 | 79.1 | 78.9 | 78.1 | 78.8 | 78.5 | 73.8 |
| 1957 | 81.5 | 79.9 | 78.1 | 81.2 | 79.5 | 73.8 |
| 1958 | 86.6 | 84.8 | 81.6 | 86.2 | 84.8 | 77.3 |
| 1959 | 92.3 | 88.7 | 84.2 | 91.9 | 88.6 | 80.1 |
| 1960 | 94.0 | 90.3 | 86.7 | 93.7 | 90.2 | 82.6 |
| 1961 | 96.3 | 94.6 | 91.4 | 96.3 | 94.6 | 90.6 |
| 1962 | 98.1 | 97.3 | 97.8 | 97.9 | 97.4 | 97.3 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 101.3 | 102.3 | 102.1 | 101.4 | 102.1 | 102.5 |
| 1965 | 102.1 | 104.9 | 105.0 | 102.1 | 104.7 | 104.7 |
| 1966 | 105.0 | 106.3 | 107.6 | 105.2 | 106.2 | 107.4 |
| 1967 | 109.8 | 108.4 | 108.2 | 110.0 | 106.4 | 108.4 |
| 1968 | 114.2 | 112.4 | 108.4 | 114.0 | 95.8 | 108.1 |
| 1969 | 118.2 | 115.6 | 110.6 | 117.3 | 97.9 | 111.5 |
| 1970 | 122.3 | 122.9 | 117.5 | 121.2 | 104.2 | 127.3 |
| 1971 | 128.3 | 134.3 | 126.0 | 123.7 | 113.0 | 139.4 |
| 1972 | 132.0 | 143.0 | 132.0 | 112.5 | 108.8 | 140.6 |
| 1973 | 129.9 | 146.0 | 133.0 | 97.6 | 96.2 | 150.5 |
| 1974 | 120.6 | 143.8 | 120.0 | 97.3 | 97.1 | 149.3 |
| 1975 | 133.6 | 170.2 | 125.2 | 109.7 | 111.0 | 167.0 |

U.S. indexes are aggregated from 4-digit relative price indexes while all the others are derived by dividing the aggregate foreign price indexes by the Japanese price index.

APPENDIX TABLE D-1

Effective Exchange Rates Against 21 Trading Partners and U.S. Exchange Rates Against the £, DM, French Franc, and Yen

(1963=100)

| | Effective Exchange Rates | | | Price, in Dollars, of | | | |
|---|---|---|---|---|---|---|---|
| | U.S. | Germany | Japan | £ | DM | French Franc | Yen |
| 1953 | 93.0 | 86.9 | 96.0 | 95.4 | 95.1 | 140.1 | 100.2 |
| 1954 | 92.8 | 86.9 | 95.9 | 95.2 | 95.1 | 140.1 | 100.2 |
| 1955 | 93.8 | 86.7 | 96.5 | 94.6 | 94.8 | 140.1 | 100.2 |
| 1956 | 93.7 | 86.9 | 96.7 | 94.8 | 94.9 | 140.1 | 100.4 |
| 1957 | 93.9 | 87.8 | 97.0 | 94.7 | 94.9 | 134.0 | 100.4 |
| 1958 | 95.8 | 90.7 | 98.3 | 100.4 | 95.1 | 115.4 | 100.4 |
| 1959 | 97.3 | 93.8 | 99.3 | 100.3 | 95.4 | 100.0 | 100.4 |
| 1960 | 98.0 | 94.3 | 99.7 | 100.3 | 95.6 | 99.9 | 100.4 |
| 1961 | 99.0 | 99.1 | 99.8 | 100.1 | 99.2 | 99.9 | 100.1 |
| 1962 | 99.8 | 99.6 | 100.1 | 100.3 | 99.7 | 100.0 | 100.2 |
| 1963 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1964 | 100.1 | 100.3 | 99.8 | 99.7 | 100.3 | 100.0 | 99.9 |
| 1965 | 100.2 | 100.1 | 100.2 | 99.8 | 99.8 | 100.0 | 100.0 |
| 1966 | 100.6 | 100.5 | 100.2 | 99.7 | 99.7 | 99.7 | 99.8 |
| 1967 | 100.7 | 101.0 | 100.4 | 98.0 | 100.0 | 99.6 | 99.8 |
| 1968 | 102.3 | 102.4 | 102.1 | 85.5 | 99.9 | 98.9 | 100.2 |
| 1969 | 102.5 | 105.3 | 103.0 | 85.4 | 101.6 | 94.5 | 100.8 |
| 1970 | 101.4 | 114.3 | 102.5 | 85.5 | 109.4 | 88.7 | 100.9 |
| 1971 | 99.0 | 118.5 | 104.3 | 87.3 | 114.7 | 89.0 | 103.7 |
| 1972 | 92.2 | 122.4 | 115.0 | 89.4 | 125.1 | 97.2 | 117.4 |
| 1973 | 84.1 | 136.6 | 125.4 | 87.7 | 150.5 | 110.4 | 133.0 |
| 1974 | 86.4 | 143.3 | 117.7 | 83.6 | 154.1 | 101.9 | 123.9 |
| 1975 | 85.5 | 145.8 | 114.0 | 79.4 | 162.4 | 114.6 | 121.8 |

Data are from the International Monetary Fund.

The effective exchange rates are those derived from the IMF Multilateral Exchange Rate Model (MERM), as described in Rudolf R. Rhomberg, "Indices of Effective Exchange Rates," IMF Staff Papers, Vol. XXIII, No. 1, March 1976. The rates against the dollar are annual averages of daily noon rates in New York.

The bilateral exchange rates for the DM and the yen used in equations for those countries in this paper are all derived from these rates against the dollar.

APPENDIX TABLE D-2

Ratios of Exports to Manufacturing Shipments or Output
United States, Germany, and Japan, 1953-1974

(1963=100)

| | U.S. | Germany | Japan |
|---|---|---|---|
| 1953 | 102.0 | 75.3 | 83.4 |
| 1954 | 105.7 | 82.6 | 104.7 |
| 1955 | 93.7 | 84.0 | 121.0 |
| 1956 | 112.5 | 92.6 | 117.1 |
| 1957 | 107.9 | 100.5 | 112.8 |
| 1958 | 111.7 | 97.8 | 115.4 |
| 1959 | 92.1 | 99.7 | 115.5 |
| 1960 | 102.2 | 102.6 | 109.8 |
| 1961 | 108.6 | 98.8 | 94.6 |
| 1962 | 104.9 | 94.5 | 98.4 |
| 1963 | 100.0 | 100.0 | 100.0 |
| 1964 | 106.8 | 101.1 | 104.8 |
| 1965 | 100.3 | 100.2 | 126.8 |
| 1966 | 100.1 | 108.4 | 127.9 |
| 1967 | 109.8 | 117.8 | 114.2 |
| 1968 | 114.7 | 119.7 | 120.1 |
| 1969 | 123.6 | 119.9 | 122.9 |
| 1970 | 142.4 | 116.4 | 124.9 |
| 1971 | 143.4 | 117.2 | 141.3 |
| 1972 | 139.6 | 119.9 | 147.2 |
| 1973 | 159.9 | 127.5 | 152.7 |
| 1974 | 208.9 | 157.5 | 214.8 |
| 1975 | 247.2 | | |

## Notes to APPENDIX TABLE D-2

U.S.: Value of exports from various issues of the Survey of Current Business (1973 and 1974), Business Statistics: 1973, p. 113 (1965-72), Foreign Commerce and Navigation of the U.S.: 1965, p. 15 (1958-64), and Commodity Trade Statistics, United Nations, (1953-58).

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Value of shipments from Statistical Survey of the Economy of Japan, 1966, 1970, and 1975, Ministry of Foreign Affairs, Economic Affairs Bureau.

APPENDIX TABLE D-3

Indicators of Cyclical Activity:
United States and Six Other Countries

(1963=100)

| | U.S. Composite Index of 12 Leading Indicators | Six-Countries Composite Index of Deflated Leading Indicators, GNP Weighted |
|---|---|---|
| 1953 | 86.2 | 60.1 |
| 1954 | 85.7 | 63.3 |
| 1955 | 96.7 | 71.8 |
| 1956 | 93.6 | 75.5 |
| 1957 | 87.3 | 76.4 |
| 1958 | 86.0 | 73.5 |
| 1959 | 96.5 | 84.7 |
| 1960 | 89.3 | 94.0 |
| 1961 | 92.6 | 98.5 |
| 1962 | 95.7 | 95.0 |
| 1963 | 100.0 | 100.0 |
| 1964 | 106.8 | 104.5 |
| 1965 | 111.9 | 103.3 |
| 1966 | 113.5 | 104.3 |
| 1967 | 111.5 | 102.9 |
| 1968 | 120.0 | 110.1 |
| 1969 | 122.3 | 116.0 |
| 1970 | 112.2 | 112.3 |
| 1971 | 119.7 | 111.2 |
| 1972 | 131.7 | 119.7 |
| 1973 | 138.2 | 139.7 |
| 1974 | 122.7 | 140.4 |
| 1975 | NA | 130.0 |

U.S. index is from Business Conditions Digest (U.S. Department of Commerce), May 1976, pp. 106-107.

Six-Country Index is an unpublished series from the NBER International Economic Indicator project. The countries included are Canada, France, Germany, Italy, the U.K., and Japan.

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