Dollar's fall boosts U.S. machinery exports, 1985–90

The post-1985 decline in the dollar's value vis-a-vis the currencies of the Nation's major trading partners helped to make these important export goods more price competitive on world markets

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After appreciating for much of the first part of the decade, the U.S. dollar turned around and, in March of 1985, began a steady course of depreciation against the currencies of several of the Nation's leading trade partners. (See chart 1.) The 35.8-percent fall in the dollar's trade-weighted value between March 1985 and the end of 1990 had a substantive impact on both price movements and trade volumes of U.S. imports and exports.[1] One sector of the U.S. economy that clearly demonstrates these effects is the machinery and transport equipment industries, the focus of this article.[2] These industries make up more than 47 percent of the total dollar value of U.S. imports and exports.[3]

The dollar's depreciation elicited different responses from U.S. and foreign producers. In general, foreign producers of machinery and transport equipment attempted to offset the effects of their currencies' gains by keeping selling prices relatively stable. U.S. manufacturers, however, allowed currency shifts to make their goods less expensive in foreign markets. This triggered a surge in U.S. exports of machinery and transport equipment which helped reduce, and in some cases reverse, trade deficits in these industries. The export growth experienced by machinery and transport equipment industries fueled a considerable improvement of the U.S. merchandise trade deficit from 1985 to 1990.[4]

This article uses several statistical measures produced by the Bureau's International Price Program to describe developments for individual industries and to show the apparent effects that dollar depreciation had on prices and volumes of internationally traded machine goods from 1985 to 1990. Such measures as dollar price indexes, average exchange rate indexes, foreign currency indexes, and pass-through rates are analyzed for five major industries: computers, telecommunications equipment, specialized and general industrial machinery, and motor vehicles.

Background

Before reaching its peak in 1985, the U.S. dollar had appreciated dramatically against the currencies of the Nation's major trade partners. U.S. economic growth during the early 1980's had exceeded the expansion of many other industrial economies. These developments led to a surge in U.S. imports and a decline in U.S. exports. As a result, the U.S. merchandise trade deficit nearly quadrupled between 1982 and 1984.[5] By 1985, the deficit had risen to an unprecedented level of $145 billion.[6]

Because the United States financed much of its expanded consumption through domestic and foreign borrowing, total outstanding U.S. debt climbed almost 58 percent, from $4.64 trillion in 1980 to $7.32 trillion in 1985.[7] Many economists were disturbed by the implications of a

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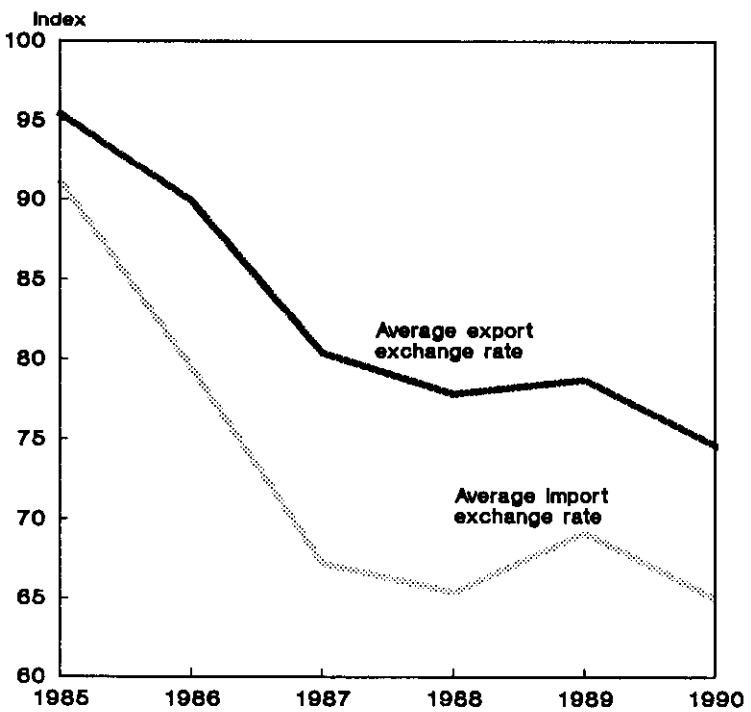
strengthening currency and escalating dollar-denominated foreign and domestic debt.[8] As the strong dollar made it increasingly difficult for U.S. manufacturers to compete in world markets, foreign governments became concerned that the U.S. deficit might lead the Nation to enact protectionist measures.[9] By early 1985, domestic and foreign pressures were mounting to lower the exchange value of the dollar. In September of 1985, finance ministers representing the United States and four other major industrialized countries embarked on a concerted effort to reduce the value of the dollar. This alliance, known as the Group of Five, included the United States, Japan, West Germany, France, and the United Kingdom.

Through increased policy coordination, the Group of Five hoped it could devalue the U.S. dollar, and in turn, offset several of the global economic imbalances—particularly the U.S. current account and trade deficits.[10] This, in turn, might also relieve the growing pressures on the Nation caused by its domestic and international debt.[11] While there is much disagreement about the long-term effects the Group of Five's actions may have had on the dollar's movement, the beginning of dollar depreciation roughly coincided with the group's first summit.

Chart 1. Indexes of trade-weighted nominal dollar exchange rates for machinery and transport equipment, 1985-90



In addition to the public attention generated by the economic summits, several factors were responsible for the falling exchange value of the dollar in the mid- to late 1980's. These included monetary policy adjustments, fluctuations in the world price of oil, and the uncertain outlook for the U.S. trade and Federal budget deficits.

Real interest rate levels have historically exerted a strong influence on the exchange value of the dollar. In theory, high interest rates in one country attract foreign investors to assets denominated in that country's currency. This drives up the demand for and cost of that currency. The opposite is also assumed to be valid, with low interest rates decreasing the demand for and cost of a country's currency.[12]

Between 1980 and 1984, real interest rates in the United States were on the rise. From 1982 to 1985, U.S. rates were significantly higher than those in Germany, Japan, and Canada. This condition roughly coincided with a period during which the dollar was very strong.

Conversely, real U.S. interest rates took a downturn during the 1985-90 period. From late 1985 through 1987, real interest rates in Germany exceeded those in the United States. In 1988, the two measures briefly converged before U.S. rates began to fall again. Japanese rates held relatively stable as the gap was narrowed by decreasing U.S. rates, which fell below Japanese rates in 1989. (See table 1.) These interest rate differentials were influential in driving down the dollar's foreign exchange value between 1985 and 1987.[13]

The combined effects of monetary policy and other economic factors can be seen in the 39.2-percent depreciation of the trade-weighted dollar for imported manufactured goods industries that occurred between 1985 and 1990.[14] Roughly 95 percent of this sharp depreciation took place in the first 3 years of that period. There was a brief pause in the dollar's descent in late 1988 and early 1989, but depreciation then resumed, with the dollar reaching its lowest value in more than 10 years by December 1990.

Other factors also contributed to the downward pressure on the dollar between 1985 and 1990. World oil prices generally have a significant influence on the value of the U.S. currency, because international trade of petroleum is conducted in U.S. dollars. In general, decreasing or low oil prices reduce demand for the dollar, thereby driving its foreign exchange value down. This was the case in 1985, 1986, and 1988, as an oversupply of oil put downward pressure on both its own price and the dollar's value. The reverse often holds true as well. This was evident in early 1989, as oil prices rallied in response to the Organization of Petroleum Exporting Coun-

tries' official price and production level agreements, sending the dollar upward.

Another element affecting the dollar's foreign exchange value was the state of the U.S. Federal budget and merchandise trade deficits. Their size and persistence exerted downward pressure on the dollar through 1987, while the reductions in both deficits in 1988 and early 1989 were partly responsible for the dollar's brief turnaround at that time. In 1990, the unfavorable outlook for the budget deficit nudged the dollar back down.[15]

During this period, the currencies of major U.S. trade partners responded to these influences in varied ways. Currencies of several industrial countries appreciated sharply and immediately against the dollar, while those of the Newly Industrialized Countries (NIC's)[16] did not respond as quickly or in the same magnitude. There are at least three reasons for these inconsistent responses among currencies. First, the currencies of the NIC's were not left to float as freely in response to market forces as were the currencies of the industrial countries. Second, real foreign interest rates, which were higher than U.S. rates, lured investors' funds to other industrial countries, thereby increasing their currencies' foreign exchange values. And third, in the early 1980's, the currencies of the NIC's had not depreciated as sharply against the dollar as had other currencies.

Among the industrial nations, the dollar lost the most value against the European currencies and the Japanese yen. Of these currencies, the German mark showed the sharpest appreciation against the dollar, gaining over 45.0 percent in value from 1985 to 1990. Currencies of other European countries and Japan also appreciated considerably, rising 39.0 percent, on average, above their 1985 exchange rates.[17] (See chart 2.)

An exception to the currency trends of the Nation's industrial trade partners was the Canadian dollar. It gained just 14.6 percent in value against the U.S. dollar between 1985 and 1990.[18] The relatively limited movement of this currency may be explained in part by the frequent intervention of Canadian authorities to keep the exchange rate of their dollar low. Another factor was the traditional interdependence of the U.S. and Canadian economies.[19] (See chart 2.)

Movements in currencies of industrial countries are important because the United States conducts a large volume of trade in manufactured goods with those countries. Almost 80 percent of all U.S. imports of manufactured goods came from the industrial countries of the European Community, Japan, and Canada in 1985.[20] These countries were also the largest markets for U.S. exports of manufactured goods.

Table 1. **Real interest rates for the United States and for selected U.S. trading partners, 1980–90**

Year	United States	Japan	Germany	Canada
1980	−1.8	1.1	2.9	2.1
1981	3.2	3.6	3.8	2.5
1982	6.4	5.3	3.5	3.1
1983	7.7	5.5	4.4	5.7
1984	7.9	4.4	5.3	8.1
1985	6.8	4.3	4.6	6.8
1986	5.7	4.3	6.1	5.1
1987	4.5	(1)	5.5	5.3
1988	4.7	3.5	4.7	6.0
1989	3.5	2.7	4.2	4.7
1990	3.0	4.1	6.0	5.8

[1] Data not available.

NOTE: Figures were calculated using the following formula: $r-i/1+i=a$.

SOURCE: International Monetary Fund, "Government Bond Yields" and "Consumer Prices," *International Financial Statistics*, various issues.

Thus, the strengthening of the currencies of industrial countries against the U.S. dollar had a particularly strong impact on both prices and trade volumes in these product areas. (See chart 3.)

In contrast, currencies of the Newly Industrialized Countries were slow to respond to downward pressures on the dollar. Historically, these currencies had been pegged to the dollar, but recently it has been widely perceived that they were undervalued. Responding to pressure from U.S. officials, the NIC's allowed their currencies to float upward from 1986 until 1990, when the South Korean won and Taiwan dollar began to weaken. Between 1985 and 1990, the Taiwan dollar appreciated most, gaining 32.6 percent against the dollar.[21] Other NIC's allowed their currencies to rise, although to a lesser extent than did Taiwan. (See chart 2.)

The shift in the currency values of the NIC's during this 6-year period had some important consequences for the U.S. machinery and transport equipment industries. The slower and more subdued reaction of these currencies to the market factors that drove up the values of other currencies relative to the dollar made the products of the NIC's more price competitive in foreign markets. This may have been a factor in the emergence of the NIC's as leading exporters to the United States in certain industries, especially those considered high technology industries.

Movements in trade measures, 1985–90

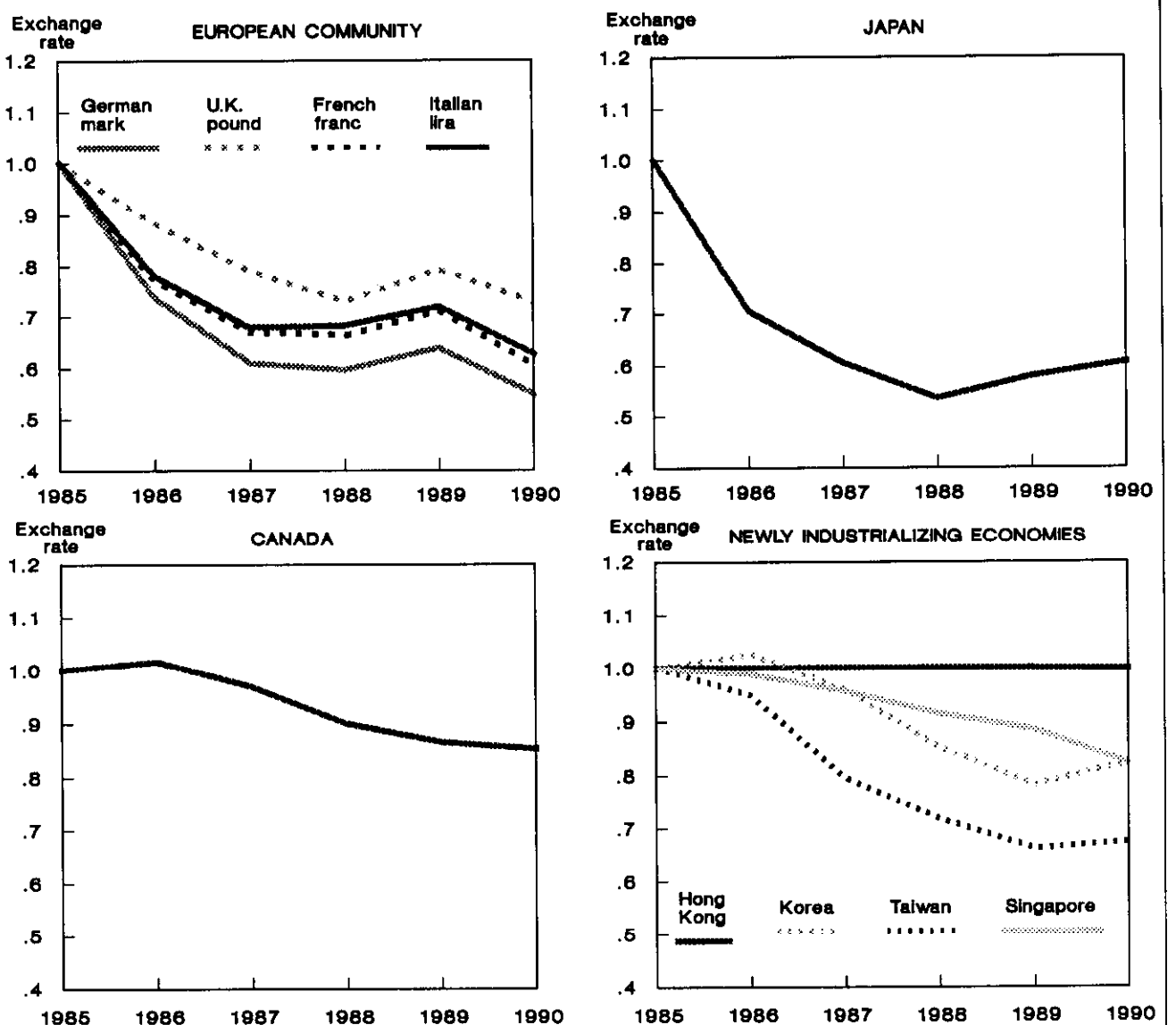
To better measure the effects of exchange rates on different industries, the International Price

Program produces several different statistical series. The program's primary outputs are the import and export price indexes, which measure price movements in dollars for various internationally traded commodities. However, because dollar-denominated indexes do not tell a complete story, foreign currency price indexes have also been developed. The latter measures indicate the price shifts for U.S. imports and exports in terms of the trade-weighted average foreign currency of U.S. trading partners.[22]

To analyze exchange rate shifts for each industry, BLS calculates average exchange rate indexes (equivalent to the trade-weighted dollar's movement). For each product category, countries are assigned specific weights based on their volume of trade with the United States. U.S. industries that traded heavily with Japan and Germany during the late 1980's generally experienced large average exchange rate shifts, because the yen and the mark appreciated considerably. Industries that traded predominantly with the NIC's or with Canada experienced smaller average exchange rate index movements.

While the majority of high technology goods imported by the United States came from Japan

Chart 2. **Trends in the exchange rate of the dollar against the currencies of selected trading partners, 1985-90**



SOURCE: "Foreign Exchange Rates," *Federal Reserve Bulletin*, various issues.

and the NIC's, the principal export market for U.S. companies was the European Community. In the industrial machinery sector, the Nation's two largest foreign suppliers were Japan and Germany, whereas Canada was the leading consumer of U.S. industrial machinery. Most imports of motor vehicles were shipped to the United States from Japan and Germany, while Canada was the largest export market for U.S. motor vehicles.

During the dollar's advance from June 1981 to June 1985, the import price index for machinery and transport equipment rose 2.5 percent.[23] As the trade-weighted dollar depreciated sharply between 1985 and 1990, the import price index rose 37.1 percent. The export price index for machinery and transport equipment also climbed between 1985 and 1990, although the 11.6-percent increase was far lower than that posted on the import side. However, more is revealed about exchange rate effects on U.S. export prices in foreign markets by the foreign currency price indexes, because these reflect the impact of the dollar's decline on the price competitiveness of U.S. goods in foreign markets. While other factors may be at work in determining prices, these indexes provide a quantifiable means of evaluating the role of the exchange rate in price movements. (See tables 1 and 2.)

The trade-weighted dollar for exports of the machinery and transport equipment industries depreciated an average of 28.7 percent between 1985 and 1990. A result of this development was that, while dollar prices of these goods rose 11.6 percent, export prices for machinery and transport equipment in foreign currency terms actually fell 20.3 percent, on average.

The U.S. dollar and foreign currency indexes can also be used together with the average exchange rate indexes to give some indication of how international buyers and sellers responded to currency shifts. These figures are referred to as "pass-through rates." Pass through is complete (100 percent) when the exporter does not adjust prices in the home currency. In this case, exchange rate shifts are reflected entirely in foreign currency prices. When pass through is less than complete, the exporter adjusts prices in the home currency, reducing effects of exchange rate shifts. A zero-percent pass through means that home currency prices are adjusted so that none of the shift in exchange rates is reflected in foreign currency prices. The concept of pass through is based on the assumption that both foreign and U.S. exporters sell in several markets and have some degree of control over their prices in overseas markets.

With respect to U.S. imports, pass-through rates measure the extent to which foreign exporters passed through the decline in the dollar's value between 1985 and 1990 in the form of higher dollar prices.[24] Consequently, they may also indicate the degree to which foreign producers absorbed these exchange rate shifts by lowering prices in their home currencies. Export pass-through rates, meanwhile, display the extent to which pass through by U.S. exporters is reflected in lower foreign currency prices for American-made goods.

From analysis of pass-through figures for U.S. imports and exports of machinery and transport equipment, three broad patterns emerged. First, 1985–90 pass-through rates of the machinery and transport equipment industries tended to be higher than pass-through figures for crude materials and intermediate manufactures. This was particularly true for U.S. exports. Past studies have attributed this pattern to the nature of trade in world markets for manufactured goods. These markets are more typically characterized by imperfect competition, product differentiation, and price discrimination than are the markets for more basic commodities.[25] Thus, manufacturers in machinery industries may have more control over prices than, for example, marketers of agricultural products. In addition to being higher than the pass-through values of other industries, pass-through rates for manufactured goods can be more meaningful, because prices of these products are less subject to the speculative effects found among various basic commodities markets.

The dollar's depreciation elicited different responses from U.S. and foreign procedures

Second, pass-through rates for almost every component of the imported machinery and transport equipment product category showed a clear pattern of increase over two periods of the 1985–90 span examined in this study (March 1985 to December 1987 and March 1985 to December 1990). (See table 3.) The average pass-through rates for "all imported machinery and transport equipment," for example, were higher for the full 6-year period than the first 3 years. While the pass-through value through December of 1987 was 43.4, it had climbed to 57.6 by the end of 1990. In other words, foreign producers apparently attempted to absorb the effects of appreciation in their currencies by lowering their prices for exports more in the first 3 years than during the entire period 1985–90.

This tendency suggests that, as the dollar continued falling against the currencies of the Nation's major trade partners, prices of machinery and transport equipment imported to the United States were increasingly responsive to exchange rate shifts. It is possible that, as the dollar fell over a longer period, the pressure on the profit margins of foreign manuracturers became more burdensome and they could not sus-

tain low levels of pass through. Thus, more of their home currencies' appreciation was passed through in the form of higher dollar prices.

While import pass-through rates showed a tendency to increase over the two periods studied, the opposite was true for export pass-through rates. Prices of U.S. machinery and transport equipment exports were most reflective of exchange rate shifts in the first subperiod—from March 1985 to December 1987. These pass-through rates generally fell over the period 1985–90 as a whole. The average pass-through rate for the "all machinery and transport equipment" export index was 90.6 through March of 1987. This figure slid to 70.8 when averaged over the 6-year period. Export pass-through rates for all U.S. machinery and transport equipment industries are shown in table 3. With the exceptions of the computer equipment and motor vehicle industries, all components of the machinery product category followed this trend.

This pattern apparently reflects willingness by U.S. exporters to pass along almost the full effects of dollar depreciation. Thus, over the 1985–87 period, foreign currency prices for U.S. exports fell almost as much, in percentage terms, as did the value of the dollar. As depreciation continued, however, these prices reflected exchange rate shifts to a lesser extent. The pattern may also be a function of general inflationary trends, both domestic and foreign, that would affect both import and export pass-through rates.

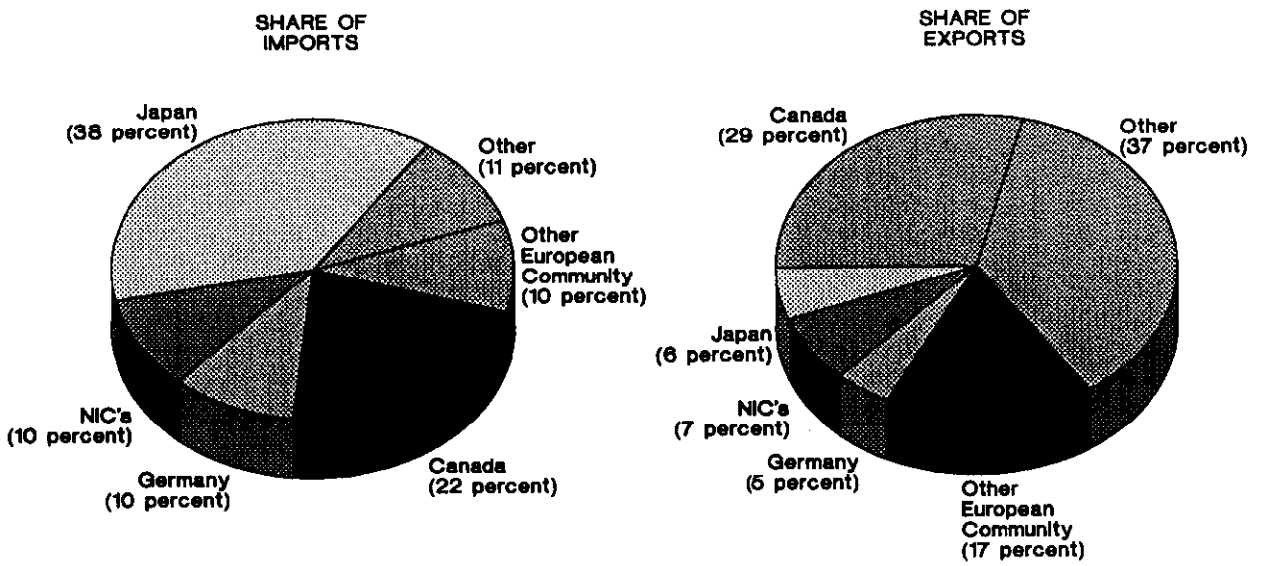
Third, pass-through rates for the machinery and transport equipment industries in both periods were higher for U.S. exports than for U.S imports. Hence, foreign currency prices of U.S. exports reflected the exchange rate shifts from 1985 to 1990 to a greater degree than did the dollar prices of U.S. imports.

Industry developments, 1985–90

In four of the five industries discussed below, the dollar's depreciation and the subsequent enhanced price competitiveness of U.S. firms encouraged strong export growth. The one exception to this trend was the motor vehicle industry.

In the high technology industries—computers and telecommunications equipment—intense competition in world markets caused U.S. and foreign manufacturers to react to exchange rate shifts in different ways. U.S. exporters passed through a large portion of the dollar's decline, which resulted in lower foreign currency prices for their products. Foreign producers absorbed most of the exchange rate shifts by lowering

Chart 3. **Shares of 1985 U.S. imports and exports accounted for by selected trading partners**



SOURCE: U.S. Bureau of the Census.

their home currency prices. The actions encouraged export growth while preventing a decline in the volume of imports.

Among the industrial machinery industries, both specialized and general, U.S. and foreign producers passed through a large percentage of currency shifts. For U.S. companies, this provided an impetus for export expansion. Likewise, higher prices for foreign goods impeded import growth. Unlike the high technology sector, which remained in deficit, the Nation's specialized and general industrial machinery industries were able to convert their trade deficits of 1986 to 1988 into surpluses by 1990.[26]

The U.S. motor vehicle industry was relatively unresponsive to exchange rate shifts, as other factors exerted greater influence on prices and trade volumes in this industry. While the industry's trade deficit improved slightly during the 1985–90 period, this was due more to slackening import levels than to export growth.

Table 2. **Percentage changes in import and export dollar indexes for the machinery and transport equipment industry, March 1985–December 1990**

Standard International Trade Classification (SITC)	Industry	Percentage change, March 1985–December 1990	
		Import dollar index	Export dollar index
7	Machinery and transport equipment	37.1	11.6
7	Machinery	35.5	9.5
71	Power generators	(1)	20.1
72	Specialized machinery	78.9	16.3
73	Metalworking machinery	65.4	26.2
74	General machines and parts	70.8	20.8
75	Computers	18.0	–8.0
76	Telecommunications equipment	7.9	13.0
77	Electrical machinery	33.2	7.6
78	Motor vehicles	37.3	13.9
79	Other transportation equipment	(1)	25.4

[1] Currently, no index is developed for this category.

High technology industries. In the high technology industries, where prices tend to fall due to technological innovation, U.S. manufacturers benefitted from the dollar's depreciation in the highly competitive computers and telecommunications equipment industries. As the dollar's value diminished, U.S. exporters of these goods were able to pass through a large percentage of the dollar's depreciation in the form of significantly lower foreign currency prices, without reducing dollar prices. To stay competitive, the foreign producers that supplied the U.S. market for computers and telecommunications equipment absorbed a considerable share of the currency shifts by lowering their home currency prices. This appears to have prevented a sharp advance in dollar prices for their products in the U.S. marketplace, which could have occurred if foreign producers had passed through more of their own currencies' appreciation.

The competitive nature of the global *computer* market has historically exerted downward pressure on prices. Companies have made continual efforts to adopt the most efficient production methods in an attempt to lower costs and prices.[27] This has often meant transferring the manufacture of parts to subsidiaries located in countries with lower labor costs. Parts are typically shipped back to the United States for final assembly into finished computers. The rapid evolution of products also tends to push prices down because consumer preference for newer technologies weakens demand for older products and puts downward pressure on their prices.

Another factor that tended to drive down computer prices was the introduction of low priced copies, or "clones," of the industry leaders' computers. Because the original manufacturers had financed all research and development expenses, costs for clone manufacturers were low, which encouraged several firms to enter the market. This contributed to the problem of overcapacity that plagued the U.S. computer industry in the late 1980's, and pushed prices down further.[28]

U.S. exporters of computers appeared to maximize their price competitiveness, in that foreign currency prices fell by more than the amount of the dollar's decline. Over the 1985–90 period, U.S. firms exporting computers lowered dollar prices 8.0 percent, while prices for their products in the foreign buyer's currency decreased by an average of 43.3 percent.

These lower foreign currency prices, combined with the quality and technological superiority of American mainframes and supercomputers, were instrumental in the expansion of U.S. exports of these products that occurred in the late 1980's. By 1990, the computer and office equipment industry had emerged as the Nation's most successful exporter among all manufacturing and mining industries.[29] Industry exports grew 75.7 percent in real terms between 1985 and 1990.[30]

By passing through less than 30.0 percent of their currencies' appreciation, foreign computer manufacturers resisted the upward pressure on their prices. Instead, these companies found it beneficial to absorb a large portion of their currencies' gains against the dollar between 1985 and 1990. During this period, they were able to maintain competitiveness by lowering their home currency prices an average of 29.6 percent. This limited the increase in dollar prices of their products to 18.0 percent. (See chart 3.)

The importance of the American market to foreign companies may have influenced their decision to squeeze profit margins in order to maintain market share. As oversupply and slackening demand in the industry persisted in the late 1980's, maintaining competitive prices became critical for foreign manufacturers.[31] Although dollar prices for foreign-made computers increased moderately, the products were still priced more competitively than U.S. computers.

Import levels continued to rise considerably during the late 1980's. From 1985 to 1990, the inflation-adjusted value of imports grew by more than 100 percent.[32] The high volume of U.S. computer imports, maintained despite the weak dollar, was largely responsible for the erosion of the U.S. trade surplus in computers in the late 1980's. A $2.4 billion deficit, the industry's first, was posted in 1989.[33]

After more than 4 years of dollar appreciation in the early 1980's, U.S. manufacturers of *telecommunications equipment* found it increasingly difficult to compete in world markets, particularly against Japanese and other Asian producers. U.S. industry trade surpluses with Canada and nations of the European Community were offset by the large and growing deficit that U.S. telecommunications producers experienced with Japan. By 1985, Japan held a bilateral surplus of $1.07 billion with the United States.[34]

As the dollar began falling in 1985, foreign demand for U.S. telecommunications equipment strengthened. This was particularly true for the component industries that produce "line equipment." Line equipment includes all products that are used in telephone sets, facsimile machines, switching equipment, telephone and computer modems, and electronic phone systems. From 1985 to 1990, inflation-adjusted dollar values of telecommunications equipment exported by the United States swelled 100.9 percent.[35]

Dollar depreciation had a direct impact on U.S. export prices, because American manufacturers passed through almost the full effects of a weaker dollar. (See table 2.) While U.S. export prices in dollar terms increased only 1.6 percent through 1987, foreign currency prices of U.S. telecommunications equipment fell 24.1 percent. Table 3 shows that U.S. exporters passed through the largest portion of the dollar's decline during the years 1985–87.

U.S. export volumes did not respond to the dollar's fall as quickly as did export prices. In the first 3 years of the study period (1985–87), U.S. exports of telecommunications equipment grew by 22.5 percent in real terms.[36] The largest expansion, however, was experienced in 1988 and 1989, when the value of exports climbed by almost 42 percent.[37] This pattern has been attributed to the lag effects associated with contracts that fix the prices of future deliveries, and to the fact that, during the late 1980's, foreign countries lowered some of the regulatory barriers that had previously restricted U.S. access to their markets.[38]

Foreign producers of telecommunications equipment, meanwhile, were adversely affected by the dollar's fall. In contrast to the actions taken by U.S. exporters, foreign suppliers of line equipment to the United States attempted to compensate for the effects of their currencies' movements against the dollar. By reducing home currency prices 35.4 percent, foreign exporters to this country passed through only 13.7 percent of their currencies' appreciation. This resulted in a relatively small 9.5-percent rise in U.S. import prices for telecommunications equipment.

Because import pass-through rates were low and U.S. demand for telecommunications imports remained strong through 1988, U.S. import volumes continued to grow. The dollar value of total imports did fall in 1990, but this was related chiefly to the cooling of the U.S. economy.

Stimulated by the weakness of the dollar and high pass-through rates, U.S. export volumes of line equipment soared between 1985 and 1990. Although U.S. exports to Japan more than doubled in terms of both dollar volume and market share between 1985 and 1990, the U.S. trade deficit with Japan and other nations of the Far East continued to deteriorate until 1989

Table 3. **Pass-through rates for U.S. imports and exports of machinery and transport equipment, March 1985–December 1990**

Standard International Trade Classification (SITC)	Industry	March 1985–December 1987		March 1985–December 1990	
		Imports	Exports	Imports	Exports
7	Machinery and transport equipment	43.4	90.6	57.6	70.8
7	Machinery	40.1	96.7	53.7	79.9
71	Power generators	(1)	80.5	(1)	54.5
72	Specialized machinery	64.5	95.4	95.1	58.8
73	Metalworking machinery	51.9	71.7	75.3	35.2
74	General machines and parts	66.7	77.6	98.5	42.6
75	Computers	31.4	111.2	26.7	112.9
76	Telecommunications equipment	13.7	95.2	11.5	67.4
77	Electrical machinery	43.6	95.8	67.7	83.9
78	Motor vehicles	44.7	43.4	59.6	39.2
79	Other transportation equipment	(1)	70.9	(1)	23.9

[1] Currently, no index is developed for this category.

because of steady U.S. import growth. While imports of Japanese telecommunications equipment grew at a slower rate than U.S. export volumes to Japan, they were growing from a much larger base. (See chart 4.)

Meanwhile, U.S. trade with all other major world regions, especially the European Community, resulted in large surpluses. The U.S. telecommunications industry's surplus with European nations increased from $78 million in 1985 to $452 million in 1989 and continued to grow in 1990.[39]

As a result of steady export growth throughout the 6-year study period and the eventual slowing of imports in 1990, the overall trade deficit of the U.S. telecommunications industry fell by more than 22 percent, from $15.7 billion in 1986 to $12.2 billion by 1990.[40] Had the foreign producers of telecommunications equipment passed through more of their currencies' shifts from 1985 to 1990, the dollar's depreciation might conceivably have reversed the U.S. trade deficit for this industry.

Industrial machinery. The general and specialized industrial machinery sectors of U.S. international trade were strongly influenced by exchange rates over the period 1985–90. The depreciation of the dollar had more noticeable effects on prices and the volume of exports and imports in these two industries than in the high technology industries. Whereas external factors prevented import prices from rising sharply in the high technology industries, both import and export prices in the industrial machinery industries were very responsive to the dollar's fall.

The tremendous price swings caused by the dollar's declining value and their subsequent effects on export and import volumes had a positive, but delayed, influence on the U.S. trade balance in the *specialized machinery* industries. The trade surplus that existed in 1985 had deteriorated to a $1.9 billion deficit by 1987.[41] Since then, however, increased exports of specialized machinery have fueled an improvement in the trade balance, which posted surpluses in both 1989 and 1990.

The turnaround in these industries can be attributed primarily to the surge in exports that took place as a result of dollar depreciation. The value of U.S. exports of construction, mining, oil drilling, and agricultural machinery rose steadily throughout the late 1980's.

Higher production costs in the United States, including those for labor and for key inputs such as iron and steel, did put upward pressure on specialized machinery prices.[42] However, American companies were able to maintain pricing competitiveness by keeping dollar prices fairly steady, and passing through close to the entire amount of the dollar's fall from 1985 through the end of 1987. This resulted in an average decrease of 23.1 percent in prices paid in the foreign buyer's currency during that time.

U.S. exporters did not sustain the high pass-through rates for the full 6 years of the study period. By the end of 1990, they had raised the dollar prices of their exports by approximately 16.3 percent. (See tables 1 and 2.) Nevertheless, foreign currency prices for U.S. specialized industrial machinery were still more than 16.6 percent lower in 1990 than in 1985.

While the depreciating dollar benefitted U.S. companies exporting specialized machinery, the effect was unfavorable for foreign companies shipping heavy machinery to the United States. Between 1985 and the end of 1987, foreign suppliers of the U.S. specialized machinery market absorbed a large portion of their currencies' appreciation against the dollar. In an effort to maintain market share, they cut prices in their home currencies by an average of 15.2 percent, yet dollar prices for their products in the U.S. marketplace still rose 47.9 percent and, by 1990, import levels had fallen off.

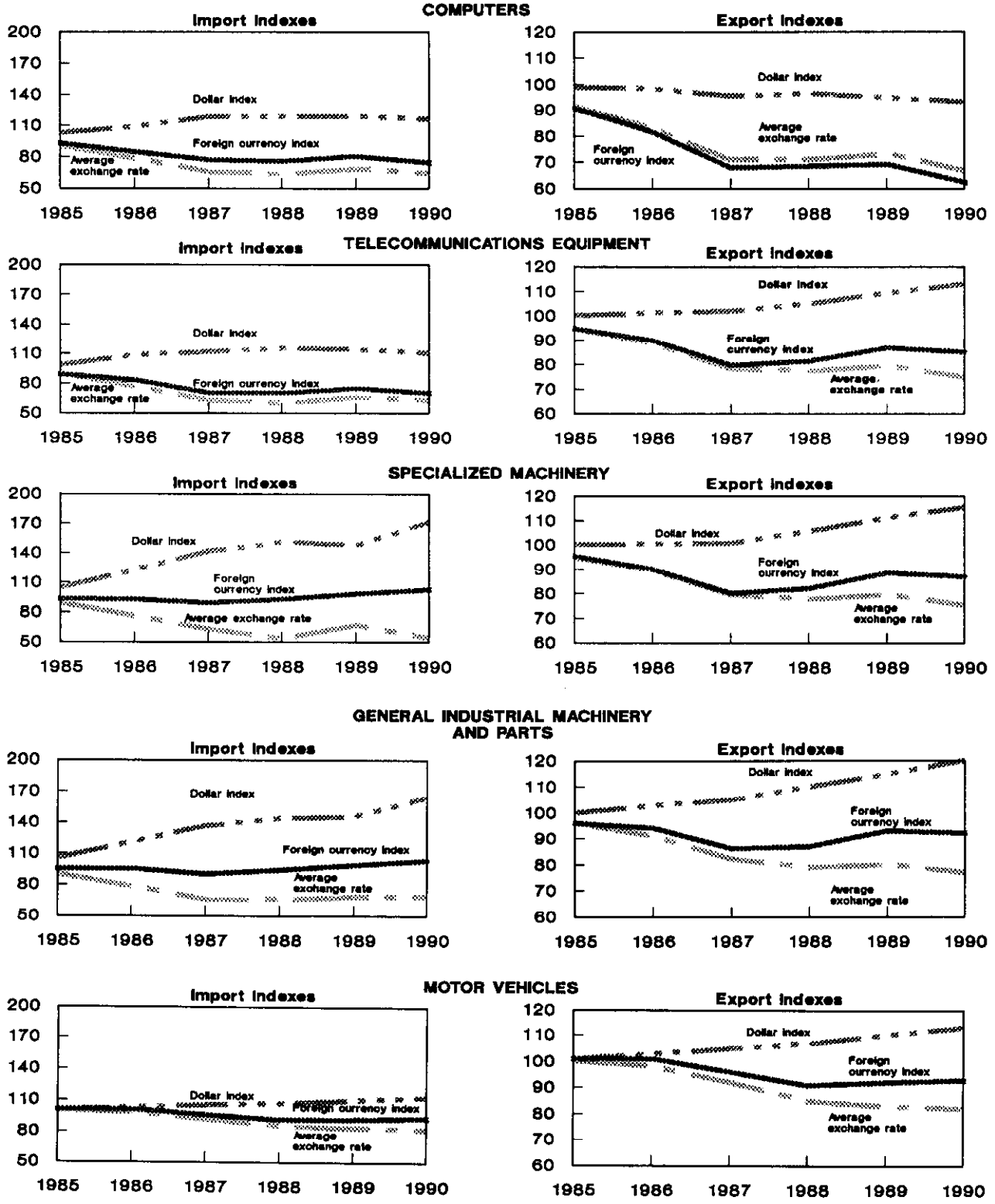
The Nation's two largest suppliers of industrial machinery were Japan and Germany.

Import pass-through rates in the specialized machinery industry increased as the dollar continued to fall. By 1990, foreign producers had passed through almost all of their currencies' increase in value. While these companies had raised their home currency prices by a mere 2.2 percent, U.S. buyers were paying prices in dollars that were almost 80 percent higher than what they had paid in late 1984. Some foreign producers managed to avoid the negative effects of currency appreciation by shifting production to subsidiaries located in the United States. (See chart 4.)

During the 4 years prior to 1985, the increasing value of the U.S. dollar, combined with rising materials and labor costs, made it increasingly difficult for U.S. manufacturers of both specialized and *general industrial machinery* to sell their products in world markets.[43] This led many U.S. firms to supply the needs of selected export markets from their overseas subsidiaries, effectively reducing U.S. exports. Simultaneously, U.S. imports from both foreign producers and foreign-based U.S. affiliates together surpassed U.S. export volumes. By 1985, the U.S. general industrial machinery sector registered its first trade deficit. (See chart 4.)

As the dollar began to slide in 1985, the impact on prices of U.S. exports was reflected immediately. U.S. producers of general industrial machinery became more competitive as they passed through over three-fourths of the

Chart 4. **Selected exchange rate indexes for U.S. imports and exports of specific categories of machinery and transport equipment, 1985–90**



dollar's decline. This led to a 16.8-percent drop in U.S. export prices in foreign currency terms through December of 1987. In other words, U.S. exporters kept their dollar prices nearly steady in the first 3 years of the study period, allowing prices in the foreign purchasers' currency to drop.

In the remaining 3 years (1988–90), as the dollar fluctuated, dollar prices of U.S. industrial machinery exports rose by somewhat larger margins. Price increases posted by component industries of the general industrial machinery category—such as those producing pumps for liquids; pumps, compressors, and blowers; and nonelectric machine parts and accessories—averaged more than 5.0 percent in both 1988 and 1989. Foreign currency prices fell by more than 11.0 percent over the same period. It is possible that, as the dollar continued depreciating over time, U.S. exporters could raise their home currency prices, possibly increasing profits, without risking higher foreign currency prices.

While dollar depreciation enhanced the competitive positions of many U.S. general industrial machinery producers in world markets, foreign suppliers of these products apparently found it difficult to absorb exchange rate shifts. Unlike foreign producers of high technology machinery and transport equipment, foreign suppliers of general industrial machinery absorbed only one-third of their currencies' appreciation through 1987. Thus, because of a high pass-through rate, dollar import prices rose 43 percent.

Japan was the principal foreign supplier of general industrial machinery to the United States. For example, Japan supplied approximately 55 percent of the $950 million U.S. import market for air-conditioning, refrigeration, and heating equipment in 1985.[44] Germany and Canada were the other leading suppliers of general industrial machinery to the United States.

Over the entire period 1985–90, foreign producers passed through an increasing portion of exchange rate shifts in their dollar prices to U.S. customers. While these companies raised their home currency prices by only 0.6 percent over the 6 years, U.S. dollar import prices for these goods were 70.8 percent higher in 1990 than they had been at the beginning of 1985.

The reaction of U.S. export volumes, and in turn trade balances, to dollar depreciation was lagged by a few years because U.S. companies were hesitant to move production back to the United States.[45] While growth in exports to the European Community was first seen in 1986, the greatest export volume gains occurred in 1988 and 1989, during which the value of U.S. exports of general industrial machinery climbed a cumulative 46 percent.[46] From 1985 to 1990, the value of U.S. exports to Europe increased by more than 110 percent, reaching $3.15 billion.[47] As in the case of the U.S. specialized machinery industries, dollar depreciation had contributed to the turnaround of this industry's trade balance by 1990.

Transport equipment. The *motor vehicle* industry is one of the product areas that was relatively unresponsive to exchange rate shifts over the 1985–90 period. A wide range of factors determined both export and import prices and trade volumes, and overshadowed the effects of the U.S. dollar's depreciation in this largest sector of U.S. manufactured goods trade. A major issue affecting motor vehicle exports is the fact that the majority of U.S. automobiles and trucks shipped abroad fall under production sharing arrangements between U.S. producers and their Canadian affiliates. Under the terms of such agreements, automobiles are assembled in foreign facilities of U.S. firms from parts manufactured at various other sites.

After 1985, foreign demand for U.S. telecommunications equipment strengthened.

Motor vehicle prices were kept from fluctuating sharply by the low level of exchange rate pass through elected by both foreign and domestic firms. In dollar terms, the U.S. import price index rose 37.3 percent between 1985 and 1990. During the same period, the export price index for motor vehicles increased 13.9 percent. U.S. automakers passed through just over one-third of the dollar's decrease in the form of lower foreign currency prices. Prices paid in the foreign currency by consumers of U.S. automobiles decreased by a trade-weighted average of 7.3 percent over the 6-year study period. (See chart 4.)

The low level of export pass through was due to many factors that put upward pressure on manufacturing costs in the United States. Growing concern over environmental and safety issues led to the retooling of facilities to produce more fuel-efficient and dependable automobiles. A large portion of the cost of implementing equipment and performance advances was passed along to the consumer in the form of higher prices. In addition to paying for increased manufacturing costs, consumers paid the higher prices generally associated with new car models. However, these inflationary pressures were offset to some extent by intensifying competition and worldwide overcapacity in the automobile industry.

An important factor determining export growth between 1985 and 1990 was the composition of the U.S. motor vehicle export market, rather than exchange rate fluctuations. Throughout the 1980's, Canada was the largest foreign consumer of U.S. motor vehicles, purchasing 62 percent of exported American automobiles in

1989.[48] The problems of weakening demand and overcapacity that plagued the U.S. car market in the late 1980's were present in the Canadian market as well.

In addition, American manufacturers entered into cooperative production agreements in Europe and Canada during the 1980's. These agreements established overseas facilities that continue to produce a large portion of the American companies' vehicles sold in foreign markets, effectively limiting U.S. export growth.

The motor vehicle industry was relatively unresponsive to exchange rate shifts.

Despite somewhat higher prices, the inflation-adjusted value of imported automobiles decreased only 1.9 percent between 1985 and 1990.[49] This was due in part to American consumers' continuing preference for Japanese and West European vehicles, and to the fact that foreign producers absorbed a large portion of the appreciation in their home currencies in order to maintain their shares of the U.S. market. By reducing prices in their home currencies by an average of 15.6 percent, foreign exporters prevented dollar prices of their products from rising dramatically. Import volumes had been limited by voluntary export restraints agreed to by Japanese automakers in April of 1981, but this led to the importation of more expensive autos.

The slight decline in import volumes over the 6 years under study is attributable more to the shift in foreign manufacturers' production locations than to dollar depreciation. In the latter part of the 1980's, foreign automakers established plants in the United States at a rapid rate. Spurred by the limitations of the voluntary export restraints, Japanese firms made the most of this production opportunity, through both wholly owned subsidiaries and joint ventures with American companies. This trend was on the rise during the late 1980's. The fact that, in 1989, automobile "transplant" establishments in the United States generated almost 3 times the amount of repatriated income earned in 1988 clearly demonstrates this pattern.[50] This trend, and not the dollar's depreciation, was primarily responsible for the slight improvement in the industry's trade deficit after 1987.

Conclusion

A number of studies have offered explanations for differences in pricing behavior between U.S. firms and companies in other industrial nations. One hypothesis is that it is easier to pass along a depreciating currency. This has the beneficial impact of lowering selling prices in foreign currency terms without having to reduce home currency prices. This was the case for all of the industries discussed here, except motor vehicles. It is, of course, more difficult to pass through an appreciating currency, because this has the effect of making the exporter's products more expensive in foreign currency terms.[51] This was the case for both the specialized and general industrial machinery industries.

Another theory emphasizes the dollar's dominant role as an international "invoice currency"—the medium of exchange in which many international transactions are denominated. This function of the currency would keep contracted dollar prices constant in the face of exchange rate fluctuations.[52] Constant dollar prices would reflect complete pass through in foreign currency terms. However, because contracts can generally be revised, this explanation is most plausible only in the short run.

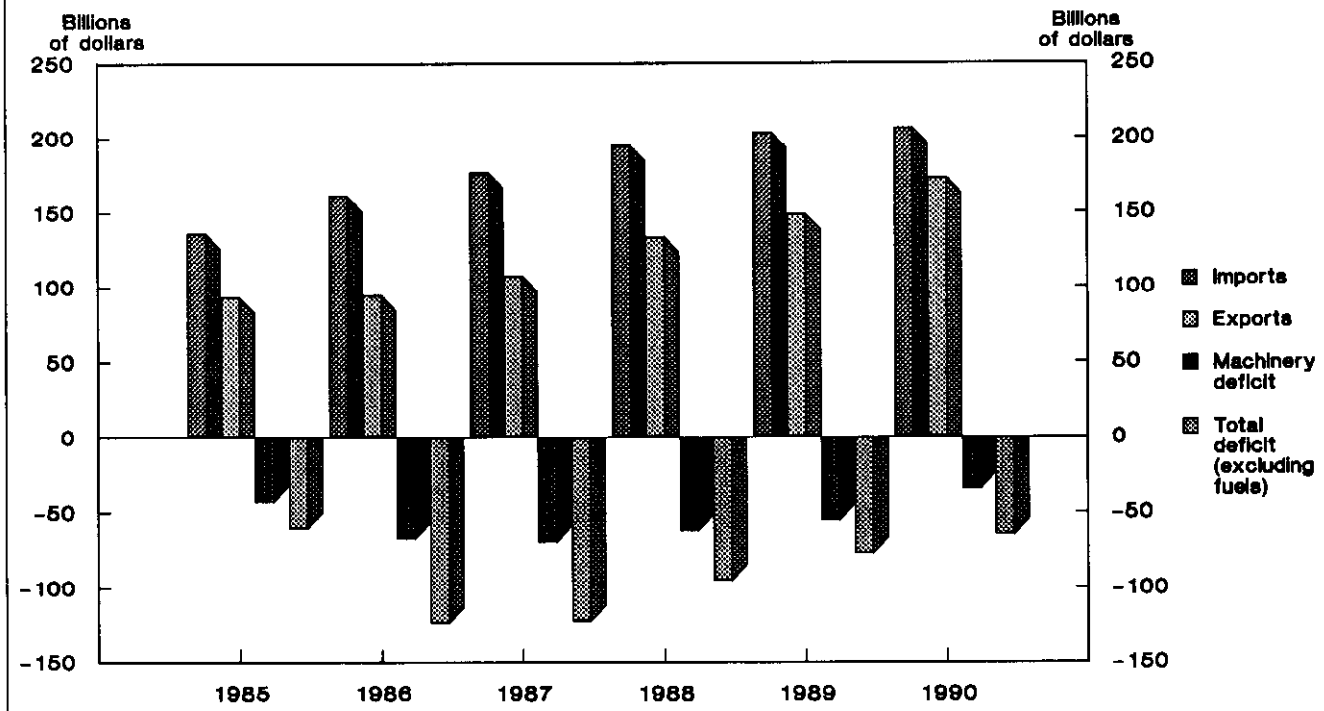
Another view is that U.S. firms with a large domestic market do not rely as heavily on exports as do companies in other nations. Thus, foreign producers may be less willing to jeopardize market share or allow volumes to be affected by exchange rate shifts.[53] This was particularly true of the high technology industries in our study.

As demonstrated in the machinery and transport equipment sector, pass-through rates varied by industry. All manufacturers of machinery and transport equipment passed through some portion of the dollar's fall. For U.S. exporters, even the smallest amount of pass through enhanced their price competitiveness. Foreign exporters, however, found it beneficial to minimize the effects of their currencies' appreciation on product prices.

From 1985 to 1990, dollar depreciation stimulated export growth among several of the industries studied by making American products less expensive to foreign buyers. In most cases, U.S. exporters passed through a greater amount of the change in the relative value of their currency than did foreign exporters to the United States. The price competitiveness of American products was therefore enhanced.

Improving trade balances in the machinery and transport equipment industries accounted for all of the improvement in the U.S. merchandise trade deficit, excluding fuels, from 1985 to 1990. This would seem to be cause for guarded optimism, for the U.S. Department of Commerce estimates that exports of all merchandise have accounted for more than one-third of overall GNP growth in the United States since 1986. And, the National Association of Manufacturers points out that Department of Commerce calculations actually underestimate the importance of exports, because they do not measure the "multiplier" effect of exports in generating economic activity in other areas of the U.S. economy.[54] □

Chart 5. **Selected statistics on U.S. trade in machinery and transport equipment and estimates of the total national trade deficit (excluding fuels), 1985–90**



SOURCE: U.S. Bureau of Census.

Footnotes

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[1] The Bureau of Labor Statistics International Price Program calculates average exchange rate indexes that are weighted bilaterally against a basket of 40 foreign currencies for each corresponding one- and two-digit SITC (Standard International Trade Classification). This particular figure represents the average exchange rate shift for all imported commodities, excluding fuels, from March 1985 to December 1990.

[2] The machinery and transport equipment industries include: power generating machinery and equipment, specialized industrial machinery, metalworking machinery, general industrial machinery and parts, office machines and computers, telecommunications equipment, electrical machinery and equipment, motor vehicles and parts, and other transport equipment (excluding aircraft).

[3] U.S. Bureau of the Census Online Information (Compro).

[4] *Ibid.* Through the end of 1990, export growth in the machinery and transport equipment industries accounted for all of the improvement of the U.S. merchandise trade deficit excluding fuels.

Economic theory and empirical evidence generally show that a depreciating currency (in this case, the U.S. dollar) results in an improvement in a country's trade balance. The Marshall-Lerner Condition states that currency devaluation will have a positive effect on a nation's trade balance when the combined price elasticities of imports and exports are greater than 1. The Condition is valid only when a country is beginning from a trade balance of zero—unlike the situation in the United States, which began with a large trade deficit. In the latter case, the trade balance will improve only when the sums of the elasticities are some proportion greater than 1. See Francisco L. Rivera-Batiz and Luis Rivera-Batiz, *International Finance and Open Economy Macroeconomics* (New York, MacMillan Publishing Company, 1985), pp. 172–73.

[5] *Economic Report of the President*. February 1991, p. 406. This figure is based on exports (f.a.s.) less imports (customs value).

[6] U.S. Bureau of the Census Online Information (Compro).

[7] *Survey of Current Business*, selected issues.

[8] John W. Schulz, "Operation Bailout: Assault On The Dollar Means Reflation Is In," *Barron's*, Oct. 21, 1985, p. 13.

[9] Blanca Riemer, "The Lords of Money, How the Top Finance Ministers Could Revamp the Monetary System," *Business Week*, Apr. 28, 1986, p. 74. Also see Department of the Treasury statement cited in footnote 10.

[10] *Announcement of the Ministers of Finance and Central Bank Governors of France, Germany, Japan, the United Kingdom, and the United States* (U.S. Department of the Treasury, Sept. 22, 1985), pp. 2–3.

[11] *Ibid.*

[12] For empirical data supporting the relationship between exchange rates and real interest rate differentials, see Deborah Danker and Peter Hooper, "International Financial Markets and the U.S. External Imbalance," *International Finance Discussion Papers*, Board of Governors of the Federal Reserve System, January 1990, pp. 23–24; and Bruce Kasman and Charles Pigott, "Interest Rate Divergences among the Major Industrial Nations," *Federal Reserve Board of New York Quarterly Review*, Autumn 1988, pp. 40–41.

[13] Christopher L. Bach, "U.S. International Transactions, Fourth Quarter and Year," *Survey of Current Business*, selected issues.

[14] The trade-weighted dollar is synonymous with the International Price Program's average exchange rate index.

[15] Bach, "U.S. International Transactions," selected issues.

[16] As used in this article, the Newly Industrialized Countries consist of Hong Kong, South Korea, Taiwan, and Singapore.

[17] "Foreign Exchange Rates," *Federal Reserve Bulletin*, selected issues, table 3.28

[18] *Ibid.*

[19] Christopher L. Bach, "U.S. International Transactions, Fourth Quarter and Year 1986," *Survey of Current Business*, March 1987, p. 35.

[20] U.S. Bureau of the Census Online Information (Compro).

[21] "Foreign Exchange Rates," *Federal Reserve Bulletin*, selected issues, table 3.28.

[22] Price developments discussed in this article are based on data from the Bureau of Labor Statistics International Price Program (IPP). That program produces import and export price indexes based on the Standard International Trade Classification (SITC) scheme. Both indexes use a modified Laspeyres formula. Price data are collected for more than 22,000 products, and are not seasonally adjusted. Beginning with data for the first quarter of 1988, released in April of that year, IPP indexes were weighted by the value of trade in 1985. (Formerly, the indexes had been weighted by the value of trade in 1980.) In addition, the indexes were recalculated from 1985 forward using the new weights. The Bureau also publishes these series by Standard Industrial Classification (SIC), as determined by the U.S. Office of Management and Budget, and end-use classifications as developed by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). Foreign currency price indexes are developed by applying the IPP's average exchange rate indexes to the dollar export and import price indexes. See Lori A. Livingston and Steven Richards, "U.S. import and export prices continued to register sizable gains in 1988," *Monthly Labor Review*, May 1989, p. 21.

[23] The year 1981 is the earliest period for which data are available.

[24] For a given category of U.S. imports (exports), the pass-through figure can be calculated by dividing the change in the dollar price index for that group by the average change of the dollar against the foreign currencies, as measured by the reciprocal of the appropriate exchange rate index.

[25] Peter Hooper and Catherine Mann, "Exchange Rate Pass Through In the 1980's: The Case Of U.S. Imports of Manufactures," prepared for the Brookings Panel on Economic Activity (Apr. 6–7, 1989), revised June 1989, p. 4.

[26] The general industrial machinery industries actually experienced trade deficits from 1985 to 1990.

[27] Because of the difficulty in accurately measuring product quality changes in high technology industries, IPP price indexes may tend to understate price decreases in the computer industry.

[28] John J. Xenakis, "PCs, Workstations and Small Systems" *Computerworld*, Sept. 25, 1989, pp. 69–71.

[29] David Wessel, "Exports Won't Pull U.S. Out of Recession," *The Wall Street Journal*, Mar. 12, 1991, p. A2.

[30] U.S. Bureau of the Census, Economic Research and Analysis Division.

[31] U.S. Department of Commerce, "Computer Equipment and Software," *1986 U.S. Industrial Outlook* and *1987 U.S. Industrial Outlook*, p. 28–1.

[32] U.S. Bureau of the Census, Economic Research and Analysis Division.

[33] U.S. Bureau of the Census Online Information (Compro).

[34] *Ibid.*

[35] U.S. Bureau of the Census, Economic Research and Analysis Division.

[36] *Ibid.*

[37] *Ibid.*

[38] U.S. Department of Commerce, "Telephone and Telegraph Equipment," *1990 U.S. Industrial Outlook*, p. 32–2.

[39] "Telecommunications Equipment Exports and Imports By Geographic Area," *U.S. Information Technology Industry Trade Analysis, 1960–89* (CBEMA, Industry Marketing Statistics Department, 1990), p. 9.

[40] U.S. Bureau of the Census Online Information (Compro).

[41] *Ibid.*

[42] U.S. Department of Commerce, "General Industrial Machinery," *1986 U.S. Industrial Outlook*, p. 22–2.

[43] *Ibid.*

[44] *Ibid.*

[45] U.S. Department of Commerce, "Industrial Machinery," *1989 U.S. Industrial Outlook*, p. 21–1.

[46] U.S. Bureau of the Census Online Information (Compro).

[47] *Ibid.*

[48] U.S. Department of Commerce, "Motor Vehicles and Parts," *1991 U.S. Industrial Outlook*, pp. 37–3, 37–4.

[49] U.S. Bureau of the Census, Economic Research and Analysis Division.

[50] U.S. Department of Commerce, "Motor Vehicles and Parts," *1991 U.S. Industrial Outlook*, p. 37–1.

[51] William Alterman, "Price Trends in U.S. Trade: New Data, New Insights," *Conference On Research In Income and Wealth*, Nov. 3–4, 1989, p. 16.

[52] Kenichi Ohno, "Exchange Rate Fluctuations, Pass-Through, and Market Share," *IMF Working Staff Papers*, vol. 37, no.2 (International Monetary Fund, June 1990), p. 298.

[53] *Ibid.*

[54] "Anchors Away, My Boys," *The Economist*, Jan. 12, 1991, p. 59.