International trends in productivity and unit labor costs in manufacturing

U.S. output per hour exceeded the rates of gain in 8 of 11 other industrial countries in 1985, but U.S. unit labor costs rose 2.7 percent relative to the trade-weighted average of the other nations after adjustment for the dollar's appreciation

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Labor productivity, as measured by output per hour, rose 4.4 percent in manufacturing in the United States in 1985. This exceeded the rates of gain recorded by Canada and 7 of 9 European countries studied—France, Italy, the United Kingdom, Denmark, the Netherlands, Norway, and Sweden. However, two major trade competitors, Japan and West Germany, along with Belgium, had larger increases.

Manufacturing output rose in each country, but the increases recorded by the United States and most of the other countries were substantially less than in the preceding year and only Canada, Japan, Denmark, and Norway had increases in both employment and aggregate hours.

Unit labor costs, which reflect changes in productivity and hourly compensation costs, rose less in the United States, at 0.6 percent, than in Canada or in the seven European countries with smaller productivity gains. Germany and Belgium, however, had about equally small increases, and unit labor costs fell in Japan. The relative value of the U.S. dollar began to fall during 1985, but on an annual average basis the U.S. dollar was up by 0.4 percent over 1984 compared with the Japanese yen, by 5 percent compared with the Canadian dollar, and by 2 to 9 percent compared with the European currencies. Consequently, when measured on a U.S. dollar basis, unit labor costs declined in Belgium, Canada, Germany, Italy, and the Netherlands, as well as in Japan. Only the three Scandinavian countries had larger increases than the United States. Measured on a national currency basis, U.S. unit labor costs fell 0.5 percent relative to a trade-weighted average of the other 11 countries; adjusted for the dollar's appreciation, U.S. relative unit labor costs rose 2.7 percent.

This article examines comparative annual average percent changes in manufacturing labor productivity and labor costs through 1985 in the United States and 11 other industrial nations.[1] The comparisons are limited to trend measures only; reliable level comparisons of manufacturing productivity and unit labor costs are not available.[2] The measures for 1985 are preliminary. Data for other years are also subject to some revision as countries revise the underlying statistics used to construct the measures.[3] The Canadian productivity and labor cost series are in the process of being revised because of a benchmark revision of the Canadian national accounts, including a shift in the base year from 1971 to 1981 for the series at constant prices, and a major historical revision in the labor income series. The revised measures were not available for inclusion in this article.[4]

The article also provides comparisons of changes in U.S. manufacturing productivity and labor costs relative to a trade-weighted average of the 11 other countries. The relative measures were constructed by taking the ratio of the U.S. indexes to weighted geometric averages of the corresponding indexes for the other 11 countries. The weights used to combine the other 11 countries' indexes into an average "competitors" index reflect the relative importance of each country as a manufacturing trade competitor as of 1980.[5]

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Productivity trends

The U.S. productivity gain of about $4\frac{1}{2}$ percent in 1985 was somewhat stronger than the average trade-weighted gain of 4 percent recorded by the 11 foreign competitor nations, although below the 5- to $5\frac{1}{2}$-percent increases recorded by Japan and Germany. (See table 1.) In the 3 years from 1982 to 1985, the U.S. average increase of 4.7 percent was about equal to the average 5-percent increase of the 11 foreign nations, most of which had average annual gains between about 4 and $5\frac{1}{2}$ percent. On the upside, Japan and the Netherlands registered nearly 6 and 7 percent and on the downside, Denmark and Norway posted 1.5 and 3 percent.

As pointed out in previous articles,[6] all 12 countries have had productivity slowdowns since about 1973 as compared with the period 1960 to 1973. The addition of 1985 data does not change this pattern. However, the U.S. productivity gains for each of the 3 years between 1982 and 1985 exceeded the U.S. average rate of gain between 1960 and 1973. The United Kingdom was the only other country to exceed its pre-1973 rate over the 1982–85 period.

Output and labor input. U.S. manufacturing output growth slowed from 11 percent in 1984 to about 4 percent in 1985. (See table 2.) Most of the other countries also had smaller output gains in 1985 than in the preceding year. A notable exception was Germany, where output rose 5 percent—Germany's largest annual increase since 1976.

The slowdown in U.S. manufacturing output growth did not result in a lower rate of productivity growth because total worker hours, which rose $6\frac{1}{2}$ percent in 1984, were reduced by 0.5 percent in 1985. (See table 3.) This has not been typical of the United States, where manufacturing output increases of 2 percent or more are normally accompanied by increases in employment and hours. It corresponds more closely to recent developments in many of the European countries, where employment and hours have frequently continued to decline even in years of relatively large output increases. In 1985, however, total manufacturing hours rose along with output in Denmark and Norway and remained about unchanged in Sweden and the United Kingdom. Employment rose strongly in Denmark and increased in Germany, the Netherlands, Norway, and Sweden. Employment and hours also rose in Canada and Japan, but at reduced rates from 1984.

The rise in Dutch manufacturing employment was the first annual increase since 1970; the increase in Norwegian employment was the first since 1977. British employment remained nearly stable after falling in 9 of the previous 10 years. However, employment in Belgium and France continued to fall for the 11th consecutive year. The tabulation below shows the peak year for manufacturing employment in each of the 12 countries and the level of employment in 1985 relative to the peak employment year and relative to 1973. The latter was one of very large output increases in each country, but not the peak employment year for any country.

	Peak employment year	*1985 index*	
		Peak = 100	*1973 = 100*
Japan	1985	100	101
Canada	1979	95	100
United States	1979	92	96
Denmark	1965	92	94
Italy	1974	87	89
Norway	1974	85	88
Sweden	1965	84	89
Germany	1970	81	83
France	1974	81	82
Netherlands	1965	70	76
Belgium	1974	65	66
United Kingdom	1966	64	70

Hourly compensation and unit labor costs

Hourly compensation costs—which include wages and salaries, supplements, and employer payments for social security and other employee benefit plans—rose $2\frac{1}{2}$ percent between 1984 and 1985 in Japan; about 5 to 6 percent in the United States, Canada, France, Germany, Belgium, Denmark, and the Netherlands; and 7 to 10 percent in Italy, the United Kingdom, Norway, and Sweden. As shown in table 4, all countries recorded slower increases in 1985 compared with their 1973–85 trend rates.

Japan, which had the largest increases in hourly compensation in the 1960's and among the largest increases in the

Table 1. Annual percent changes in manufacturing productivity, 12 countries, 1960–85

Year	United States	Canada	Japan	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden	Foreign countries (weighted)[1]
Output per hour:													
1960–85	2.7	3.4	8.0	5.5	4.8	5.4	3.5	6.5	4.8	6.2	3.2	4.7	5.4
1960–73	3.2	4.7	10.3	6.5	5.8	7.3	4.3	6.9	6.4	7.4	4.3	6.4	6.8
1973–85	2.2	1.9	5.6	4.4	3.7	3.5	2.7	6.0	3.0	5.0	2.1	3.0	3.9
1973–79	1.4	2.2	5.5	5.0	4.3	3.3	1.2	6.2	4.2	5.5	2.1	2.6	3.9
1979–85	3.1	1.7	5.7	3.8	3.2	3.7	4.2	5.7	1.9	4.4	2.0	3.3	3.9
1984	4.1	3.7	7.0	3.9	3.7	5.4	4.5	3.5	1.0	10.7	2.6	4.4	5.0
1985	4.4	3.2	5.0	3.3	5.6	3.1	3.4	4.6	.7	3.1	.9	2.7	4.1

[1] A trade-weighted average of the 11 foreign countries. See description of weights in text.

NOTE: Rates of change based on the compound rate method.

Table 2. Annual percent changes in manufacturing output, 12 countries, 1960–85

Year	United States	Canada	Japan	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden
Output:												
1960–85	3.4	4.2	9.3	4.6	3.3	4.6	1.2	4.2	3.8	3.8	2.5	3.1
1960–73	4.8	6.5	12.8	7.3	5.2	7.0	3.0	6.6	5.3	6.0	4.6	5.1
1973–85	1.9	1.7	5.6	1.7	1.3	2.0	−.8	1.6	2.2	1.5	.1	1.1
1973–79	1.9	2.7	3.6	3.1	1.7	3.1	−.7	1.5	1.6	1.7	.1	.5
1979–85	1.8	.6	7.5	.4	.8	1.0	−.9	1.6	2.8	1.4	.1	1.6
1984	10.8	8.2	11.4	1.0	2.7	3.7	3.9	1.7	5.8	5.5	2.5	6.0
1985	3.8	4.6	6.4	.2	5.0	1.8	3.2	.9	5.3	2.1	2.4	2.0

NOTE: Rates of change based on the compound rate method.

first half of the 1970's, has had the smallest average rate of increase in the 1980's—about 4 percent. The only other countries with average gains of 6 percent or less since 1980 are the United States, Germany, and the Netherlands.

Unit labor costs, which reflect changes in both labor productivity and hourly compensation, fell for the fourth consecutive year in Japan as productivity continued to climb more than hourly compensation. Manufacturing unit labor costs were about unchanged in 1985 in Belgium. Unit labor costs rose only about 0.5 percent in the United States and Germany. In the previous 2 years, unit labor costs fell 3 percent in the United States and rose only 0.5 percent in Germany. Canada and the other European countries had 1985 increases of 2 to 7 percent.

Unit labor costs in U.S. dollars

Unit labor costs measured in U.S. dollars were significantly influenced by 1985 changes in currency exchange rates, as they were in the previous 4 years. The value of the U.S. dollar began to fall during 1985 relative to the Japanese yen and the European currencies, but measured on an annual average basis, the U.S. dollar was largely unchanged relative to the yen and rose about 2 to 5 percent relative to the currencies of Canada and all of the European countries except Italy. The dollar rose 8 percent relative to the Italian lira. Consequently, manufacturing unit labor costs on a U.S. dollar basis declined in Canada, Germany, Italy, Belgium, and the Netherlands as well as in Japan. On a national currency basis, 8 of the 11 foreign countries had larger unit labor cost increases than the United States; on a U.S. dollar basis, only the three Scandinavian countries had larger increases.

The strong gain of the U.S. dollar relative to most other currencies began about 1980. As of 1985 (annual average),

Table 3. Annual percent changes in manufacturing employment and hours, 12 countries, 1960–85

Year	United States	Canada	Japan	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden
Aggregate hours:												
1960–85	0.6	0.8	1.1	−0.8	−1.5	−0.8	−2.3	−2.2	−0.9	−2.2	−0.9	−1.5
1960–73	1.6	1.8	2.3	.8	−.6	−.2	−1.2	−.3	−1.1	−1.2	.3	−1.2
1973–85	−.3	−.3	−.1	−2.6	−2.4	−1.4	−3.4	−4.2	−.8	−3.2	−1.9	−1.8
1973–79	.5	.5	−1.8	−1.9	−2.5	−.2	−1.8	−4.5	−2.5	−3.6	−1.9	−2.0
1979–85	−1.2	−1.0	1.7	−3.3	−2.3	−2.6	−4.9	−3.8	.9	−2.9	−1.8	−1.6
1984	6.4	4.4	4.1	−2.8	−.9	−1.6	−.5	−1.8	4.7	−4.7	−.2	1.5
1985	−.5	1.4	1.3	−3.0	−.5	−1.2	−.2	−3.5	4.6	−1.0	1.4	−.6
Employment:												
1960–85	.6	1.0	1.7	−.1	−.5	.4	−1.7	−1.3	0	−1.1	.1	−.5
1960–73	1.4	1.9	3.3	1.3	.4	1.6	−.6	.8	.5	.1	1.3	.1
1973–85	−.3	0	.1	−1.7	−1.6	−1.0	−2.9	−3.4	−.5	−2.3	−1.1	−1.0
1973–79	.8	.8	−1.5	−.9	−1.6	.3	−1.4	−3.4	−2.0	−2.3	−.2	−.5
1979–85	−1.4	−.8	1.7	−2.4	−1.6	−2.2	−4.4	−3.5	1.0	−2.3	−1.9	−1.5
1984	4.9	4.4	2.9	−2.9	−.9	−4.0	−1.2	−1.2	5.0	−2.0	−1.3	.7
1985	−.5	.7	1.9	−3.0	1.1	−2.3	−.2	−6.3	6.9	1.6	1.2	.3
Average hours:												
1960–85	.1	−.2	−.6	−.7	−.9	−1.1	−.6	−.9	−1.0	−1.2	−.9	−1.1
1960–73	.2	−.2	−1.0	−.5	−1.0	−1.8	−.7	−1.1	−1.6	−1.3	−1.0	−1.3
1973–85	0	−.3	−.1	−1.0	−.8	−.5	−.5	−.7	−.3	−1.0	−.8	−.8
1973–79	−.2	−.4	−.3	−.9	−.9	−.5	−.5	−1.1	−.5	−1.3	−1.7	−1.6
1979–85	.2	−.2	.1	−1.0	−.7	−.4	−.5	−.3	−.1	−.6	.1	−.1
1984	1.4	−.1	1.2	.1	0	2.5	.7	−.6	−.3	−2.8	1.2	.8
1985	−.1	.7	−.6	0	−1.6	1.1	0	3.0	−2.2	−2.5	.3	−.9

NOTE: Rates of change based on the compound rate method.

the Japanese yen was only 5 percent below its 1980 value. However, the Canadian dollar was down to 86 percent of its 1980 value, relative to the U.S. dollar, and the European currencies ranged between about 45 and 60 percent of their 1980 values. The following tabulation shows the effect of these exchange rate changes by comparing the average annual percentage changes in each country's unit labor costs between 1980 and 1985, as measured on a national currency basis and on a U.S. dollar basis:

	National currency	*U.S. dollars*
United States	2.1	2.1
(Trade-weighted average, 11 countries)	3.1	−4.3
Canada	5.4	2.1
Japan	−1.2	−2.3
Norway	7.0	−4.2
Italy	11.9	−4.7
Denmark	6.2	−6.5
United Kingdom	3.9	−7.6
Germany	1.8	−7.6
France	7.4	−7.7
Sweden	5.5	−8.4
Netherlands	.1	−9.7
Belgium	1.2	−12.2

Expressed in national currencies, 7 of the 11 foreign countries had greater increases in unit labor costs than the United States. Taking into account the appreciation of the dollar since 1980, only one country besides the United States—Canada—had an increase in unit labor costs.

Unadjusted for exchange rate changes, Japan improved its relative competitive position more than any of the other 11 countries, with an overall decline in unit labor costs between 1980 and 1985. However, because of the sharp relative depreciations of all of the European currencies, all nine European countries had larger declines in unit labor costs than Japan after adjustment for relative changes in exchange rates. The countries that most improved their competitive positions were those with small increases in unit labor costs in national currency terms and large relative currency depreciations, such as Belgium and the Netherlands. Table 5 shows annual percent changes in U.S. unit labor costs, average trade-weighted "competitors" unit labor costs, and the U.S. relative measures.

Recent exchange rate changes

The comparative measures in this article are based on annual average measures. Therefore, the 1985 trend measures of unit labor costs on a national currency basis have been adjusted to a U.S. dollar basis using annual average exchange rates for 1985. As noted earlier, the U.S. dollar in 1985 was largely unchanged relative to the Japanese yen on an annual average basis and rose between 2 and 9 percent relative to the currencies of the other 10 countries. However, by the end of 1985, the U.S. dollar had depreciated strongly against the yen and most European currencies and the dollar continued to depreciate during 1986. Table 6 provides a comparison of October 1986 exchange rates and

Table 4. Annual percent changes in hourly compensation and unit labor costs in manufacturing, 12 countries, 1960–85

Year	United States	Canada	Japan	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden	Foreign countries (weighted)[1]
Hourly compensation:													
1960–85	6.5	8.1	11.9	12.1	9.1	15.9	12.1	10.9	11.6	10.7	10.7	11.2	10.9
1960–73	5.0	6.2	15.1	10.0	10.3	13.6	9.3	11.0	12.2	12.9	10.0	10.5	10.9
1973–85	8.2	10.3	8.6	14.4	7.7	18.4	15.1	10.7	10.9	8.4	11.6	11.9	10.8
1973–79	9.5	12.2	12.8	16.3	9.5	20.6	19.2	14.0	14.0	11.6	13.4	14.2	13.8
1979–85	6.9	8.3	4.6	12.5	6.0	16.1	11.2	7.5	7.9	5.2	9.8	9.7	8.0
1984	3.6	1.5	2.9	8.8	4.8	8.4	7.1	8.3	5.6	4.8	8.5	9.5	4.7
1985	5.0	5.1	2.5	5.9	6.0	10.2	7.3	4.8	5.6	5.3	7.7	10.1	5.3
Unit labor costs:													
1960–85	3.7	4.6	3.6	6.2	4.1	9.9	8.3	4.1	6.5	4.3	7.3	6.2	5.2
1960–73	1.8	1.4	4.3	3.3	4.3	5.9	4.8	3.8	5.5	5.2	5.4	3.9	3.8
1973–85	5.8	8.2	2.8	9.5	3.9	14.3	12.1	4.5	7.6	3.3	9.3	8.7	6.7
1973–79	8.0	9.8	6.9	10.7	4.9	16.7	17.9	7.4	9.4	5.8	11.1	11.2	9.5
1979–85	3.7	6.6	−1.1	8.3	2.8	12.0	6.7	1.7	5.9	.8	7.6	6.2	4.0
1984	−.5	−2.1	−3.9	4.7	1.0	2.8	2.5	4.6	4.5	−5.4	5.8	4.8	−.3
1985	.6	1.9	−2.5	2.5	.5	7.0	3.7	.2	4.8	2.1	6.7	7.3	1.1
Unit labor costs in U.S., dollars:													
1960–85	3.7	3.2	5.3	3.7	5.5	5.0	5.0	3.4	4.7	4.8	6.5	4.0	4.6
1960–73	1.8	1.2	6.6	4.1	8.0	6.4	3.7	5.8	6.6	7.7	7.2	5.3	5.1
1973–85	5.8	5.4	3.9	3.3	3.0	3.6	6.4	.9	2.7	1.7	5.7	2.7	4.1
1973–79	8.0	7.0	10.8	11.5	11.6	10.0	15.1	12.5	11.9	11.7	13.4	11.5	10.8
1979–85	3.7	3.9	−2.5	−4.4	−5.0	−2.5	−1.7	−9.6	−5.8	−7.3	−1.4	−5.5	−2.2
1984	−.5	−6.8	−3.8	−8.7	−9.3	−11.0	−9.6	−7.4	−7.7	−15.8	−5.3	−2.8	−7.4
1985	.6	−3.4	−2.9	−.3	−2.8	−1.6	.7	−2.5	2.4	−1.3	1.3	3.1	−2.0

[1] A trade-weighted average of the 11 foreign countries. See description of weights in text.

NOTE: Rates of change based on the compound rate method.

Table 5. Relative annual percent changes in U.S. unit labor costs in manufacturing, 1960–85

Year	United States	11 foreign countries[1]	Relative measures[2]
Unit labor costs in national currency:			
1960–85	3.7	5.2	−1.4
1960–73	1.8	3.8	−2.0
1973–85	5.8	6.7	−.9
1973–79	8.0	9.5	−1.4
1979–85	3.7	4.0	.3
1980–85	2.1	3.1	−.9
1981	7.3	8.2	−.8
1982	6.2	5.7	.4
1983	−2.5	.9	−3.4
1984	−.5	−.3	−.2
1985	.6	1.1	−.5
Unit labor costs in U.S. dollars:			
1960–85	3.7	4.6	−.9
1960–73	1.8	5.1	−3.2
1973–85	5.8	4.1	1.6
1973–79	8.0	10.8	−2.5
1979–85	3.7	−2.2	6.0
1980–85	2.1	−4.3	6.7
1981	7.3	−3.1	10.7
1982	6.2	−5.5	12.3
1983	−2.5	−3.4	1.0
1984	−.5	−7.4	7.4
1985	.6	−2.0	2.7

[1] A trade-weighted average of the 11 foreign countries.

[2] Ratio of U.S. measure to the trade-weighted measure for the 11 foreign countries.

NOTE: Rates of change based on the compound rate method.

January-October 1986 exchange rates relative to annual average 1985 and 1980 exchange rates.

As the table shows, while the Canadian dollar continued to depreciate slightly, the Japanese yen as of October 1986 had risen 52 percent in value relative to the U.S. dollar over the annual average of 1985 and the European currencies were up 10 to 46 percent. Whether U.S. relative unit labor costs will fall in 1986 in line with the depreciation of the U.S. dollar will, of course, depend on comparative 1986 developments in productivity and hourly compensation costs. As of the first three quarters of 1986, U.S. manufacturing unit labor costs were up only 0.3 percent over the first three quarters of 1985.

While the relative values of the Japanese yen and the European currencies rose strongly in 1986, only the Japanese yen has increased in value over 1980. The relative values of the European currencies, which in 1985 ranged between 45 and 60 percent of their 1980 values, ranged between 60 and 90 percent of their 1980 values as of October 1986.

Exchange rates and trade. Because of the 1985–86 depreciation of the U.S. dollar, many commentators have expected significant improvement in the U.S. trade balance. However, two important facts are often overlooked. The U.S. dollar has not depreciated against the Canadian dollar, and Canada accounted for 20 percent of U.S. manufactured imports, for 25 percent of U.S. manufactured exports, and for 12 percent of the U.S. trade deficit in manufactured products in 1985. Of possibly greater significance, the U.S. dollar has not depreciated against the currencies of most of the Asian and Latin American countries or areas that are frequently referred to as the newly industrializing countries—such as Hong Kong, Singapore, South Korea, Taiwan, Brazil, and Mexico. Table 6 also shows exchange rate indexes for these 6 countries and areas, along with 1985 U.S. trade weights (percent of U.S. imports and exports of manufactured goods) and percent of the U.S. trade deficit in manufactured goods for the 6 and for the 11 foreign coun-

Table 6. Exchange rate indexes, 18 countries or areas, 1980–86

[Value of foreign currency relative to the U.S. dollar]

Country	Index: 1985 = 100			Index: 1980 = 100				Trade weights[1] (percent)	U.S. trade deficit[2] (percent)
	1985	Jan.–Oct. 1986	October 1986	1980	1985	Jan.–Oct. 1986	October 1986		
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	—	—
Canada	100.0	98.2	98.4	100.0	85.6	84.1	84.2	21.7	12.1
Japan	100.0	141.5	152.4	100.0	95.0	134.4	144.8	18.3	36.3
France	100.0	128.5	136.8	100.0	47.0	60.5	64.4	3.1	3.2
Germany	100.0	133.9	146.7	100.0	61.8	82.8	90.6	5.9	10.4
Italy	100.0	126.7	137.6	100.0	44.9	56.8	61.7	2.8	5.4
United Kingdom	100.0	113.6	109.9	100.0	55.8	63.4	61.3	4.5	.6
Belgium	100.0	131.5	142.5	100.0	49.3	64.8	70.2	1.6	−.8
Denmark	100.0	129.5	140.2	100.0	53.2	68.9	74.5	.4	.9
Netherlands	100.0	134.0	146.4	100.0	59.9	80.2	87.7	2.0	−1.7
Norway	100.0	116.6	116.7	100.0	57.5	67.0	67.1	.2	0
Sweden	100.0	120.1	124.9	100.0	49.2	59.1	61.4	1.2	2.0
Brazil	100.0	46.1	44.4	100.0	[3]	[3]	[3]	1.9	3.6
Hong Kong	100.0	99.8	99.9	100.0	63.9	63.8	63.8	2.3	5.3
Mexico	100.0	48.0	33.0	100.0	[3]	[3]	[3]	4.7	−1.8
Singapore	100.0	101.2	101.1	100.0	97.3	98.5	98.3	1.6	.7
South Korea	100.0	97.1	98.0	100.0	70.5	68.5	69.1	3.1	5.2
Taiwan	100.0	104.5	108.8	100.0	90.3	94.3	98.3	4.2	11.9

[1] Percent of total U.S. imports and exports of manufactured goods in 1985, excluding special category exports (military goods sent out under Department of Defense contracts). Weight for Belgium is Belgium-Luxembourg combined.

[2] Percent of U.S. trade deficit in manufactured goods in 1985. See footnote 1.

[3] Not relevant unless adjusted for inflation.

tries covered by the comparative unit labor cost measures.

The six newly industrializing countries and areas accounted for 18 percent of U.S. trade in manufactured goods in 1985 and for 25 percent of the trade deficit in manufactured products. For comparison, the nine European countries covered by this article accounted for 22 percent of U.S. trade and 20 percent of the deficit. As of October 1986, the relative value of the Taiwan dollar was up moderately against the U.S. dollar but the Hong Kong and Singapore dollars and the South Korean won were little changed from their 1985 values. The relative values of the currencies of Brazil and Mexico were only about half of their average 1985 values as of October 1986, but, in large part, this reflects sharply higher prices. A more meaningful comparison among countries with markedly different price developments is a real exchange rate index, that is, one adjusted for relative differences in inflation. Inflation-adjusted exchange rate indexes for Brazil and Mexico (1985=100) were, respectively, 108 and 82 in the first half of 1986.

The principal trade-weighted dollar exchange rate indexes are those published by the Board of Governors of the Federal Reserve System, the Department of the Treasury, the International Monetary Fund, and the Morgan Guaranty Trust Co. of New York. All of these indexes show a sharp depreciation of the U.S. dollar since early 1985, but, while all four indexes include Canada, they all exclude the six newly industrializing countries and areas of Asia and Latin America. An exchange rate index including these countries was recently developed by senior economist W. Michael Cox of the Federal Reserve Bank of Dallas.[7] His index, which covers 131 U.S. trading partners, shows only a 6-percent depreciation of the U.S. dollar between March 1985 and May 1986, while the other four indexes show depreciations ranging from about 18 percent up to 34 percent.[8] The differentials between the Cox index and the other four would probably be less on an inflation-adjusted basis. An inflation-adjusted index computed by Cox shows a 7-percent depreciation of the U.S. dollar between the first and fourth quarters of 1985, compared with a nominal 2-percent depreciation over the same period.[9] □

—FOOTNOTES—

[1] The data relate to all employed persons, including the self-employed, in the United States and Canada, and to all wage and salary employees in the other countries. Hours refer to hours paid in the United States and to hours worked in the other countries.

[2] The Bureau does not prepare level comparisons of manufacturing productivity and unit labor costs because of data limitations and technical problems in comparing the levels of manufacturing output among countries. Each country measures total manufacturing output in its own currency units. To compare outputs among countries, a common unit of measure—such as the U.S. dollar—is needed. However, satisfactory conversion factors are not available for the manufacturing sector. Market exchange rates are not suitable as a basis for comparing output levels. What are needed are purchasing-power-parity (PPP) exchange rates, that is, the number of foreign currency units required to buy goods and services equivalent to what can be bought with one unit of U.S. currency. Reasonably reliable PPP exchange rates are available for total gross domestic product (GDP) and are used by the Bureau for comparing levels of total GDP. See Michael Ward, *Purchasing Power Parities and Real Expenditures in the OECD* (Paris, Organization for Economic Cooperation and Development (OECD), 1985); and Peter Hill, *International Price Levels and Purchasing Power Parities,* OECD Economic Studies No. 6 (Paris, OECD, Spring 1986). However, these PPP exchange rates are derived from the expenditure side of the national accounts (consumer, business, and government final expenditures for goods and services) and not from the output side of the accounts (gross product originating by industry). Therefore, they do not provide PPP exchange rates by industry. Some researchers have published level comparisons of manufacturing productivity using either the PPP exchange rate for total GDP or a constructed PPP exchange rate based on selected final expenditures by consumers and businesses. However, there are large differences in PPP exchange rates for different categories of final expenditure and the author is not aware of any satisfactory justification for the use of either procedure for comparing manufacturing output levels, although a constructed PPP exchange rate that excludes government consumption expenditures and consumer expenditures on services should provide a better approximation of a PPP exchange rate for the manufacturing sector than the PPP for total GDP.

[3] This article includes revised statistics which have not yet been incorporated in "Current Labor Statistics," table 47, this issue.

[4] The output figures from 1981 forward will be based on 1981 price weights. The figures for earlier years will continue to be based on 1961 and 1971 price weights, although they will be expressed in 1981 constant dollar levels. This contrasts with the U.S. method; when the U.S. national accounts were rebased to 1982, the entire constant dollar series was revised.

[5] The trade weights were adapted from weights developed by the International Monetary Fund (IMF). The original IMF weights cover 17 countries; the 11 foreign countries covered by this article account for 94 percent of the IMF 16 U.S. competitors' total trade weight. For more information on the relative indexes, see Patricia Capdevielle, Donato Alvarez, and Brian Cooper, "International trends in productivity and labor costs," *Monthly Labor Review*, December 1982, pp. 3–14.

[6] For example, see Edwin Dean, Harry Boissevain, and James Thomas, "Productivity and labor cost trends in manufacturing, 12 countries," *Monthly Labor Review*, March 1986, pp. 3–10.

[7] See W. Michael Cox, "A New Alternative Trade-Weighted Dollar Exchange Rate Index," *Economic Review*, Federal Reserve Bank of Dallas, September 1986, pp. 20–28. In addition to introducing the new index, the article provides a comparison with the four principal indexes. Cox's index differs from the other four primarily by its much broader coverage—131 countries versus 10 to 22 countries. It also differs in that he uses annually moving rather than constant trade weights. Both the 1985 and 1986 indexes are based on 1985 weights, but the 1986 indexes will be revised when full-year 1986 trade data become available. During the period when the dollar was appreciating strongly, the five indexes show more similar results—a U.S. dollar appreciation between January 1980 and March 1985 ranging from 42 percent up to Cox's 65.5 percent.

For another recently compiled trade-weighted dollar exchange rate index that includes the major newly industrializing countries and areas, see Irwin L. Kellner "Why Our Trade Gap Persists," *Manufacturers Hanover Economic Report*, September 1986. Kellner's index covers the 17 largest U.S. trading partners and uses 1985 weights. It shows only about a 4-percent trade-weighted depreciation of the U.S. dollar between February 1985 and August 1986.

[8] March 1985 to April 1986 for the Treasury index. All of the other four indexes include Canada, but with very different weights. As reported in Cox, the weights given to Canada are 9 percent in the Board of Governors index, 30 percent in the Morgan Guaranty Trust index, and 21 percent in the International Monetary Fund and his own index (1985 weight).

[9] Information provided directly to the author by W. Michael Cox. Cox's article did not include an inflation-adjusted index.

The Morgan Guaranty Trust Co. publishes both nominal and real effective U.S. dollar exchange rates. They show virtually the same U.S. dollar depreciation—24.0 and 24.7 percent, respectively, between March 1985 and July 1986.