

Trends in manufacturing productivity and labor costs in the U.S. and abroad

The gain in output per hour in U.S. manufacturing was matched only by the United Kingdom among 11 other industrial countries in 1986; Japanese and European unit labor costs, measured in U.S. dollars, rose 20–40 percent

ARTHUR NEEF AND JAMES THOMAS

The U.S. gain in manufacturing labor productivity in 1986—about 3½ percent—was matched only by the United Kingdom among 11 other industrial countries studied. Modest increases of about 1 to 3 percent were recorded by Japan and five European countries—Belgium, Denmark, France, West Germany, and Italy. Productivity fell slightly in Canada and two European countries—the Netherlands and Norway—and remained unchanged in Sweden.

While this marked the fourth consecutive year of relatively large productivity increases in the U.S. manufacturing sector, manufacturing employment declined for the second consecutive year to 91 percent of the 1979 peak. Employment also fell in Japan and four of the European countries, but rose 1 to 2 percent in Canada, Germany, the Netherlands, Norway, and Sweden.

Unit labor costs—a measure of the relationship between hourly labor costs and labor productivity (output per hour)—fell about ½ of 1 percent in U.S. manufacturing in 1986. Unit labor costs rose in all of the other industrial countries—by about 1 percent in Japan and Belgium, more than 7 percent in Norway and Sweden, and 2 to 5 percent in the other countries. This marked the first year since 1981 that Japanese unit labor costs rose. Korea (Republic of Korea), newly added to the unit labor cost comparisons, recorded an increase of 3½ percent.

The favorable productivity and labor cost developments of 1986 improved the competitive situation of U.S. manu-

facturing. However, this modest improvement was dwarfed by the effect of the massive changes in exchange rates on lowering U.S. unit labor costs relative to Japan and Europe. Largely because of exchange rate changes, Japanese unit labor costs measured in U.S. dollars rose more than 40 percent in 1986, and European unit labor costs rose from nearly 20 percent in the United Kingdom up to 40 percent in Germany. On the other hand, Canadian and Korean unit labor costs benefited from small relative depreciations of their currencies.

This article examines comparative trends in manufacturing labor productivity and labor costs through 1986 in the United States and 11 other industrial nations and introduces comparative unit labor cost measures for Korea.¹ Korea has not been added to the productivity and hourly compensation measures at this time because of apparent deficiencies in the labor input measures available to the Bureau. The introduction of Korea emphasizes the major importance the newly industrializing countries are having on world trade in manufactured goods. In 1986, Korea accounted for 4.3 percent in value of U.S. imports of manufactured goods and for 5.6 percent of the U.S. trade deficit in manufactured goods. Only Japan, Canada, Germany, and Taiwan accounted for larger shares.

The measures reported on in this article reflect major benchmark revisions of the Canadian, French, and Italian national accounts and other revisions of underlying data series as well as the usual modifications of some recent yearly figures.² The Canadian changes include a comprehensive revision of the output measures for the period 1961–

Arthur Neef is chief of the Division of Foreign Labor Statistics, Bureau of Labor Statistics. James Thomas is an economist in the same division.

85, a shift in the base period for the calculation of constant value output from 1971 to 1981 for the years beginning 1981, and a historical revision in the labor income series. The French base period for constant value output has been shifted from 1970 to 1980 for the years beginning 1977, and the average hours series has been revised to account for part-time workers. The Italian base period for constant value output has been shifted from 1970 to 1980, beginning with 1980.

The Canadian revisions affect year-to-year changes, but have little effect on the long-term measures. The French revisions lower France's rate of productivity growth, primarily through their effect on the output measures. Prior to rebasing, the manufacturing output measure rose at an annual average rate of 0.4 percent from 1979 to 1985; after the rebasing, output declined by 0.3 percent per year. The productivity growth rate over this period is lowered by $\frac{1}{2}$ of a percentage point per year and unit labor costs are increased by 1 percentage point per year. The Italian revisions have the opposite effect. Prior to the revisions, manufacturing output showed no growth between 1980 and 1985. The Italian measure now shows a 0.4-percent rate of increase. This change, along with a downward revision in the employment figures, raises Italy's 1980–85 productivity growth rate by nearly $1\frac{1}{2}$ percentage points per year. Because of an upward revision in hourly compensation, however, the revisions have little effect on unit labor costs.

Productivity trends

As pointed out in previous articles, all 12 industrial countries have had productivity slowdowns since 1973. However, the nearly 4-percent gain in 1986 in U.S. labor productivity reflects a continuing recovery in the U.S. manufacturing productivity growth rate since 1979. (See chart 1.) All the countries show slowdowns in productivity in the 1973–79 period, and only the United States, Italy, Sweden, and the United Kingdom have achieved productivity gains in the 1979–86 period that exceed their rates of deceleration. In addition, the United States and the United Kingdom are the only two countries to have increased their productivity growth enough since 1979 to surpass their pre-1973 trend rates.

Output

Manufacturing output grew for at least the second consecutive year in all countries except France, where output fell slightly for the second consecutive year, and Sweden (unchanged). The U.S. output growth rate of 2.8 percent for 1986 was the third largest increase recorded in all 13 countries. The Korean output increase of more than 17 percent overshadowed the gains of the other countries and was the largest increase in that country since 1978. Excluding France and Sweden, the other countries, led by Italy, had increases that ranged from 1 percent to around 3 percent.

However, output growth was slower than the 1985 increases in 10 of the countries studied. The most significant slowing of output growth seems to be occurring in Japan, where the 1986 output growth rate of 1.5 percent is far below the 1985 rate.

Korea's output growth rate since 1973, 12 percent per year, greatly exceeds that of any of the industrial countries. At the other extreme, British manufacturing output in 1986 was still 8 percent below the peak level reached in 1973.

Aggregate hours and employment

Total hours of labor input rose about 1 to $2\frac{1}{2}$ percent in six countries and fell by about the same range in the other six industrial countries, including the United States. Four of the six countries with 1986 increases in aggregate hours—Canada, Germany, the Netherlands, and Norway—also had increases in employment of at least $1\frac{1}{2}$ percent. Denmark's increases resulted almost entirely from an increase in average hours. In Italy, total hours rose 2 percent despite a $1\frac{1}{2}$ percent reduction in employment.

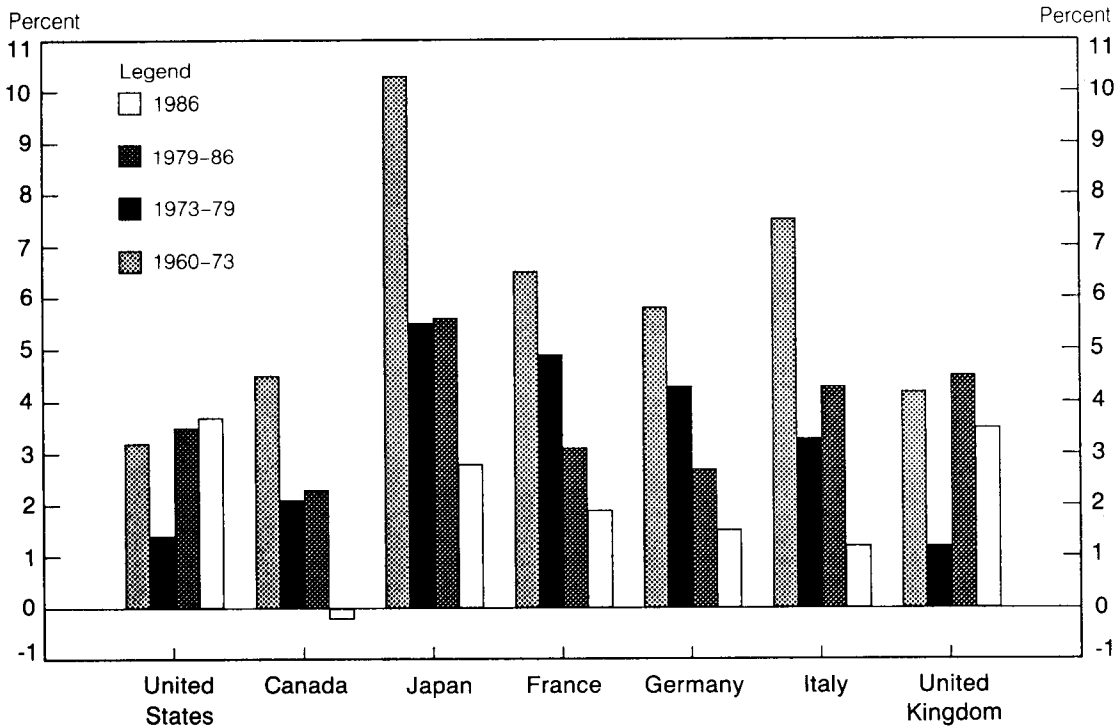
In the six countries in which labor input fell, employment declined $\frac{1}{2}$ of 1 percent in Japan and Belgium, over 1 percent in the United States, and over 2 percent in France and the United Kingdom, but rose 1 percent in Sweden. The $\frac{1}{2}$ -percent decline for Japan was the first since 1982 and reflected a leveling off from the previous year's employment peak. For Belgium and France, 1986 was the 12th consecutive year of employment declines. In the United Kingdom, employment has declined in 11 of the past 12 years.

Table 1. Annual percent changes in manufacturing productivity, 12 countries, 1960–86

Year	United States	Canada	Japan	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden
Output per hour:												
1960–86	2.8	3.3	7.9	5.2	4.6	5.7	3.6	6.3	4.6	5.9	3.2	4.6
1960–73	3.2	4.5	10.3	6.5	5.8	7.5	4.2	6.9	6.4	7.4	4.3	6.4
1973–86	2.5	2.2	5.6	3.9	3.5	3.8	3.0	5.8	2.8	4.5	2.1	2.8
1973–79	1.4	2.1	5.5	4.9	4.3	3.3	1.2	6.0	4.2	5.5	2.1	2.6
1979–86	3.5	2.3	5.6	3.1	2.7	4.3	4.5	5.5	1.7	3.7	2.2	3.0
1985	5.1	2.5	7.3	3.1	4.1	1.5	3.8	3.0	–.2	3.2	1.1	3.8
1986	3.7	–.2	2.8	1.9	1.5	1.2	3.5	2.6	1.3	–.3	–.6	.2

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

Chart 1. Average annual percent changes in manufacturing productivity in seven countries, selected periods, 1960-86



Hourly compensation and unit labor costs

Hourly compensation rose moderately, at about $2\frac{1}{2}$ to 5 percent, in 1986 in all the industrial countries except the Scandinavian countries and the United Kingdom, which recorded gains of 6 to 10 percent. The increases in all countries were less than their average rates of gain since 1979 and well below the large increases recorded in the 1970's.

The United States, Japan, and the Netherlands had the smallest 1986 increases, ranging from the Dutch increase of $2\frac{1}{2}$ percent to the Japanese gain of $3\frac{1}{2}$ percent. The Netherlands and Japan, which had some of the largest increases during the 1960's and through the early 1970's, continued to exhibit the wage restraint which has resulted in these two countries having the lowest rates of increase over the 1979-86 period.

The United States was the only country showing a 1986 decline in unit labor costs, a measure of the relationship of hourly compensation to productivity. Unit labor costs increased in the other 12 countries studied. Japan and Belgium had increases of close to 1 percent, with the other countries increasing from about 2 to 5 percent except Norway, which advanced by 10 percent, and Sweden, which advanced by 7 percent.

Unit labor costs in U.S. dollars

In assessing changes in unit labor costs in competitive terms, changes in the market value of each country's currency need to be taken into account, as well as relative changes in costs measured in national currencies. Between 1979-80 and 1985, the U.S. dollar rose strongly versus the European currencies and, to a lesser extent, against the Canadian dollar and Japanese yen. U.S. unit labor costs rose much less from 1979 to 1985 than those of any of the other countries except Japan, the two Benelux countries, and Germany on a national currency basis, but Canada was the only other country to show an increase after adjustment for exchange rate changes.

The U.S. dollar began depreciating strongly against the yen and most European currencies in 1985 and continued to depreciate during 1986. Between 1985 (annual average) and 1986 (annual average), the value of the yen relative to the U.S. dollar rose more than 40 percent and European currency values appreciated from 13 percent in the United Kingdom to 30 percent or more in Belgium, Denmark, France, Germany, and the Netherlands. Therefore, the relative improvement in U.S. manufacturing unit labor costs measured in national currency terms was greatly enhanced by exchange rate movements. Measured in U.S. dollar

Table 2. Annual percent changes in manufacturing output and labor input, 13 countries, 1960-86

Year	United States	Canada	Japan	Korea ¹	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden
Output:													
1960-86	3.4	4.3	9.0	13.5	4.2	3.2	4.8	1.2	4.2	3.7	3.8	2.6	3.1
1960-73	4.8	6.5	12.8	—	7.3	5.2	7.3	3.0	6.6	5.3	6.0	4.6	5.1
1973-86	2.1	2.2	5.4	12.0	1.2	1.2	2.3	-7	1.8	2.2	1.6	.6	1.1
1973-79	1.9	2.5	3.6	16.5	2.9	1.7	3.1	-7	1.3	1.6	1.7	.1	.5
1979-86	2.2	1.9	6.9	8.2	-3	.8	1.7	-6	2.3	2.7	1.4	.9	1.5
1985	4.3	5.5	8.4	3.8	-7	3.5	1.5	3.0	2.1	3.0	2.3	2.5	3.3
1986	2.8	2.3	1.5	17.4	-4	2.5	3.3	1.1	1.7	2.7	1.1	1.7	0
Aggregate hours:													
1960-86	.6	.9	1.0	—	-9	-1.4	-9	-2.3	-2.0	-9	-2.0	-6	-1.5
1960-73	1.6	1.9	2.3	—	.8	-6	-2	-1.1	-3	-1.1	-1.2	.3	-1.2
1973-86	-4	0	-2	—	-2.7	-2.1	-1.5	-3.5	-3.7	-7	-2.8	-1.5	-1.7
1973-79	.5	.4	-1.8	—	-1.9	-2.5	-2	-1.9	-4.5	-2.5	-3.6	-1.9	-2.0
1979-86	-1.2	-3	1.2	—	-3.3	-1.9	-2.5	-4.9	-3.1	.9	-2.2	-1.2	-1.4
1985	-8	2.9	1.0	—	-3.7	-6	0	-8	-9	3.3	-9	1.4	-5
1986	-9	2.5	-1.2	—	-2.2	1.0	2.1	-2.4	-8	1.3	1.5	2.3	-2
Employment:													
1960-86	.5	1.1	1.6	—	-2	-5	.1	-1.8	-1.0	.1	-9	.2	-4
1960-73	1.4	2.0	3.3	—	1.3	.4	1.6	-5	.8	.5	.1	1.3	.1
1973-86	-4	.1	0	—	-1.8	-1.3	-1.3	-3.1	-2.9	-4	-1.9	-8	-8
1973-79	.8	.8	-1.5	—	-1.1	-1.6	.3	-1.4	-3.4	-2.0	-2.3	-2	-5
1979-86	-1.4	-4	1.3	—	-2.4	-1.2	-2.7	-4.5	-2.4	1.0	-1.6	-1.4	-1.1
1985	-7	2.6	1.6	—	-3.2	1.1	-1.1	-9	-1.4	6.9	1.7	1.2	.2
1986	-1.2	1.9	-5	—	-2.3	1.6	-1.5	-2.2	-6	.2	1.8	2.1	1.1

¹ Korean data begin with 1970.

NOTE: Rates of change based on the compound rate method. Dashes indicate data are not available.

Table 3. Annual percent changes in hourly compensation and unit labor costs in manufacturing, 13 countries, 1960-86

Year	United States	Canada	Japan	Korea ¹	France	Germany	Italy	United Kingdom	Belgium	Denmark	Netherlands	Norway	Sweden
Hourly compensation:													
1960-86	6.4	8.0	11.7	—	11.9	8.9	15.6	11.8	10.7	11.4	10.4	10.7	11.1
1960-73	5.0	6.2	15.1	—	10.0	10.3	13.5	9.2	11.0	12.2	12.9	10.0	10.5
1973-86	7.8	9.8	8.4	—	13.8	7.5	17.7	14.4	10.3	10.6	7.8	11.5	11.7
1973-79	9.5	12.0	12.8	—	16.2	9.5	20.6	19.4	14.0	14.0	11.6	13.4	14.2
1979-86	6.4	7.9	4.8	—	11.7	5.8	15.2	10.3	7.2	7.8	4.7	9.9	9.6
1985	5.3	5.0	4.9	—	8.1	6.0	10.4	6.6	6.9	6.4	5.1	8.7	12.0
1986	3.3	3.9	3.5	—	4.5	4.7	4.3	7.4	3.7	5.9	2.4	9.7	7.4
Unit labor costs:													
1960-86	3.4	4.5	3.5	13.0	6.4	4.1	9.4	7.9	4.1	6.5	4.2	7.3	6.2
1960-73	1.8	1.6	4.3	—	3.3	4.3	5.6	4.8	3.8	5.5	5.2	5.4	3.9
1973-86	5.2	7.5	2.7	13.3	9.5	3.9	13.3	11.1	4.3	7.5	3.2	9.2	8.6
1973-79	8.0	9.8	6.9	20.2	10.8	4.9	16.7	17.9	7.5	9.4	5.8	11.1	11.2
1979-86	2.8	5.5	-8	7.6	8.4	3.0	10.4	5.6	1.6	5.9	1.0	7.6	6.4
1985	.2	2.4	-2.3	2.3	4.8	1.8	8.8	2.8	3.8	6.6	1.8	7.6	7.8
1986	-4	4.1	.7	3.6	2.5	3.1	3.0	3.7	1.1	4.5	2.7	10.4	7.2
Unit labor costs in U.S. dollars:													
1960-86	3.4	3.0	6.6	5.9	5.0	6.7	5.8	5.3	4.5	5.8	5.9	7.1	4.9
1960-73	1.8	1.3	6.6	—	4.1	8.0	6.1	3.7	5.8	6.6	7.7	7.2	5.3
1973-86	5.2	4.8	6.5	6.5	5.8	5.5	5.4	6.8	3.2	5.1	4.2	7.1	4.6
1973-79	8.0	6.9	10.8	16.4	11.5	11.6	10.0	15.2	12.7	11.9	11.7	13.4	11.5
1979-86	2.8	3.0	3.0	-1.2	1.1	.6	1.6	.2	-4.3	-4	-1.8	1.9	-1.1
1985	.2	-2.9	-2.7	-5.3	2.0	-1.5	.1	-2	1.0	4.2	-1.6	2.1	3.7
1986	-4	2.4	42.6	2.2	32.9	39.8	31.9	17.4	34.3	36.8	39.2	28.2	29.3

¹ Korean data begin with 1970.

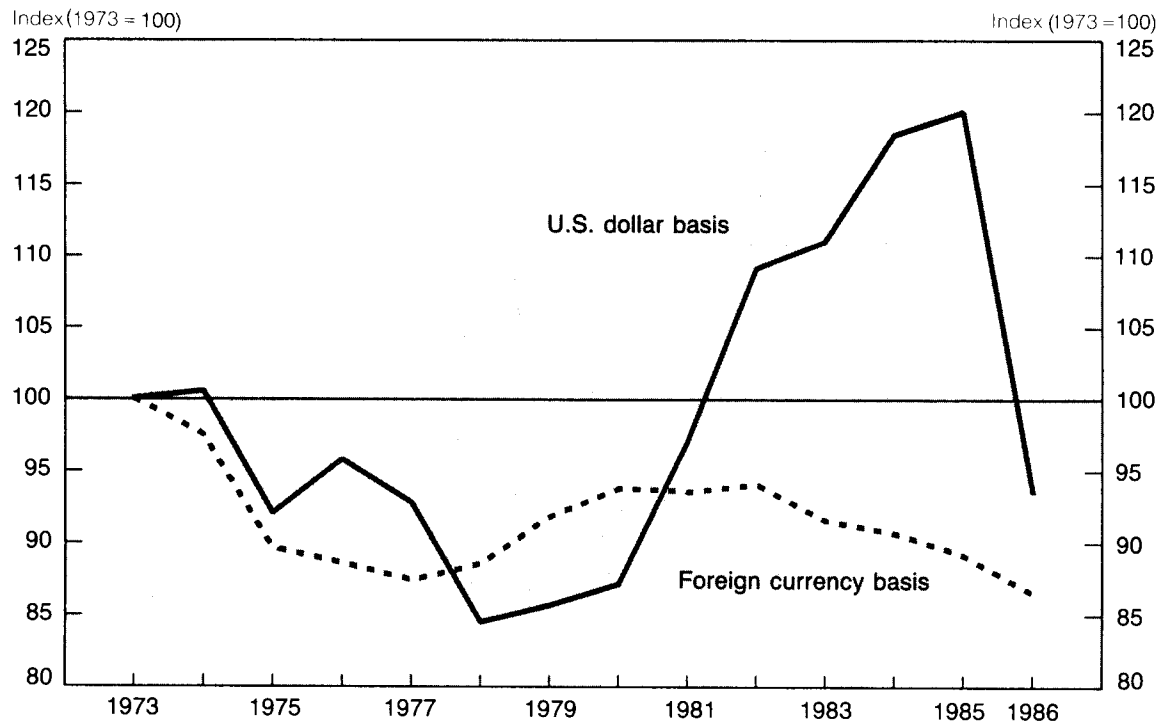
NOTE: Rates of change based on the compound rate method. Dashes indicate data are not available.

terms, unit labor costs rose more than 40 percent in Japan from 1985 to 1986 and by about 20 to 40 percent in the European countries, compared with the 0.4-percent decline in the United States. The market values of the Canadian dollar and Korean won continued to fall slightly in 1986; therefore, Canada's and Korea's competitive situations ben-

efited to an even greater extent from exchange rate movements.

Despite the sharp 1986 appreciations of the Japanese and European currencies, only the yen had a higher relative value in 1986 than in 1979—up 30 percent. The Canadian dollar, the German mark, and the Dutch guilder were 16–18

Chart 2. Relative indexes of unit labor costs, United States, 1973-86



percent below their 1979 values and the other European currencies still 30 to more than 40 percent lower. In the absence of adjustment for these exchange rate changes, Japan improved its relative competitive position more than any of the other countries, with an overall decline in manufacturing unit labor costs between 1979 and 1986, followed by the Benelux countries, the United States, and Germany with increases of 7 to 23 percent. The other countries had increases of nearly 50 up to 100 percent. Adjusted for exchange rate changes, however, Japan's increase slightly exceeded that of the United States at 23 percent and equaled Canada's increase.

Trade-weighted relative unit labor costs

The preceding section provides comparisons of trends in unit labor costs on a country-by-country basis. However, the countries covered differ greatly in their relative importance to U.S. foreign trade in manufactured goods. For example, Canada and Japan each accounted for about 20 percent of total U.S. imports and exports of manufactured goods in 1986, the four large European countries each accounted for about 3 to 7½ percent, and the five smaller European countries each accounted for about 2 percent or less. Consequently, the Bureau also constructs trade-weighted summary measures that take account of these differences.

Two summary measures are constructed: a "competitors" index, which is the trade-weighted geometric average of the indexes for the 11 other industrial countries (Korea is not included), and a relative index, which is the ratio of the U.S. index to the "competitors" index. The trade weights were derived by rescaling a 17-country International Monetary Fund (IMF) series, which the IMF uses to compute relative cost and price indicators, to the 12 industrial countries covered by this article. The weights are based on disaggregated 1980 trade data for manufactured goods and take account of both direct bilateral trade and the relative importance of "third country" markets.

Chart 2 shows U.S. relative unit labor cost indexes on both a national currency and U.S. dollar basis over the 1973 to 1986 period. As the chart shows, U.S. unit labor costs, measured on a national currency basis declined from 1973 to 1977 relative to the 11 "competitor" countries, rose slightly from 1977 to 1982, and then declined again from 1982 to 1986. As of 1986, U.S. relative unit labor costs were down 13 percent from 1973 and 1 percent from the previous low in 1977.

Measured on a U.S. dollar basis, U.S. relative unit labor costs were down 16 percent as of 1978, rose moderately in 1979 and 1980, and then rose sharply as the dollar appreciated strongly in the first half of the 1980's. As of 1985, U.S. relative unit labor costs were up 38 percent over 1980 and

Table 4. Percent change in manufacturing unit labor costs in 13 countries, 1979–86

Country	Unit labor costs: National currency			Exchange rate ¹			Unit labor costs: U.S. dollars		
	1979–86	1979–85	1985–86	1979–86	1979–85	1985–86	1979–86	1979–85	1985–86
United States	21	22	0	—	—	—	21	22	0
Canada	46	40	4	-16	-14	-2	23	20	2
Japan	-5	-6	1	30	-9	42	23	-14	43
Korea	67	61	4	-45	-44	-1	-8	-10	2
Belgium	12	11	1	-34	-50	33	-27	-45	34
Denmark	50	43	5	-35	-51	31	-3	-29	37
France	76	72	3	-39	-53	30	8	-19	33
Germany	23	19	3	-16	-38	36	4	-26	40
Italy	100	94	3	-44	-56	28	12	-15	32
Netherlands	7	4	3	-18	-40	36	-12	-37	39
Norway	67	51	10	-32	-41	16	14	-11	28
Sweden	54	44	7	-40	-50	21	-7	-28	29
United Kingdom	46	41	4	-31	-39	13	1	-14	17

¹ Value of foreign currency relative to the U.S. dollar.

20 percent over 1973. The sharp fall in the U.S. dollar against the yen and European currencies, which began in 1985 and continued during 1987, resulted in a 1985–86 decline of 22 percent in U.S. relative unit labor costs. While still about 11 percent above the previous low in this index in 1978, it put U.S. relative costs at about the same level as in 1977.

This overall index of U.S. relative unit labor costs of course masks some divergent trends among the competitor countries. In particular, the U.S. dollar rose less against the Canadian dollar in the first half of the 1980's than it did against the European currencies and did not fall against the Canadian dollar in 1986. Relative to a "competitors" index consisting of Japan and the nine European countries, U.S. unit labor costs rose 47 percent between 1980 and 1985 and fell 26 percent in 1986.

Recent exchange rate changes

The Japanese and European currencies continued to appreciate against the U.S. dollar during 1987 and the Canadian dollar rose moderately. The Korean won also began appreciating during 1987. As of late November, the Canadian dollar was 6 percent above its 1986 average value, the Korean won was up 20 percent, and the other currencies were up 15 to more than 30 percent. U.S. manufacturing unit labor costs fell through the first three quarters of 1987 and were about 3 percent below their 1986 average as of the third quarter. Consequently, the U.S. competitive situation should have improved relative to Japan, Europe, and Korea. □

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 industrial countries.

The comparisons are limited to trend measures only because reliable level comparisons of manufacturing productivity and unit labor costs are

not available. See Arthur Neef, "International trends in productivity and unit labor costs in manufacturing," *Monthly Labor Review*, December 1986, p. 17, footnote 2.

² This article includes revised statistics which have not yet been incorporated in "Current Labor Statistics," table 47, this issue.