International comparisons of manufacturing unit labor costs

The rate of labor productivity growth was lower in the United States than in Japan and several European countries over the 1979–92 period; only Belgium and the Netherlands had smaller average increases in unit labor costs after adjustment for exchange rate changes

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Among 12 countries compared—the United States, Canada, Japan, and nine Western European countries—only Sweden and the United Kingdom had larger increases in manufacturing labor productivity (output per hour) than the United States in 1992, but over the 1979–92 period, Japan and six of the European countries had higher average rates of gain.

Manufacturing unit labor costs remained unchanged between 1991 and 1992 in the United States and Canada, fell in Sweden, and rose elsewhere. Over the 1979–92 period, only Japan, Belgium, and the Netherlands had lower annual average increases than the United States. Measured on a U.S.-dollar basis—to account for relative changes in exchange rates—only Belgium and the Netherlands had lower 1979–92 average increases.

This article first examines comparative trends in manufacturing output per hour, unit labor costs, and related measures for the United States and 11 other industrial nations in the most recent year, 1992, and then discusses developments over the period 1979 to 1992. Also covered are trends in unit labor costs in Korea and Taiwan. The Bureau has not computed productivity measures for Korea and Taiwan because adequate labor input measures, for use with the output measures, have not been developed. Korea and Taiwan are included in the analysis of comparative developments in unit labor costs, however, because of the economies covered, only Canada, Japan, Germany, and the United Kingdom account for higher proportions of U.S. trade in manufactured goods than Korea or Taiwan. (Data for Germany relate to the former West Germany. For a description of the country measures, see the appendix.)

The analysis also includes relative trade-weighted measures of productivity and unit labor costs—that is, the U.S. measure relative to a trade-weighted average for the other economies or selected economies.

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Comparative trends, 1991–92

Productivity. U.S. manufacturing labor productivity (output per hour) increased 4.3 percent in 1992. This performance was exceeded by the United Kingdom, with 5-percent productivity growth, and Sweden, with a 7-percent increase. Canada and Belgium matched the U.S. rate and the remaining European countries experienced slower

growth, ranging from increases of about 3 percent in France to one-half of 1 percent in Germany. Japan, with a drop of 5 percent, was the only country studied to experience a decline in productivity in 1992. (See table 1.)

The U.S. manufacturing productivity increase in 1992 represents a substantial improvement over the previous year's performance and is the largest increase the United States has experienced since 1987. Productivity growth also improved in 1992, relative to 1991, in many of the foreign countries studied. The exceptions to this pattern were Germany and Japan, where productivity performance was worse in 1992 than in 1991, and Denmark and the Netherlands, which experienced about the same rates of increase in both years.

While productivity growth was improved in many countries, these gains were accompanied by declines in employment and hours worked in virtually every case. The productivity increase in the United States resulted from a combination of a 3-percent increase in manufacturing output and a drop of 1 percent in labor input (as measured by hours worked). Increases in productivity for Canada, Belgium, Denmark, and France also were brought about by rising output and falling labor input, while Norway experienced an increase in output, but no change in hours worked. Despite declines in output, Germany, Italy, the Netherlands, Sweden, and the United Kingdom all achieved productivity increases because the hours worked measure fell more. In Japan, a 1-percent decrease in hours worked was not enough to offset a 6-percent drop in output.[1]

Recent exchange rate changes

As of September 1993, the currencies of 12 of the 13 foreign economies studied had depreciated substantially. The exception was Japan, where the yen appreciated throughout the year and was up 20 percent against the dollar in September, relative to the yen's average 1992 value.

The Korean won and the New Taiwan dollar depreciated slowly but steadily throughout the year and by September, the won was down about 3 percent while the New Taiwan dollar had depreciated about 7 percent. The Canadian dollar depreciated about 9 percent.

The currencies of the European economies generally followed a pattern of depreciation in the first 3 months of 1993, a moderate appreciation in April and May, further decline through August, and some strengthening in September. As of September 1993, the German mark and the Dutch guilder were down about 4 percent, relative to their 1992 averages; the Belgian, Danish, and French currencies were down 7 percent to 9 percent; the Norwegian krone and British pound were down about 13 percent; the Italian lira, 21 percent; and the Swedish krona, 27 percent.

In the first three quarters of 1993, U.S. unit labor costs were 2 percent below both their level for the same period in 1992 and the annual average for 1992. Consequently, these relative exchange rate changes suggest that U.S. manufacturing competitiveness probably improved substantially relative to Japan, but may have deteriorated, compared with Canada and Europe.

Output and labor input. U.S. manufacturing output was up 3.2 percent in 1992, following 2 consecutive years in which output declined. The U.S. output increase was exceeded only by Korea (5 percent) and Taiwan (3-1/2 percent). Canada, Belgium, Denmark, France, and Norway had smaller output increases of less than 2 percent, while Italy, the Netherlands, Sweden, and the United Kingdom experienced declines of less than 1 percent. Sharper output declines occurred in Germany and Japan.

Employment in manufacturing fell in 11 of the 12 countries for which this measure was calculated. Japan was the only country to increase manufacturing employment (nearly 2 percent) in 1992. Manufacturing employment declined about 2 percent in the United States, a larger relative decrease than occurred in Denmark, Germany, the Netherlands, or Norway, but smaller than the employment reductions in Canada, Belgium, France, and Italy, which posted declines ranging from 2-1/2 percent to 4-1/2 percent; the United Kingdom, which experienced a drop of about 5-1/2 percent; and Sweden, where employment was down by 9 percent. All of the countries, except Japan and Germany, underwent employment declines also in 1991.

Although employment rose in Japan in 1992, average hours worked were reduced by 3 percent, resulting in about a 1-percent decline in total hours. Total hours also fell in all of the other countries except Norway, where hours were unchanged. As with employment, hours fell in all countries except Japan and Germany in 1991.

Hourly compensation costs. U.S. manufacturing hourly compensation costs—which comprise wages and salaries, supplements, and employer payments for social security and other employer-financed benefit plans—increased 4-1/2 percent in 1992. This figure was about in the middle of the range for the countries studied. Hourly compensation costs increased at about the same rate in Japan and Belgium as in the United States, while

Table 1. **Annual percent changes in manufacturing productivity, unit labor costs, and related measures, 14 countries or areas, selected periods, 1990–92**

Country or area	Output per hour	Output	Total hours	Employment	Hourly compensation	Unit labor costs		Exchange rate
						National currency	U.S. dollars	
United States:								
1990–91	1.9	–2.2	–4.1	–3.5	5.4	3.4	3.4	...
1991–92	4.3	3.2	–1.1	–2.1	4.4	.1	.1	...
Canada:								
1990–91	.6	–6.6	–7.2	–7.1	6.0	5.3	7.3	1.8
1991–92	4.2	.5	–3.6	–4.3	4.1	.0	–5.2	–5.2
Japan:								
1990–91	4.3	5.8	1.5	3.9	5.8	1.5	9.3	7.7
1991–92	–5.0	–6.1	–1.2	1.8	4.6	10.1	16.8	6.2
Korea:								
1990–91	(1)	8.9	(1)	(1)	(1)	5.7	2.0	–3.5
1991–92	(1)	4.8	(1)	(1)	(1)	7.0	.5	–6.1
Taiwan:								
1990–91	(1)	6.6	(1)	(1)	(1)	1.6	2.2	.6
1991–92	(1)	3.5	(1)	(1)	(1)	6.0	12.7	6.4
Belgium:								
1990–91	2.2	–.4	–2.6	–.9	6.4	4.1	1.7	–2.3
1991–92	4.3	.3	–3.8	–3.8	4.6	.4	6.8	6.4
Denmark:								
1990–91	1.3	–.8	–2.0	–2.3	4.4	3.1	–.3	–3.3
1991–92	1.4	.5	–.9	–1.2	2.7	1.3	7.4	6.1
France:								
1990–91	–.1	–1.9	–1.8	–1.5	4.2	4.4	.7	–3.5
1991–92	2.9	.5	–2.4	–2.6	3.4	.5	7.2	6.7
Germany:								
1990–91	3.0	3.6	.6	1.6	6.6	3.6	.8	–2.7
1991–92	.5	–1.5	–2.0	–1.8	6.0	5.5	12.2	6.4
Italy:								
1990–91	3.3	–.6	–3.8	–2.7	10.7	7.1	3.4	–3.5
1991–92	3.7	–.5	–4.0	–3.9	6.8	3.0	3.8	.7
Netherlands:								
1990–91	.9	.0	–.9	–.7	5.2	4.3	1.5	–2.7
1991–92	.8	–.4	–1.2	–1.0	5.4	4.6	11.3	6.4
Norway:								
1990–91	.7	–2.1	–2.8	–3.3	4.7	3.9	.1	–3.7
1991–92	1.8	1.8	.0	–1.0	2.8	1.0	5.5	4.5
Sweden:								
1990–91	1.2	–5.6	–6.7	–6.6	8.9	7.6	5.3	–2.1
1991–92	7.2	–.8	–7.4	–9.2	3.4	3.6	.2	3.9
United Kingdom:								
1990–91	3.9	–5.3	–8.8	–7.1	11.2	7.0	6.0	–.9
1991–92	4.9	–.8	–5.5	–5.6	8.4	3.3	3.3	–.1

[1] Data not available.

Canada, Denmark, France, Norway, and Sweden all experienced smaller increases. Germany, Italy, the Netherlands, and the United Kingdom each recorded increases of between 5-1/2 percent and 8-1/2 percent.

All of the countries studied had smaller hourly compensation increases in 1992 than in 1991, except the Netherlands, where the rate increased only slightly. The reduction in the U.S. rate of increase, relative to 1991, was less than those in most of the other 10 countries.

Unit labor costs. U.S. unit labor costs in manufacturing were virtually unchanged from 1991 to 1992. Canada also had about the same unit labor costs in 1992 as it had the year before. Swedish unit labor costs fell 3-1/2 percent, but the other European countries had unit labor cost increases, ranging from less than 1 percent in Belgium and France to more than 5 percent in Germany. The three Asian economies sustained the highest increases; 6 percent in Taiwan, 7 percent in Korea, and 10 percent in Japan—the largest increase in that country since 1975. The underlying causes for the substantial unit labor cost increases in Korea and Taiwan differ from those leading to the sharp increase in Japan. In Korea and Taiwan, the increases occurred in the context of relatively strong output growth and are not out of line with recent experience. The Japanese unit labor cost increase in 1992 was primarily the result of an economy in recession. That Japanese firms, particularly the larger firms, traditionally have been reluctant to shed regular employees during cyclical downturns

is probably an exacerbating factor. This practice hinders them from reacting quickly or fully to cut total labor costs in the face of declines in output, despite reducing the rate of increase in hourly compensation costs.

Unit labor costs in U.S. dollar terms. The U.S. competitive position *vis-à-vis* most other economies, as measured by unit labor costs adjusted for changes in the exchange rate, improved in 1992. The U.S. position was enhanced by flat unit labor costs and a weaker dollar relative to the currencies of Japan and most of Europe. In only two of the economies studied did the home currency depreciate relative to the U.S. dollar between 1991 and 1992. The Canadian dollar fell 5 percent against the U.S. dollar—the first decline in 6 years—and the Korean won fell 6 percent. The British pound was unchanged relative to the dollar, and the Italian lira appreciated less than 1 percent. Currencies in Norway and Sweden appreciated in the 4-percent to 4-1/2 percent range, while Japan, Taiwan, and the other European countries saw their currencies appreciate between 6 percent and 7 percent against the U.S. dollar.

The weaker dollar meant that, for many economies, unit labor costs increased substantially more when measured in U.S. dollars (that is, adjusted for changes in exchange rates) than when measured on a national currency basis. The most notable exception to this pattern was Canada, the only country to experience a decline in unit labor costs on a U.S. dollar basis in 1992. On a national currency basis, Canadian unit labor costs were unchanged over the year, as were unit labor costs in the United States. When measured in U.S. dollars, however, Canadian unit labor costs fell 5 percent, solely because of the depreciation of the Canadian dollar.

Aided by the depreciation of the won, Korean unit labor costs measured in U.S. dollars rose only one-half of 1 percent. The United Kingdom, where the pound was unchanged relative to the dollar over the year, showed an increase of about 3-1/2 percent. Swedish unit labor costs, which fell on a national currency basis, were unchanged on a U.S.-dollar basis. The remaining economies found their unit labor cost increases exacerbated by exchange rate movements. Unit labor costs in U.S. dollars rose between 5 and 7-1/2 percent in Belgium, Denmark, France, and Norway. Japan, Taiwan, Germany, and the Netherlands faced U.S. dollar-basis unit labor cost increases in the double digits, with Japan experiencing the greatest increase, at about 17 percent.

Comparative trends, 1979–92

Comparable U.S. manufacturing output data currently are not available before 1977. (See the box on the U.S. output measures, page 54.) Consequently, the analysis of long-term trends is restricted to the 16-year period from 1977 forward. However, it is more useful to choose 1979, a peak year for U.S. manufacturing output, as a starting point for analysis. The year 1979 also provides a convenient starting point for analysis of the foreign economies covered, because most of them also recorded manufacturing output peaks in 1979 or 1980. Japan, which did not experience a decline in output until 1986, is the exception to this pattern.

It is useful to divide the 1979–92 period studied at 1985 because U.S. manufacturing productivity growth accelerated in the second half of the period. In addition, the trade-weighted value of the dollar rose strongly between 1979 and 1985, then reversed itself and fell even further between 1985 and 1992. This makes 1985 an especially relevant breaking point for the analysis of changes in competitiveness stemming from movements in unit labor costs and currency exchange rates.

Productivity. U.S. manufacturing productivity rose at an average annual rate of about 2-1/2 percent between 1979 and 1992. This rate of increase placed the United States about in the middle of the range of the 11 foreign economies covered, although 7 of the 11 had growth rates that were slightly to substantially higher than the U.S. rate. Canada, Denmark, and Germany had average annual productivity growth rates of between 1 percent and 2 percent; France, the Netherlands, Norway, and Sweden had average annual gains in the 2-1/2 percent to 3-percent range; and Japan, Belgium, Italy, and the United Kingdom experienced the highest rates of increase—between 3-1/2 percent and 4-1/2 percent per year.[2]

Between 1979 and 1985, U.S. manufacturing productivity grew at a rate of only 2 percent per year. While Denmark and Germany recorded similar average annual rates of increase, all of the remaining countries had more rapid productivity growth. Belgium led the group during this period, with growth of 6 percent per year, followed by Italy, with a 5-percent rate of increase, and the United Kingdom, with 4-1/2 percent.

U.S. manufacturing productivity growth improved substantially in the 1985–92 period, rising to 2.8 percent per year. In contrast to the earlier subperiod, U.S. productivity growth between 1985 and 1992 was exceeded only by that of Japan and Italy, at 3 percent to 3-1/2 percent per year, and the United Kingdom, at 4-1/2 percent. Japan's average growth rate of 3-1/2 percent for this period was pulled down substantially by a particularly poor showing in 1992. The U.S. rate of increase was matched by Belgium, France, and Sweden. The other five countries had lower productivity

growth rates during this period. They ranged from about 1 percent annually in Canada and Denmark to 2 percent per year in Germany.

Average productivity growth rates for the 1979–85 and 1985–92 periods are shown in chart 1 for the United States, Canada, Japan, Europe (trade-weighted average), and selected European countries.

The United States was the only country to experience a higher productivity growth rate in the 1985–92 period than in the 1979–85 period. However, the United Kingdom maintained its high growth rate of 4-1/2 percent over both subperiods. Japan and France saw small dropoffs of about one-half of 1 percentage point in their average rates of increase, and Germany's productivity growth remained about constant between the two periods. At the other end of the spectrum, Belgium's average growth rate fell to about 3 percent, from 6 percent, in the 1979–85 period, Canada's growth rate dropped from 2-1/2 to less than 1 percent, and the Netherlands saw a decline from more than 4 percent per year to about 1-1/2 percent. The drop in Japan's average rate of growth was entirely attributable to that country's economic performance in 1992. If 1991 is used as the endpoint for the analysis instead of 1992, the difference in Japanese growth rates between the earlier and later subperiods becomes a 1-percent increase, rather than a decline.

Rising output with stable or increasing labor input is the image typically called to mind when productivity gains are discussed. The 1979–92 productivity gains recorded by most of the countries, however, resulted about as much or more from declining employment and hours as from output increases. The United Kingdom achieved its 4-1/2-percent productivity growth over the period primarily through a 4-percent annual reduction in hours worked; manufacturing output rose less than one-half of 1 percent per year. Norway's 2-1/2-percent productivity growth rate resulted almost entirely from a decline in total hours, as output remained almost unchanged over the period. Productivity gains for Canada, France, and Sweden resulted more from reducing labor input than from gains in output, and hours reductions were about as large a factor as output gains in the United States, Belgium, Germany, and Italy. There were two exceptions to the pattern of productivity gains resulting partly from declines in labor input: Japan, where both output and hours rose, and Denmark, where output rose and employment and hours were about unchanged.

Chart 1. **Average annual percent changes in manufacturing productivity in seven countries and Europe, selected periods, 1979–92**

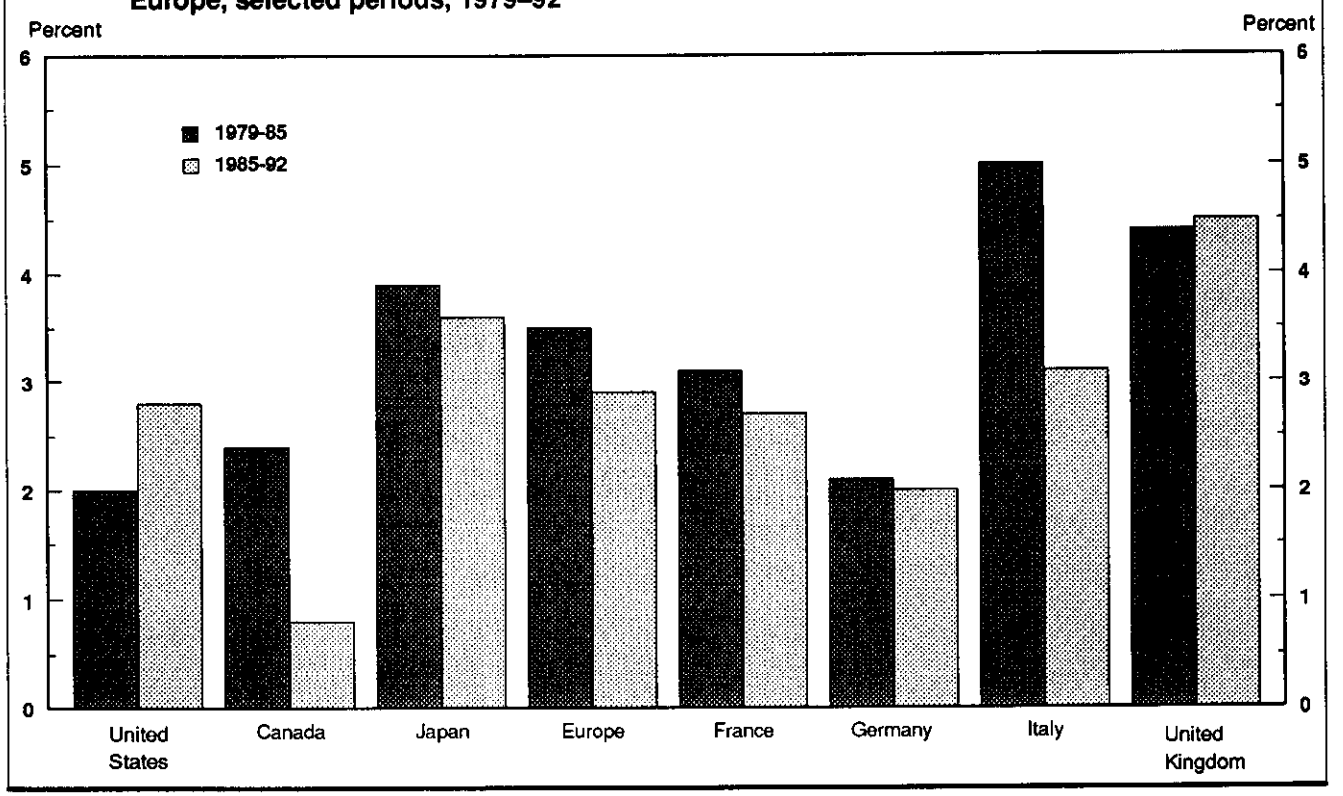


Table 2. **Annual percent changes in manufacturing productivity, unit labor costs, and related measures, 14 countries or areas, selected periods, 1979–92**

Country or area	Output per hour	Output	Total hours	Employment	Hourly compensation	Unit labor costs		Exchange rate
						National currency	U.S. dollars	
United States:								
1979–92	2.4	1.5	–1.0	–1.1	5.4	2.9	2.9	...
1979–85	2.0	.7	–1.2	–1.4	6.9	4.9	4.9	...
1985–92	2.8	2.1	–.7	–.9	4.2	1.3	1.3	...
Canada:								
1979–92	1.5	.6	–.9	–.8	6.6	5.0	4.7	–.2
1979–85	2.4	1.5	–.9	–.8	8.7	6.1	3.4	–2.5
1985–92	.8	–.1	–.9	–.9	4.8	4.0	5.8	1.8
Japan:								
1979–92	3.7	4.8	1.0	1.6	4.8	1.0	5.3	4.3
1979–85	3.9	5.8	1.8	1.7	4.7	.7	–.8	–1.5
1985–92	3.6	4.0	.4	1.5	4.8	1.2	10.8	9.4
Korea:								
1979–92	(1)	10.0	(1)	(1)	(1)	8.2	4.3	–3.6
1979–85	(1)	9.1	(1)	(1)	(1)	8.2	–1.9	–9.3
1985–92	(1)	10.9	(1)	(1)	(1)	8.2	9.9	1.6
Taiwan:								
1979–92	(1)	7.3	(1)	(1)	(1)	5.2	8.1	2.8
1979–85	(1)	8.3	(1)	(1)	(1)	7.1	5.3	–1.7
1985–92	(1)	6.4	(1)	(1)	(1)	3.6	10.6	6.8
Belgium:								
1979–92	4.3	2.3	–1.9	–1.8	5.9	1.5	.8	–.7
1979–85	6.1	2.6	–3.3	–2.7	7.8	1.6	–9.7	–11.1
1985–92	2.9	2.1	–.8	–1.0	4.4	1.5	10.7	9.2
Denmark:								
1979–92	1.3	1.3	–.1	.2	6.3	4.9	3.7	–1.1
1979–85	2.1	2.9	.8	1.0	8.1	5.9	–5.8	–11.0
1985–92	.7	–.1	–.8	–.5	4.7	3.9	12.6	8.4
France:								
1979–92	2.9	.7	–2.1	–1.7	8.0	5.0	3.2	–1.7
1979–85	3.1	–.4	–3.4	–2.3	12.8	9.4	–3.4	–11.7
1985–92	2.7	1.6	–1.1	–1.2	4.1	1.3	9.3	7.8
Germany:								
1979–92	2.0	1.2	–.8	–.1	5.6	3.5	4.8	1.2
1979–85	2.1	.2	–1.8	–1.1	5.9	3.8	–4.1	–7.6
1985–92	2.0	2.0	.0	.8	5.3	3.3	13.1	9.5
Italy:								
1979–92	4.0	2.3	–1.6	–1.9	11.7	7.4	4.2	–3.0
1979–85	5.0	1.8	–3.1	–2.9	16.7	11.1	–3.3	–12.9
1985–92	3.1	2.7	–.4	–.9	7.6	4.4	11.1	6.5
Netherlands:								
1979–92	2.8	1.9	–.8	–.6	3.8	1.0	2.1	1.0
1979–85	4.2	1.6	–2.5	–2.1	4.8	.6	–7.5	–8.0
1985–92	1.6	2.1	.6	.7	3.0	1.4	11.0	9.5
Norway:								
1979–92	2.4	.1	–2.2	–2.1	8.2	5.7	4.1	–1.6
1979–85	2.9	1.0	–1.9	–1.8	10.0	6.9	–2.1	–8.4
1985–92	1.9	–.6	–2.5	–2.4	6.7	4.7	9.7	4.7
Sweden:								
1979–92	2.8	1.0	–1.7	–2.1	8.6	5.7	3.2	–2.3
1979–85	3.0	2.1	–.9	–1.2	9.6	6.4	–5.2	–11.0
1985–92	2.6	–.1	–2.4	–2.9	7.8	5.0	11.0	5.7
United Kingdom:								
1979–92	4.4	.3	–4.0	–3.7	10.2	5.5	4.0	–1.4
1979–85	4.4	–1.2	–5.3	–4.9	12.1	7.4	–1.0	–7.9
1985–92	4.5	1.5	–2.8	–2.6	8.5	3.9	8.6	4.5

[1] Data not available.

Output. Manufacturing output was higher in 1992 than in 1979 in all of the economies covered except Norway. Canada and all of the other European economies had modest increases in the range of 1/2 percent to 2-1/2 percent per year. The U.S. output increase of 1-1/2 percent per year falls in the middle of this range. However, the Asian economies included in this study far outpaced the countries of Europe and North America. The effect of a 6-percent decline in output in 1992 notwithstanding, Japan's average rate of output growth over the period as a whole was above 4-1/2 percent per year, twice the pace of the fastest growing European economy. Growth in the newly industrializing economies of Asia was even more impressive—10 percent a year in Korea and more than 7 percent a year in Taiwan.

Between 1979 and 1985, U.S. manufacturing output grew only 0.7 percent per year, a rate which was exceeded by 10 of the 13 foreign economies. Two countries, France and the United Kingdom, had output declines over this period and output in Germany was largely unchanged. Canada and the remaining European countries experienced growth in the range of 1 percent to 3 percent annually, while average increases for the Asian economies ranged from about 6 percent to 9 percent per year.

Between 1985 and 1992, output growth in the United States improved to a rate of 2 percent per year. The countries that had performed poorly in the earlier subperiod—France, Germany, and the United Kingdom—all rebounded in the later subperiod to post growth rates of 1-1/2 percent to 2 percent per year. However, output growth in Canada and the Scandinavian countries stagnated during this period—overall output growth was virtually unchanged in Canada, Denmark and Sweden, and output fell in Norway. Japan and Taiwan also encountered drops in output growth rates in the latter period, although they—along with Korea, which raised its output growth rate to 11 percent per year—were still the top performers. Once again, Japan's average growth rate in this period was heavily influenced by its 1992 decline.

Employment and total hours. The 1979–92 period was characterized by decreases in manufacturing employment in the United States and most of the foreign countries. Japan, with an average gain of 1-1/2 percent per year, was the only country—of the 12 for which this measure is included—to substantially increase manufacturing employment during this period. (According to their household labor force surveys, manufacturing employment rose 3.3 percent per year in Korea and 1.7 percent per year in Taiwan.[3]) Denmark had a small increase and German manufacturing employment was about unchanged over the period. For the remaining countries, the average annual decline in manufacturing employment ranged from one-half of 1 percent in the Netherlands to more than 3-1/2 percent in the United Kingdom. In the 1979–85 period, only Japan and Denmark had employment increases; in the 1985–92 period, Japan, Germany, and the Netherlands experienced job growth.

U.S. manufacturing employment reached its peak in 1979. As of 1992, it was down by 14 percent. Canadian manufacturing employment did not peak until 1989, but then fell by 16 percent between 1989 and 1992. With the exception of Italy (1980), manufacturing employment peaked much earlier in Europe—1974 in Belgium, France, and Norway; 1970 in Germany; 1966 in the United Kingdom; and 1965 in Denmark, the Netherlands, and Sweden.

Japan was the only country with an increase in hours worked over the 1979–92 period, although Danish total hours were essentially unchanged. Average hours fell in most of the countries at rates of up to one-half of 1 percent per year, although Germany had a larger decline of nearly 1 percent annually. The United States, Italy, and Sweden were the only countries in which average hours rose.

Hourly compensation. Hourly compensation costs in U.S. manufacturing rose at an average annual rate of 5-1/2 percent from 1979 to 1992. Only Japan, which had an average yearly increase under 5 percent, and the Netherlands, where hourly compensation costs rose less than 4 percent per year, had smaller average increases during this period. Germany matched the U.S. rate of increase. Several countries—France, Italy, Norway, Sweden, and the United Kingdom—had increases of 8 percent or more, with Italy experiencing the largest rate of increase at about 11-1/2 percent per year.

Every country reduced its rate of increase in hourly compensation costs between the subperiods 1979–85 and 1985–92 except Japan, where the rate of increase remained constant. In the United States, hourly compensation slowed from an average yearly increase of 7 percent during 1979–85 to about 4 percent during 1985–92. Other countries experienced even larger decreases in rates of compensation growth. The largest declines were in France, from nearly 13 percent to 4 percent, and Italy, from more than 16 percent to 7-1/2 percent. Only the Netherlands, at 3 percent per year, had a smaller average rate of increase than the United States in the latter period.

Unit labor costs. Between 1979 and 1992, U.S. manufacturing unit labor costs increased at an average rate of 3 percent per year. This favorable U.S. performance was one factor that tended to

improve U.S. competitiveness over the period, relative to most of the foreign economies studied. Only three countries—Japan, Belgium, and the Netherlands—had lower unit labor cost growth rates than the United States, about 1 percent to 1-1/2 percent per year over the period as a whole. The remaining economies had unit labor cost increases ranging from 3-1/2 percent per year in Germany to 8 percent in Korea. Canada, Taiwan, France, the United Kingdom, and the Scandinavian countries all saw increases of between 5 percent and 6 percent per year; Italy's rate of increase, 7-1/2 percent per year, put it above all the other economies studied except Korea.

After rising at around 5 percent per year from 1979 to 1985, U.S. manufacturing unit labor costs decelerated to a 1.3-percent annual rate of increase between 1985 and 1992. None of the foreign economies studied had a lower rate of increase than the United States during this period, although Japan, Belgium, France, and the Netherlands matched the U.S. rate. All except four of the foreign economies—Japan, Korea, Belgium, and the Netherlands—experienced unit labor cost slowdowns, in some cases substantial, in the latter subperiod. The most notable change occurred in France, where the annual growth rate in unit labor costs dropped from 9-1/2 percent to about 1-1/2 percent. Italy also underwent a substantial reduction in unit labor cost growth, from 11 percent down to 4-1/2 percent. Like the United States, Canada, Taiwan, Denmark, Norway, and the United Kingdom each had average increases about 2 to 3-1/2 percentage points lower in the later than the earlier period, and Germany and Sweden experienced modest reductions in growth, one-half of 1 percent for Germany and 1-1/2 percent for Sweden.

Among the countries that did not experience slowdowns in unit labor cost growth in the 1985–92 period, none had a major runup in unit labor cost growth. Although Japan and the Netherlands saw their unit labor cost growth double in the 1985–92 period,[4] they still had among the lowest rates of increase, compared with those of the other economies. Korea's annual 8-percent rate of gain was the most rapid increase in any economy studied and remained the same in both subperiods. Belgium also experienced the same rate of increase in both subperiods.

Unit labor costs in U.S. dollars. In addition to changes in unit labor costs, the competitiveness of a country's manufactured products in world markets is affected by changes in the value of that country's currency relative to those of other countries. Therefore, changes in unit labor costs measured in U.S. dollars (to adjust for relative changes in exchange rates) are a better indicator of changes in competitiveness than are unit labor costs measured in national currencies.

Currency exchange rates changed dramatically over the course of the 1980's. The U.S. dollar appreciated sharply relative to the currencies of most

U.S. output measures

The historical real manufacturing output data for the United States are the 1987 fixed-price-weighted measures prepared by the Bureau of Economic Analysis of the U.S. Department of Commerce for 1977 through 1991, published in the November issue of the *Survey of Current Business*. The 1991–92 percent change in manufacturing output is based on the trend shown by the industrial production indexes published by the U.S. Federal Reserve Board. Comparable manufacturing output data currently are not available prior to 1977.

The U.S. real output measures normally constructed by the Bureau of Economic Analysis are based on fixed price weights of a single year. Fixed-weighted real output series have several advantages, but, if there are major changes in relative prices over the period covered, the change in real output becomes sensitive to the choice of price weights. This issue is discussed in Robert P. Parker, "Gross Product by Industry, 1977–90," *Survey of Current Business*, May 1993. The article shows alternative measures of real output growth, using "benchmark-years-weighted quantity index" numbers for total gross domestic product (GDP) and for manufacturing for the years 1977–87. The 1977–87 growth rate for manufacturing output is 2.5 percent; the growth rate based on the 1987 fixed-weighted measure is 1.7 percent. (For 1987–90, the 1987 fixed-weighted measure is used for both manufacturing and GDP. According to the article (page 36), "The differences between this measure and a benchmark-years-weighted measure in which 1990 is treated as if it were a benchmark year are fairly small.") BLS is studying these new alternative measures produced by the Bureau of Economic Analysis, and will consider introducing them in future computations of manufacturing productivity.

Most of the foreign economies link fixed-weighted measures covering various periods, but some also produce annual chain-weighted indexes. The output measures used in this article are fixed weighted, with the following exception: the measures for Norway for 1987 forward are based on relative prices of the preceding year.

of the economies studied between 1979 and 1985. This trend then reversed, and the dollar depreciated rapidly against most of those currencies in the latter half of the 1980's. Because of this pattern in currency exchange rate movements, it is particularly useful to divide the period studied at 1985 when analyzing changes in unit labor costs adjusted for changes in exchange rates.

Between 1979 and 1985, the currencies of all the foreign economies in this study depreciated, by varying amounts, relative to the U.S. dollar. The weaker European currencies, those of Belgium, Denmark, France, Italy, and Sweden, depreciated at rates of 11 percent to 13 percent per year against the dollar. The relatively stronger European currencies of Germany, the Netherlands, Norway, and the United Kingdom fell about 7-1/2 percent to 8-1/2 percent annually. The Korean won fell more than 9 percent per year. The currencies of Canada, Japan, and Taiwan depreciated much less sharply, dropping between 1-1/2 percent to 2-1/2 percent per year.

By contrast, during the 1985–92 period, the currencies of all the foreign economies appreciated to some extent relative to the U.S. dollar. The European currencies all appreciated between 4-1/2 percent and 9-1/2 percent per year. The Belgian franc, German mark, and Dutch guilder led this group, with rates of 9 percent to 9-1/2 percent per year. The Japanese yen also appreciated 9-1/2 percent annually during this period, while the New Taiwan dollar increased in value by about 7 percent annually. The currencies showing modest appreciations were those of Canada, at nearly 2 percent and Korea, at 1-1/2 percent per year.

The effects of these strong movements in currency exchange rates dominate the trends in the U.S. dollar-based unit labor cost measures. The U.S. competitive position deteriorated during the 1979–85 period, and improved during the 1985–92 period, largely because of these exchange rate movements.

Between 1979 and 1985, while unit labor costs measured in national currencies increased for all the foreign economies studied and rose at a 5-percent annual average rate in the United States, exchange rate adjusted unit labor costs (that is, measured on a U.S.-dollar basis) declined in all except two of the foreign economies. The declines ranged from 1 percent per year in Japan to 9-1/2 percent in Belgium. The economies of Canada and Taiwan, which experienced increases in unit labor costs on a U.S. dollar basis, along with Japan, had the smallest declines in relative currency values during this period.

The U.S. competitive disadvantage, due to the strength of the dollar during the 1979–85 period, was reversed after 1985 and currency exchange rate movements became an advantage. With very small increases in U.S. unit labor costs measured on a national currency basis, and with the dollar weakening against every currency, unit labor costs adjusted for exchange rate changes increased at a much slower rate in the United States than in any other country. While U.S. unit labor costs increased only 1.3 percent per year, the increases in the foreign economies ranged from 6 percent per year in Canada to 13 percent in Germany.

The favorable performance of U.S. unit labor costs in the latter half of the 1980's and early 1990's, as well as the effect of exchange rate movements, provided the United States with the third lowest average annual increase in dollar-based unit labor costs, at 3 percent per year, over the entire 1979–92 period. Only Belgium (less than 1 percent) and the Netherlands (2 percent) had more favorable unit labor cost performances on a U.S. dollar basis. Denmark, France, and Sweden experienced average annual increases of around 3-1/2 percent, while Canada, Korea, Italy, Norway, and the United Kingdom had increases of about 4 percent to 4-1/2 percent. Unit labor costs increased at rates of 5 percent in Germany; 5-1/2 percent in Japan; and 8 percent in Taiwan.

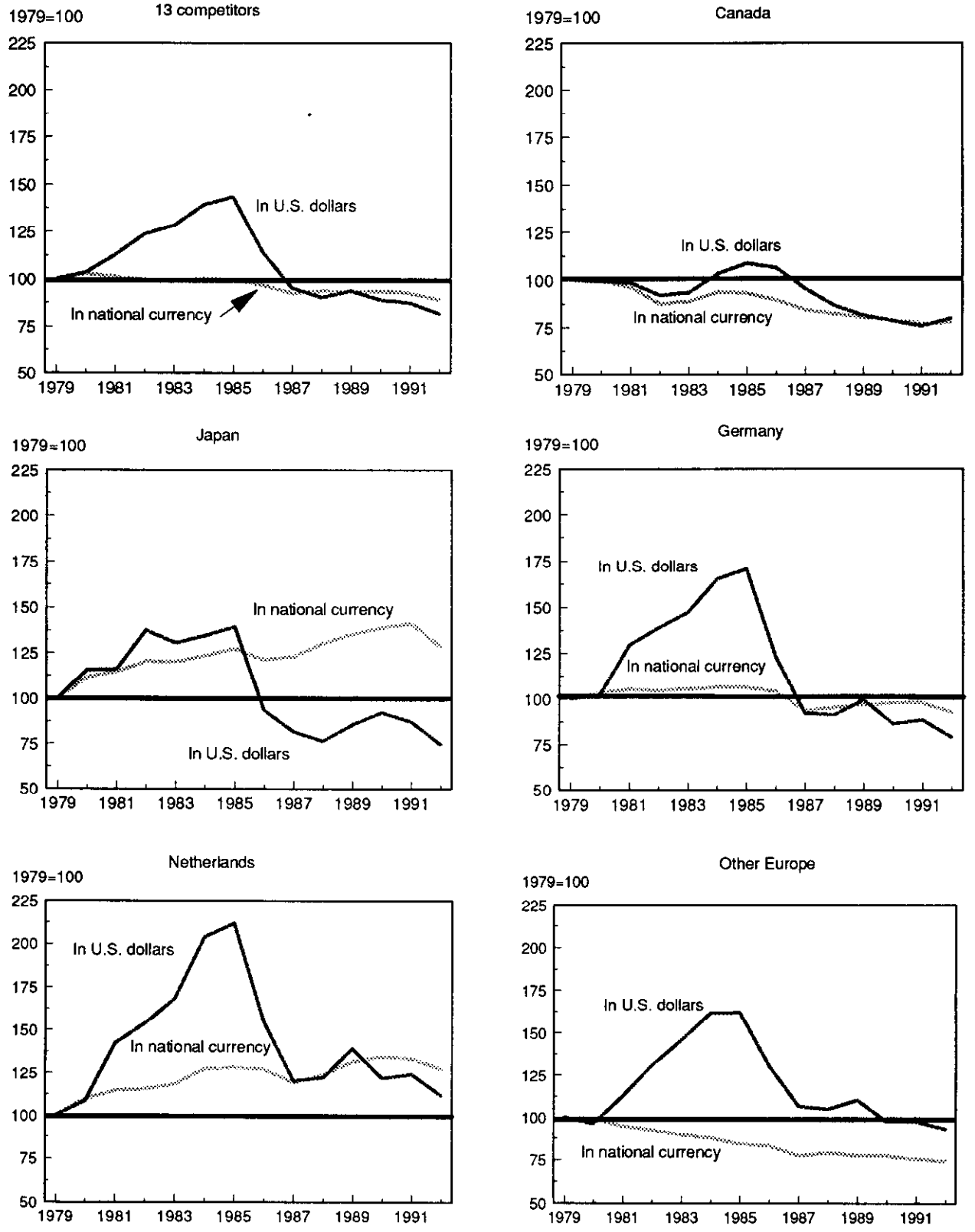
Relative unit labor costs

The economies covered by these comparative measures differ greatly in their relative importance to U.S. trade in manufactured products. Therefore, the Bureau constructs trade-weighted measures that take account of these differences. The trade weights used were derived by rescaling a series covering 21 economies that was developed by the International Monetary Fund. These

Table 3. **Average annual percent changes in U.S. unit labor costs in manufacturing relative to 13 competitors, selected periods, 1979–92**

	National currency			U.S. dollars		
	1979–92	1979–85	1985–92	1979–92	1979–85	1985–92
13 competitors	–0.9	–0.1	–1.6	–1.5	6.2	–7.7
Canada	–1.9	–1.2	–2.6	–1.7	1.4	–4.3
Japan	1.9	4.1	.1	–2.2	5.7	–8.5
Korea	–4.9	–3.1	–6.4	–1.3	6.9	–7.8
Taiwan	–2.1	–2.1	–2.2	–4.8	– .4	–8.4
Europe	–1.6	–1.3	–1.8	– .8	8.9	–8.5
Germany	– .6	1.0	–1.9	–1.8	9.3	–10.4
Netherlands	1.9	4.2	– .1	.9	13.3	–8.7
Other Europe	–2.3	–2.8	–1.8	– .6	8.4	–7.6
Belgium	1.4	3.2	– .2	2.1	16.1	–8.5
Denmark	–1.8	–1.0	–2.5	– .8	11.3	–10.1
France	–1.9	–4.1	.0	– .3	8.6	–7.3
Italy	–4.2	–5.6	–3.0	–1.3	8.4	–8.9
Norway	–2.6	–1.9	–3.3	–1.1	7.2	–7.6
Sweden	–2.6	–1.5	–3.5	– .3	10.7	–8.8
United Kingdom	–2.4	–2.4	–2.5	– 1.0	6.0	–6.7

Chart 2. **U.S. unit labor costs in manufacturing relative to competitors, 1979–92**



weights are based on disaggregated 1980 trade data for manufactured goods, and take account of both bilateral trade and the relative importance of "third country" markets.[5] The following are the rescaled weights (in percent):

Country	*Weights*
Japan	25
Canada	19
Germany	14
United Kingdom	12
France	8
Italy	6
Taiwan	4
Korea	3
Belgium	3
Netherlands	3
Sweden	2
Denmark	1
Norway	1

Two summary measures are constructed: "competitors" indexes, which are the trade-weighted geometric averages of the unit labor cost indexes for competitor economies; and relative indexes, which are the ratio of the U.S. index to "competitors" index. Chart 2 shows the U.S. unit labor cost index relative to all 13 foreign economies on both a national currency and a U.S.-dollar basis over the 1979–92 period. The chart also shows the U.S. index relative to the indexes for selected individual countries—Canada, Japan, Germany, and the Netherlands—and relative to a trade-weighted index for the other seven European countries. Table 3 shows average annual percent changes in U.S. unit labor costs relative to all 13 foreign economies, the 9 European economies, and each of the individual economies for 1979 to 1992 and the two subperiods being analyzed.

With unit labor costs expressed on a national currency basis for all economies, U.S. unit labor costs rose substantially relative to Japan, Belgium, and the Netherlands, and moderately relative to Germany between 1979 and 1985, but fell relative to Canada, Korea, Taiwan, and the other European countries. (See chart 2 and table 3.) While most of the foreign economies had larger unit labor cost increases than did the United States, U.S. costs were virtually unchanged relative to all 13 competitor economies combined, in part, because Japan and Germany have such large trade weights.

U.S. unit labor costs were about unchanged relative to those of Japan, Belgium, France, and the Netherlands during the 1985–92 period, and fell relative to those of Germany and each of the other economies as well as relative to the 13 competitor economies combined.

Over the entire 1979–92 period, U.S. unit labor costs rose about 2 percent per year relative to Japan and the Netherlands, somewhat less relative to Belgium, fell relative to each of the other economies, and declined about 1 percent per year relative to the 13 competitor economies combined.

Measured on a U.S.-dollar basis for all economies, U.S. unit labor costs rose relative to each competitor except Taiwan in the 1979–85 period. Unit labor costs in the United States rose 6 percent annually relative to the 13 competitors, nearly 6 percent relative to Japan, and nearly 9 percent relative to the European economies.

Measured in U.S. dollar terms, U.S. unit labor costs fell relative to each of the 13 competitor economies during the 1985–92 period. The improvement in U.S. manufacturing competitiveness was substantial over this period—on an annual average basis, U.S. relative unit labor costs fell 8-1/2 percent against Japan and against the nine European countries combined (including more than 10 percent against Germany), around 8 percent against Korea and Taiwan, more than 4 percent against Canada, and about 7-1/2 percent against all 13 economies combined.

For the 1979–92 period as a whole, U.S. unit labor costs fell about 1 percent per year relative to those of the 13 competitors measured in own-currency terms, and about 1-1/2 percent per year adjusted for relative changes in the value of the U.S. dollar. The U.S. competitive position, as measured by U.S. dollar-basis unit labor costs, improved relative to every economy except those of Belgium and the Netherlands. The U.S. competitive position improved the most relative to Taiwan, followed by Japan, Germany, and Canada—the three economies with the largest trade weights among the competitor nations. □

Footnotes

[1] The long-term output measure for Japan is gross product originating from the Japanese national accounts. This measure is not yet available for 1992. Therefore, the Bureau has made a preliminary estimate of Japan's 1991–92 percent change in manufacturing output on the basis of Japan's industrial production index for manufacturing (basically a gross output measure) and an index of materials consumed by manufacturing establishments.

[2] Japan's average rate of productivity growth from 1979 to 1992 was about 3-1/2 percent, while the United Kingdom led the group of countries in this study with 4-1/2 percent growth over the period. However, for the 1979–91 period, the two countries had identical productivity growth rates of 4-1/2 percent. The inclusion of 1992, a year in which the United Kingdom had strong productivity growth and Japan experienced a sharp productivity decline, strongly affects the average

growth over the period as a whole.

[3] As noted earlier, the Bureau has not constructed productivity measures and, therefore, does not show labor input measures for either Korea or Taiwan because of possible inconsistencies between the readily available measures of labor input (such as from the household labor force surveys conducted by both economies) and the national accounts output measures.

[4] Once again, the deterioration in Japan's unit labor cost performance between 1985 and 1992 was entirely due to the effect of a very high unit labor cost increase in 1992. Japanese unit labor costs actually fell between 1985 and 1991, an improvement over the earlier subperiod.

[5] See Ann K. McGuirk, "Measuring Price Competitiveness for Industrial Country Trade in Manufactures," working paper (International Monetary Fund, April 28, 1986). This paper relates to 17 industrial countries. McGuirk subsequently recalculated the trade weights to include Hong Kong, Korea, Singapore, and Taiwan. The weights given to Korea and Taiwan would be larger based on a more current year.

APPENDIX: Measures of manufacturing productivity and unit labor costs

The Bureau of Labor Statistics constructs trend indexes of manufacturing labor productivity (output per hour), hourly compensation costs, and unit labor costs from three basic aggregative measures—output, total labor hours, and total compensation. The hours and compensation measures refer to all employed persons, including self-employed persons and unpaid family workers, in the United States and Canada and to all employees (wage and salary earners) in the other economies. Hours refer to hours worked in all countries. (The figures for Canada in this release are the official measures prepared by Statistics Canada.)

In general, the measures relate to total manufacturing as defined by the International Standard Industrial Classification. However, the measures for France, Italy (beginning 1970), and the United Kingdom (beginning 1971) refer to mining and manufacturing less energy-related products; the measures for Denmark include mining and exclude manufacturing handicrafts from 1960 to 1966; and the measures for the Netherlands exclude petroleum refining and include coal mining from 1969 to 1976.

Output. In general, the output measures are value added in manufacturing (gross product originating) in constant prices from the national accounts of each country. However, output for Japan prior to 1970 and the Netherlands from 1969 to 1977 are indexes of industrial production. The national accounts measures for the United Kingdom are essentially identical to its indexes of industrial production. While methods of deriving national accounts measures differ substantially from country to country, the use of different procedures does not, in itself, connote lack of comparability—rather, it reflects differences among countries in the availability and reliability of underlying data series.

Labor input. The total hours measures are developed from statistics of manufacturing employment and average hours. The series used for France (from 1970 forward), Norway, and Sweden are official series published with the national accounts. Where official total hours series are not available, the measures are developed by BLS using employment figures published with the national accounts, or other comprehensive employment series, and estimates of annual hours worked.

For the Republic of Korea and Taiwan, BLS publishes only measures of unit labor costs and its components—output and total compensation. Total hours, and consequently productivity, are not computed for Korea and Taiwan because BLS has not yet developed adequate labor input series.

Compensation (labor cost). The compensation measures are from the national accounts, except those for Belgium, which are developed by the Bureau using statistics on employment, average hours, and hourly compensation. Compensation includes all payments in cash or kind made directly to employees plus employer expenditures for legally required insurance programs and contractual and private benefit plans. In addition, for some countries, compensation is increased to account for other significant taxes on payroll or employment (or reduced to reflect subsidies). Self-employed workers are included in the U.S. and Canadian figures by assuming that their hourly compensation is equal to the average for wage and salary employees.

Current indicators. For most countries, the measures for recent years may be based on current indicators of manufacturing output (such as industrial production indexes), employment, average hours, and hourly compensation until national accounts and other statistics used for the long-term measures become available.

Level comparisons. The BLS measures are limited to trend comparisons. BLS 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 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. 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.

PPP exchange rates are available for total gross domestic product (GDP). These rates, however, 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, or value added). Therefore, PPP exchange rates are not provided by industry. The PPP exchange rates for total GDP are not suitable for each component industry, such as manufacturing.