Productivity and the Economy: A Chartbook

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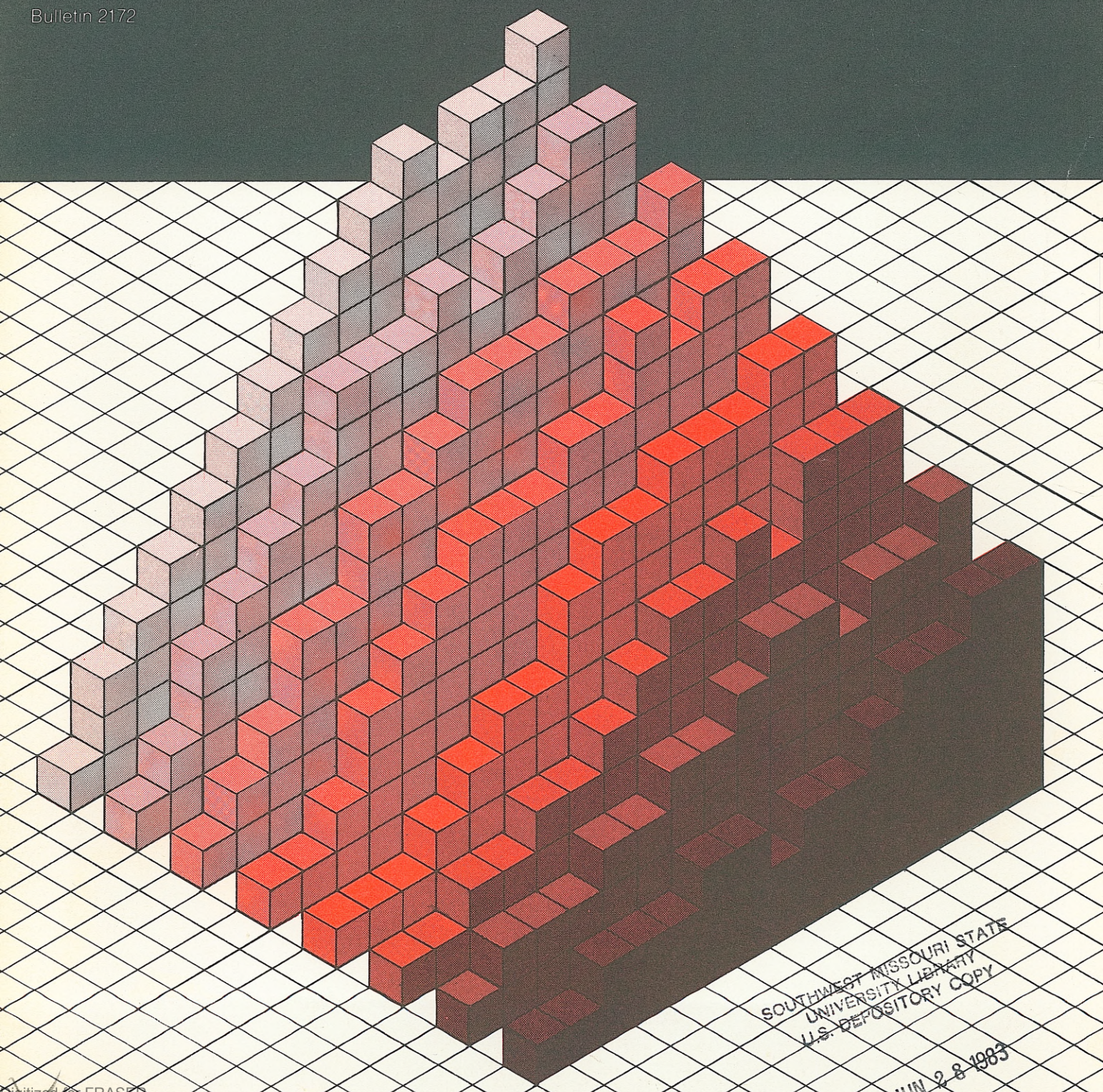

Productivity and the Economy: A Chartbook

U.S. Department of Labor
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Preface

Productivity plays a role in most issues of economic policy. Consequently, there is a continuous need for information about productivity, though the focus of attention varies with the economic climate. During periods of rising prices, attention centers on the relationship among productivity, wages, and costs. The relation between productivity and employment has also been a concern, especially in times of economic slowdown. Furthermore, the link between productivity and economic growth remains a perennial subject of intense study.

This chartbook is designed to show what productivity is and how it interacts with other aspects of the economy. It is divided into two parts. The first part shows how productivity has changed over time. The second portrays changes in costs and prices as influenced by productivity. It also includes charts tracing trends in capital formation, and research and development. Wherever possible, international comparisons are presented so as to add perspective to a subject that is often treated solely within a national framework.

This chartbook was produced in the Office of Productivity and Technology of the Bureau of Labor Statistics.

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Part I.

Productivity and how it is measured

Productivity is a concept that expresses the relationship between the quantity of goods and services produced—output—and the quantity of labor, capital, land, energy, and other resources that produced it—input. Productivity can be measured in two ways. One way relates the output of an enterprise, industry, or economic sector to a single input such as labor or capital. The other relates output to a composite of inputs, combined so as to account for their relative importance. The choice of a particular productivity measure depends on the purpose for which it is to be used.

The most generally useful measure of productivity relates output to the input of labor time—output per hour, or its reciprocal, unit labor requirements. This kind of measure is used widely because labor productivity is relevant to most economic analyses, and because labor is the most easily measured input. Relating output to labor input provides a tool not only for analyzing productivity, but also for examining labor costs, real income, and employment trends.

Labor productivity can be measured readily at several levels of aggregation: The business economy, its component sectors, industries, or plants. Nearly all of the productivity measures used in this chartbook are measures of output per hour. Depending on the components of the measure used and the context, labor productivity will be called output per hour of all persons engaged in the productive process, output per employee hour, or just output per hour.

The use of labor productivity indexes does not imply that labor is solely or primarily responsible for productivity growth. In a technologically advanced society, labor effort is only one of many sources of productivity improvement. Trends in output per hour also reflect technological innovation, changes in capital stock and capacity utilization, scale of production, materials flow, management skills, and other factors whose contribution often cannot be measured.

The output side of the output per hour ratio refers to the finished product or the amount of real value added in various enterprises, industries, sectors, or the economy as a whole. Few plants or industries produce a single homogeneous commodity that can be measured by simply counting the number of units produced. Consequently, for the purpose of measurement, the various units of a plant's or an industry's output are combined on some common basis—either their unit labor requirements in a base period or their dollar value. When information on the amount of units produced is not available, as is often the case, output must be expressed in terms of the dollar value of production, adjusted for price changes.

As noted, productivity can be measured in terms of several inputs. Multifactor productivity measures, consisting of output per unit of combined inputs of labor and capital, have been developed by BLS. They are included in this chartbook and cover total private business, nonfarm business, and manufacturing.

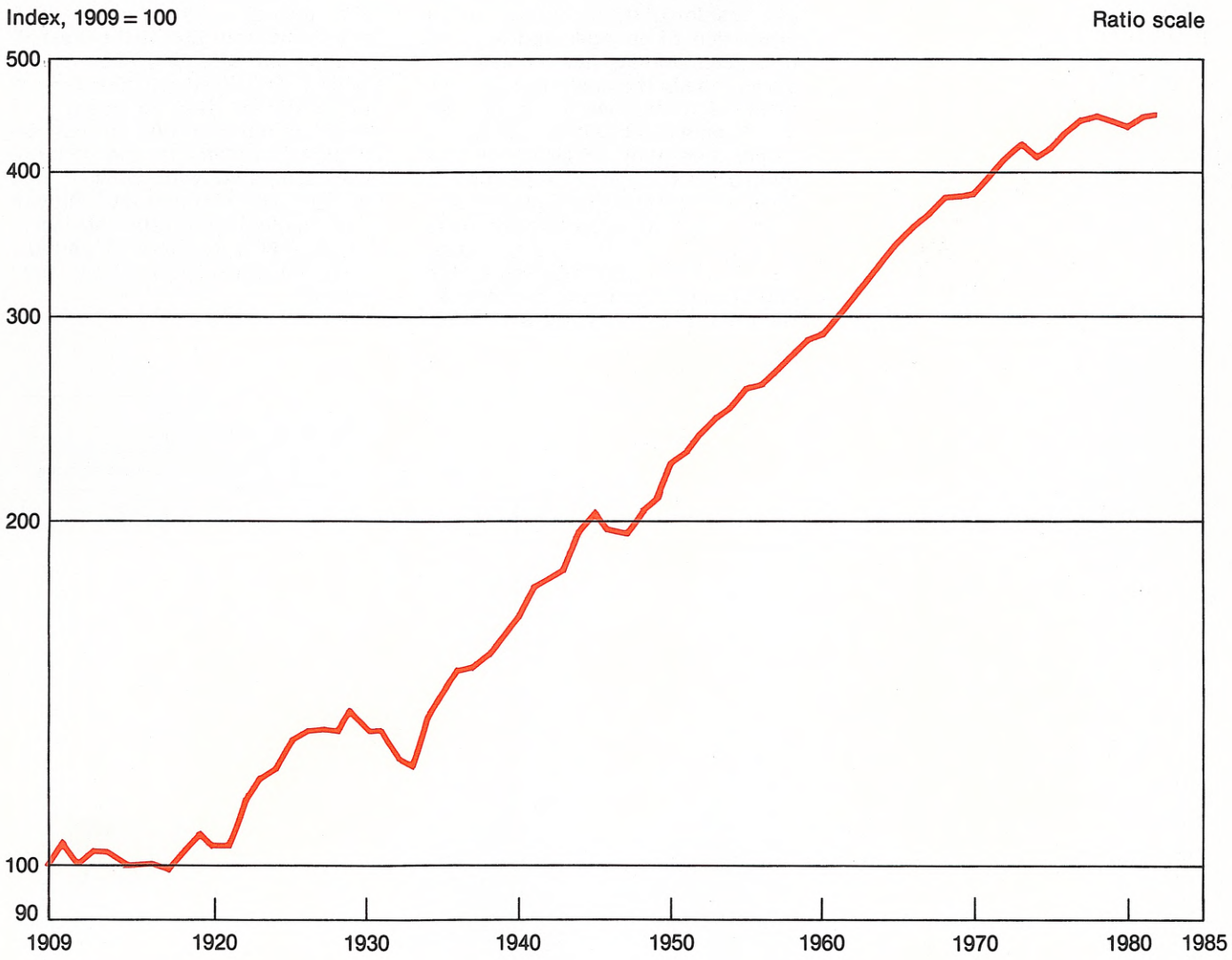
Productivity has generally improved over time

Official U.S. measures of productivity begin with the year 1909 and continue to the present. In general, productivity has moved upward. In 1982, productivity in the business economy was 4½ times above its 1909 level.

Period	Output per hour of all persons in the business economy[1] (average annual percent change)
1909–82	2.5
1909–29	1.6
1929–47	2.9
1947–82	2.6

[1] Total private economy, 1909–46.

Chart 1.
Output per hour of all persons in the business economy, 1909-82



Source: Bureau of Labor Statistics

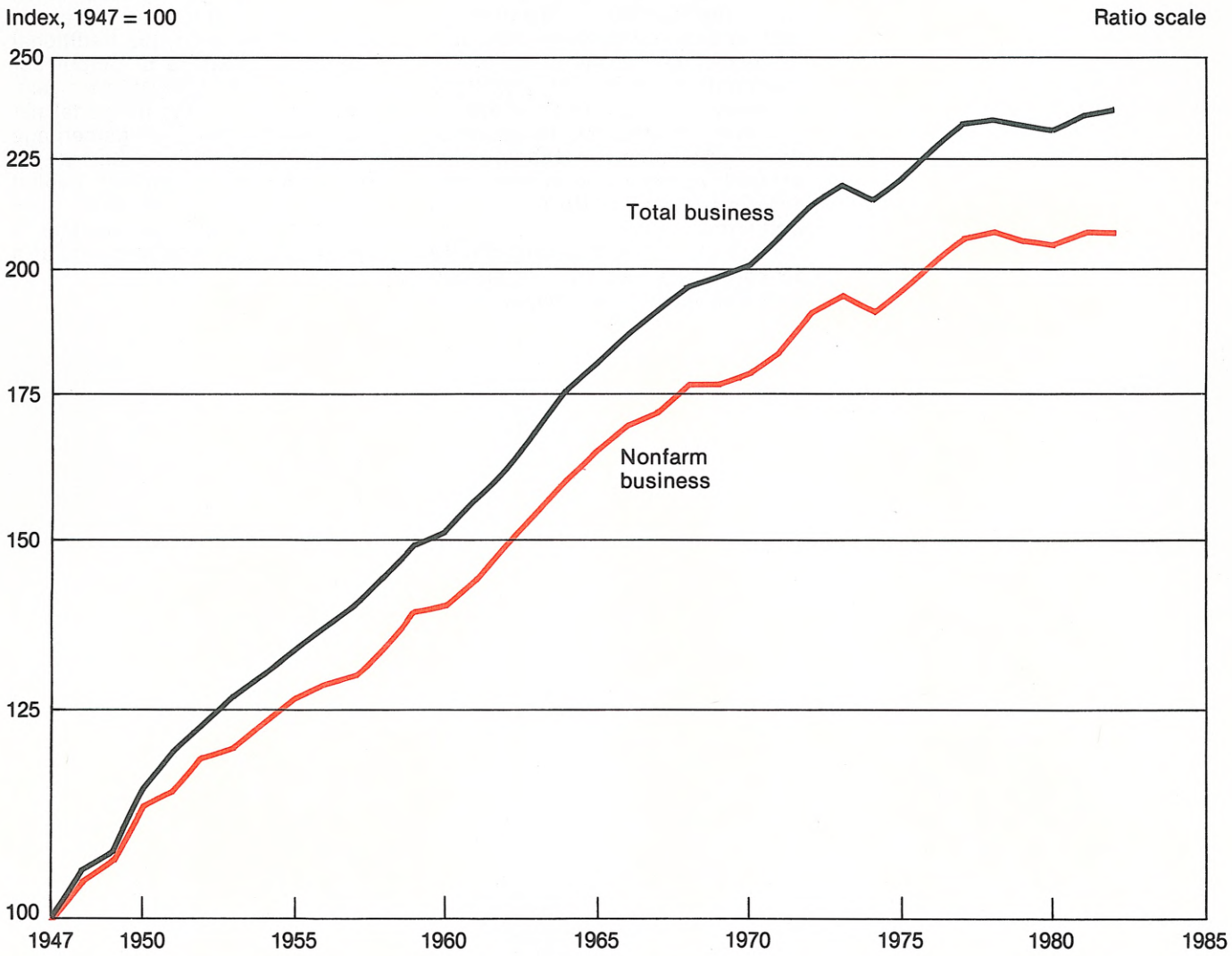
Productivity advance has slowed over the past 17 years

Rates of growth in the productivity of the business economy and the nonfarm business economy have significantly slowed since 1965. Explanations for the slowdown have included the effects of change in the composition of the labor force as the proportion of younger and less experienced workers has increased; a slower rise in the capital-labor ratio, resulting from lessened investment in equipment and structures at the same time that employment and hours rose strongly; a leveling off in research and development expenditures; diversion of investment funds to pollution abatement; the maturation of some industries with little new technology; and changes in attitudes toward work. No simple explanation for the decline exists, nor is there general agreement on the quantitative impact of the various factors.

The deceleration since the mid-1960's must really be broken into two periods—the period from 1965 to 1973 and from 1973 to the present. The factors affecting productivity trends during these two periods were quite different. The composition of the labor force shifted to less experienced workers in the 1965–73 span compared with what it had been between 1947 and 1965. Growth in the capital-labor ratio, strong in the 1947–65 and 1965–73 periods, weakened considerably from 1973 forward.

Period	Output per hour of all persons (average annual percent change)	
	Business economy	Nonfarm business economy
1947–82	2.5	2.4
1947–65	3.4	3.3
1965–73	2.4	2.4
1973–82	.9	.7

Chart 2.
Output per hour of all persons in the total business and nonfarm business economies, 1947-82



Source: Bureau of Labor Statistics

Multifactor productivity indexes take account of capital as well as labor inputs

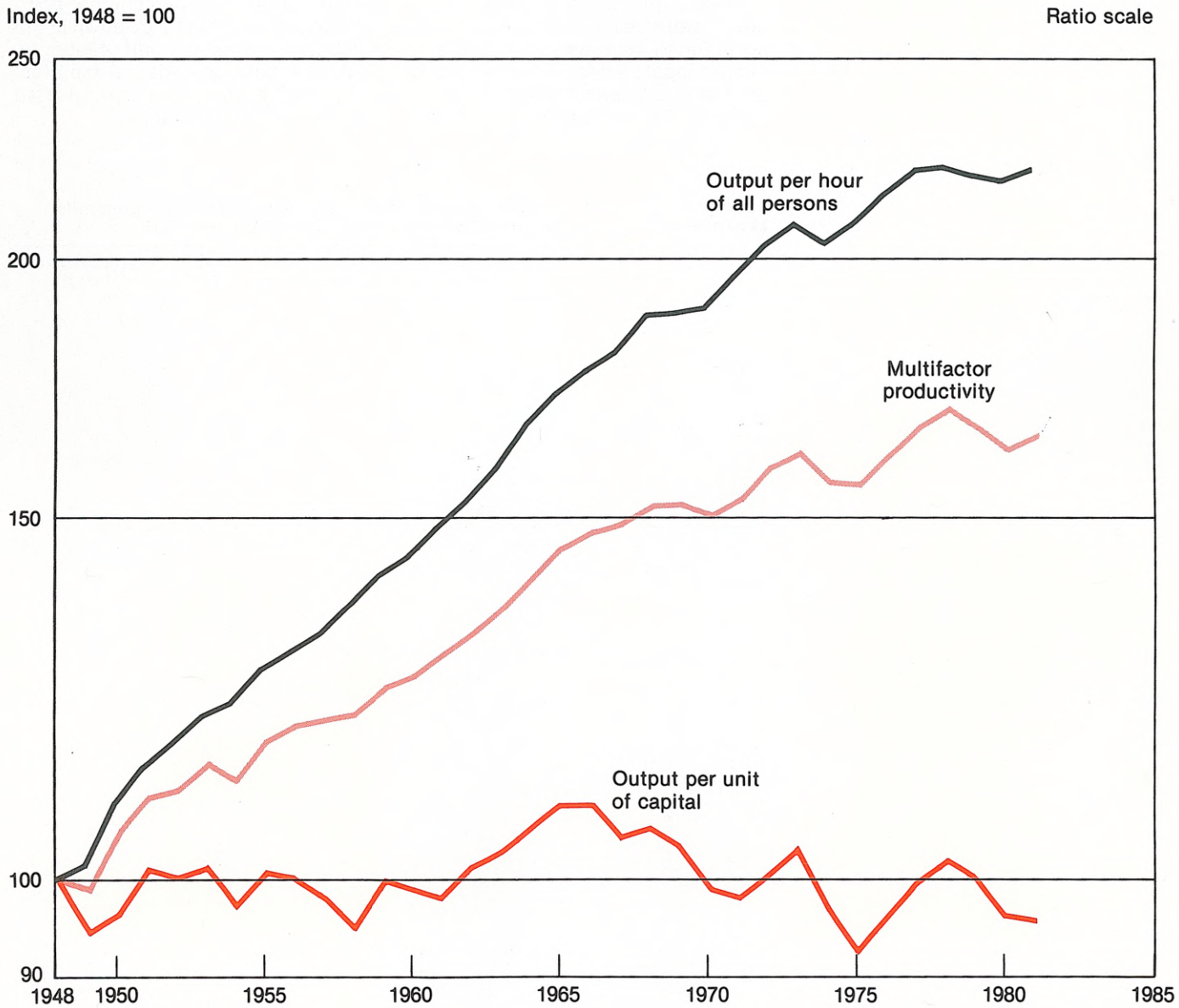
Multifactor productivity, measured by output per unit of combined labor and capital input, rose an average of 1.5 percent per year from 1948 to 1981 in the private business sector.

This new productivity series shows the changes in the amount of labor and capital used in production. As such, it reflects the joint effect of many influences, including changes in technology, the level of output, utilization of capacity, the organization of production, managerial skills, as well as changes in the characteristics and efforts of the workforce.

The traditional productivity series—output per hour of all persons—reflects these influences and also the impact of changes in capital per unit of labor input. The new measures, therefore, supplement the existing measures by providing a basis for measuring that impact.

Over the 1948–81 period, when multifactor productivity increased 1.5 percent per year, the traditional productivity measure of output per hour rose 2.4 percent per year. Therefore, the growth in capital per hour contributed 0.9 percentage point to the growth in output per hour. Output per unit of capital services fluctuated between 1948 and 1981 but did not register a significant trend over the period as a whole.

Chart 3.
Output per hour of all persons, output per unit of capital, and multifactor productivity, private business sector, 1948-81



Source: Bureau of Labor Statistics

Multifactor productivity trends reflect a significant slowdown for nearly all of the past 10 years

The growth in multifactor productivity in the private business sector showed two distinct patterns: 2.0 percent per year from 1948 to 1973, but only 0.1 percent per year from 1973 to 1981. This slowdown reflected a falloff in output growth, coupled with a faster growth of combined inputs of labor and capital. The accelerated increase in labor and capital inputs after 1973 was due to the faster increase in the hours of all persons. The annual rate of growth of capital was slower after 1973.

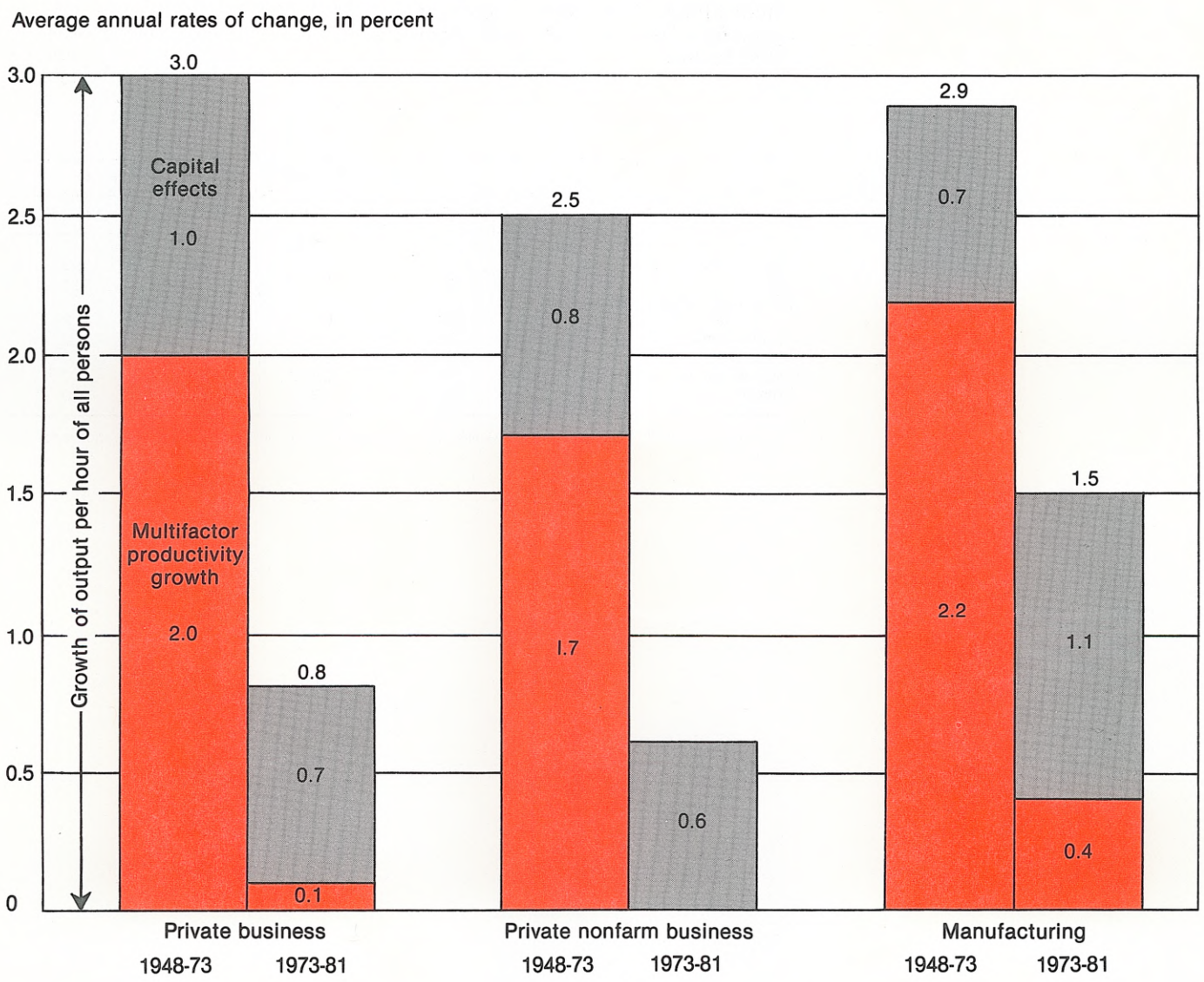
The traditional productivity measure of output per hour slowed—dropping from a growth rate of 3.0 percent during the 1948–73 period to 0.8 percent from 1973 to 1981. Of this 2.2 percentage point falloff, 0.3 percentage point was the result of the slowdown in the growth of capital per unit of labor input. The balance—that of multifactor productivity growth—reflected the remaining influences.

Average annual rates of change in output per hour of all persons, the contribution of capital services per hour, and multifactor productivity, 1948 to 1981

Measure	1948–81 (1)	1948–73 (2)	1973–81 (3)	Slowdown (2–3)
Private business[1]				
Output per hour of all persons	2.4	3.0	0.8	–2.2
Minus: Contribution of capital services per hour[2]	.9	1.0	.7	–.3
Equals: Multifactor productivity[3]	1.5	2.0	.1	–1.9

[1] Excludes government enterprises.
[2] Change in capital per unit of labor weighted by capital's share of total output.
[3] Output per unit of combined labor and capital input.

Chart 4.
Output per hour of all persons, capital effects, and multifactor productivity, 1948-73 and 1973-81



Source: Bureau of Labor Statistics

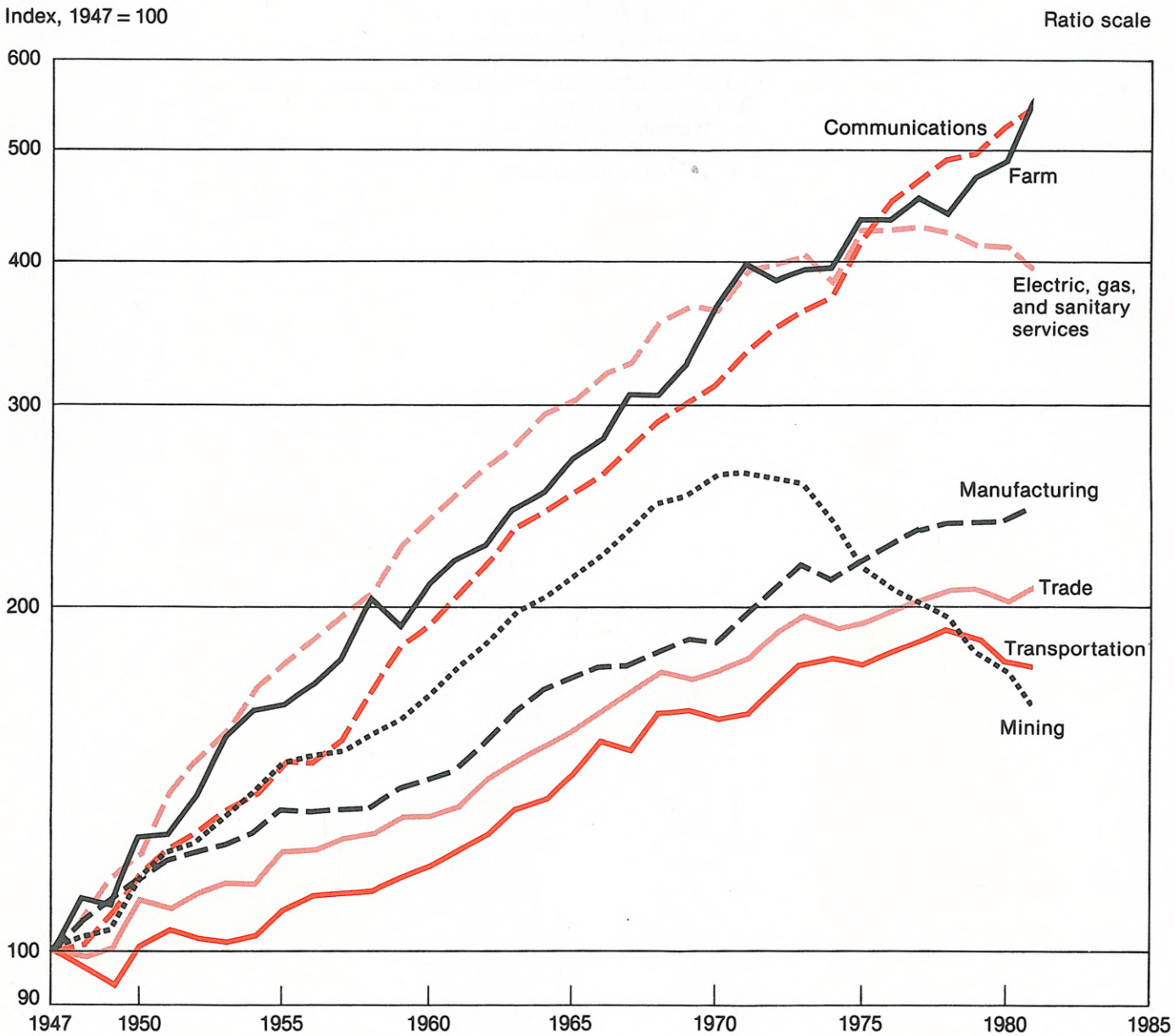
The major sectors of the economy display widely varying productivity trends

Wide variations prevail between the rates of productivity change of the various sectors of the economy. All sectors, however, experienced significant slowdowns of their average annual rates of productivity improvement after 1965. Furthermore, all sectors, except communications, had slower rates of gain from 1973 to 1981 than from 1965 to 1973.

Sector[1]	Output per hour (average annual percent change)			
	1947–81	1947–65	1965–73	1973–81
Communications	5.3	5.4	4.7	5.3
Farm	4.8	5.3	5.2	3.4
Electricity, gas, and sanitary services	4.4	6.4	3.6	.3
Transportation	2.3	2.1	2.2	.2
Trade	2.4	2.4	2.6	1.0
Manufacturing	2.7	2.6	2.7	1.7
Mining	2.2	4.2	2.5	5.0

[1] Adequate productivity data are not available for services; construction; and finance, insurance, and real estate.

Chart 5.
Output per hour of all persons by major sector, 1947-81

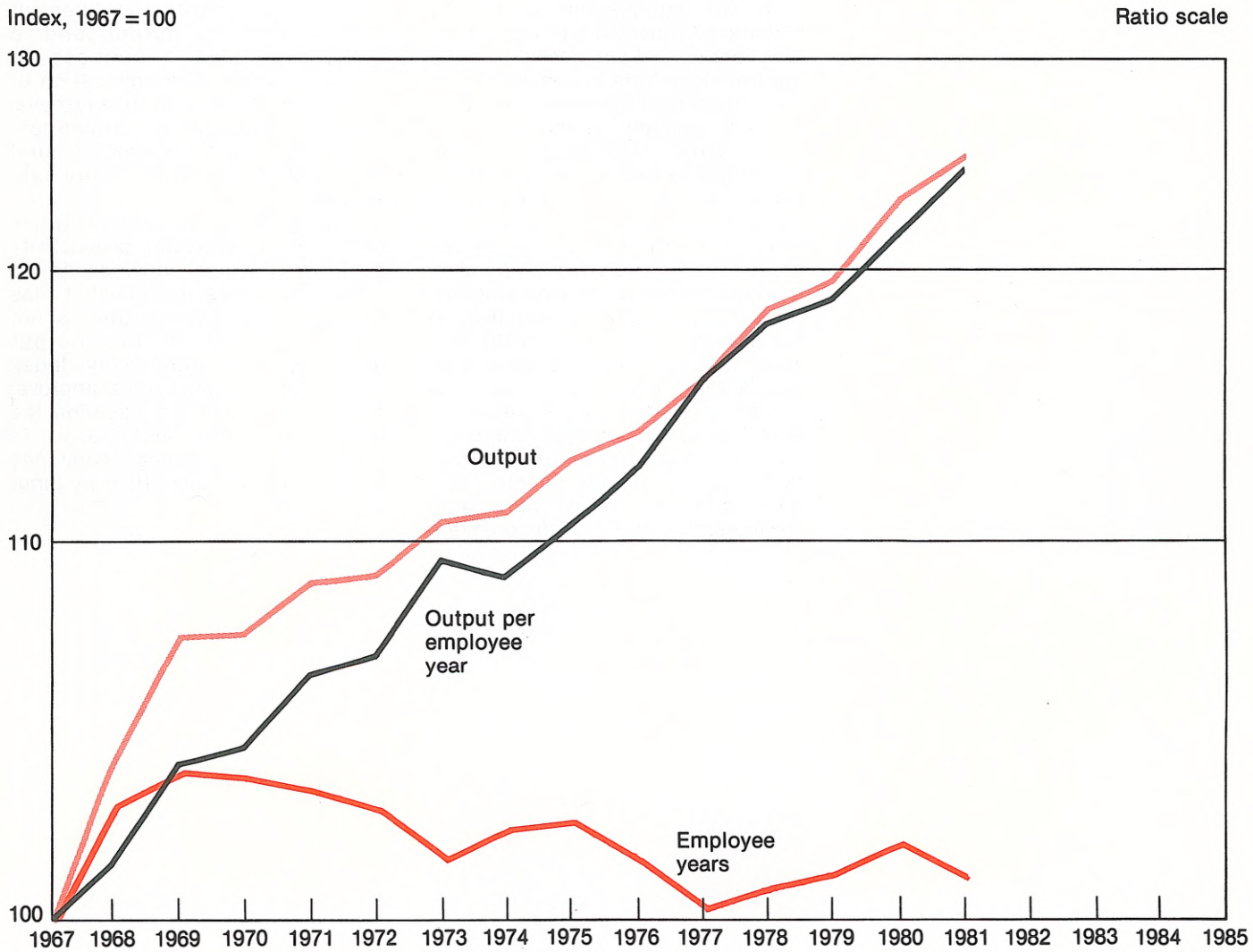


Source: Bureau of Labor Statistics

Many Federal Government functions have shown significant productivity advances

In recent years, BLS has developed and refined productivity measures for a substantial portion of the Federal Government, which employs 20 percent of all government workers. Currently, these measures cover about 66 percent of Federal civilian employment. Productivity increased in the measured sample at a rate of 1.5 percent a year between 1967 and 1981, reflecting a 1.4-percent average annual increase in output and a -0.1-percent average annual decline in employment.

Chart 6.
Output per employee year, output, and employee years in the Federal Government, measured sample, fiscal years 1967-81



Source: Bureau of Labor Statistics

Improved technology underlies much of the rising productivity in functions of the Federal Government

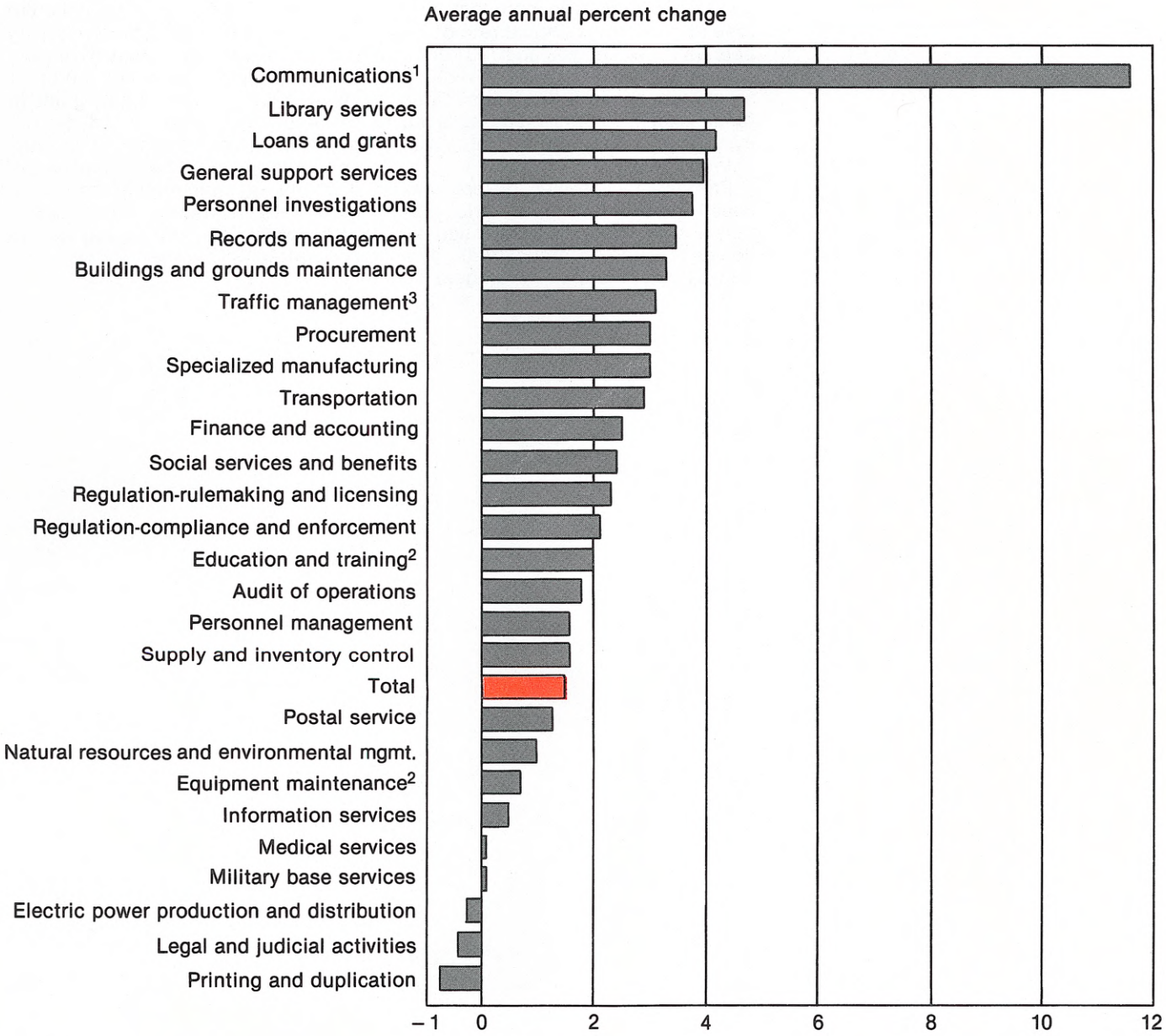
Federal Government organizations have been grouped into 28 functional classifications. Some functions are fairly homogeneous, such as finance and accounting; others, such as information services, represent aggregations of diverse activities. Productivity trends for the functions varied substantially, ranging from long-term increases of 11.6 percent per year for communications to -0.8 percent in printing and duplication. Nineteen of the categories exceeded the rate for the overall sample while nine fell below.

The largest gains in productivity were due to technological improvements in equipment and the introduction of computerized systems. Thus, the increase in productivity in the communications function between 1973 and 1981 was associated with a sharp growth in output (11.0 percent annually) and a declining work force (-0.6 percent annually). Through equipment upgrading, technological improvements, and the increased use of automated facilities, the Federal Telecommunications System, for example, was able to service an expanding volume of calls at lower cost.

Noteworthy productivity advances also occurred in library services. The 5.2-percent annual growth in productivity was linked with an 8.1-percent annual rise in output and a 2.8-percent annual increase in employee years. The application of automated systems to data retrieval systems, cataloging, circulation, distribution, and inventory control contributed to productivity advances.

Among the functional areas which experienced long-term productivity declines were legal activities. As the scope of cases adjudicated has become more complex (this is not fully reflected in the output measure), the productivity index understates possible actual improvement. In printing and duplication, the long-term productivity drop is traceable to declining workloads which were not fully offset by input adjustments.

Chart 7.
Output per employee year by functional grouping,
Federal Government and total measured sample, fiscal years 1967-81



[1]Fiscal years 1973-81.
[2]Fiscal years 1968-81.
[3]Fiscal years 1972-81.

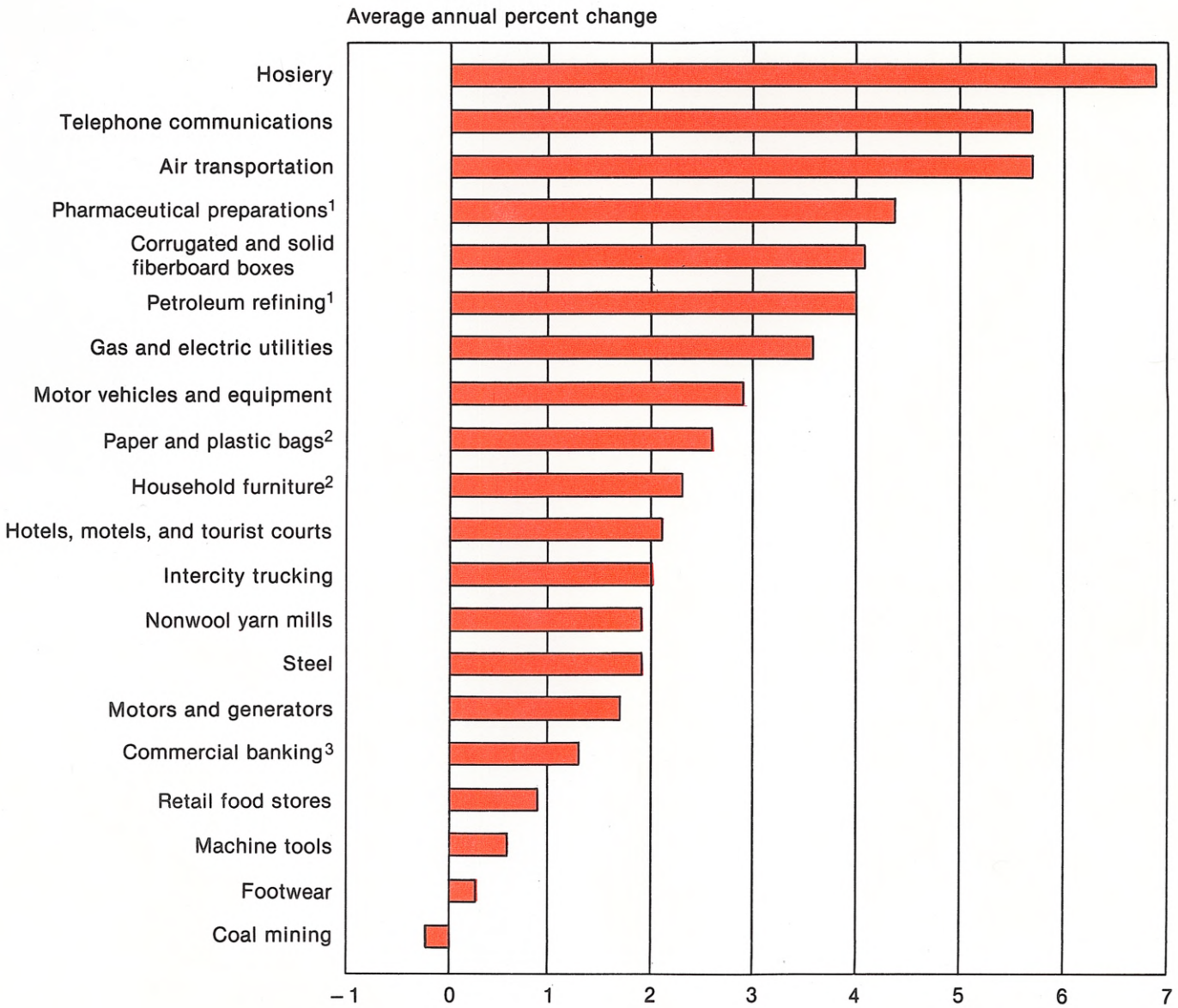
Source: Bureau of Labor Statistics

Productivity in individual industries has changed at widely varying rates

Productivity trends in individual industries are widely dispersed around the average for the economic sector, such as manufacturing or transportation, to which they belong. For example, productivity in manufacturing rose at an average annual rate of 2.7 percent between 1960 and 1981 but a number of the industries for which BLS develops measures showed rates far in excess of the manufacturing average and many showed rates well below.

Productivity growth differs between industries for a variety of reasons. Some industries, such as hosiery, which (together with synthetic fibers and malt beverages) led for the period with an average annual increase of close to 7 percent, installed highly advanced production machinery and enjoyed rapidly growing demand for their output. Air transportation's showing is linked to the introduction of jetliners during the sixties, accompanied by strong expansion in air travel. At the other end, the lack of productivity gains in footwear has been linked to difficulties in adopting mass production methods, and the decline in productivity in coal mining has been partly related to the need to comply with new safety and health regulations after 1969.

Chart 8.
Output per employee hour in selected industries, 1960-81



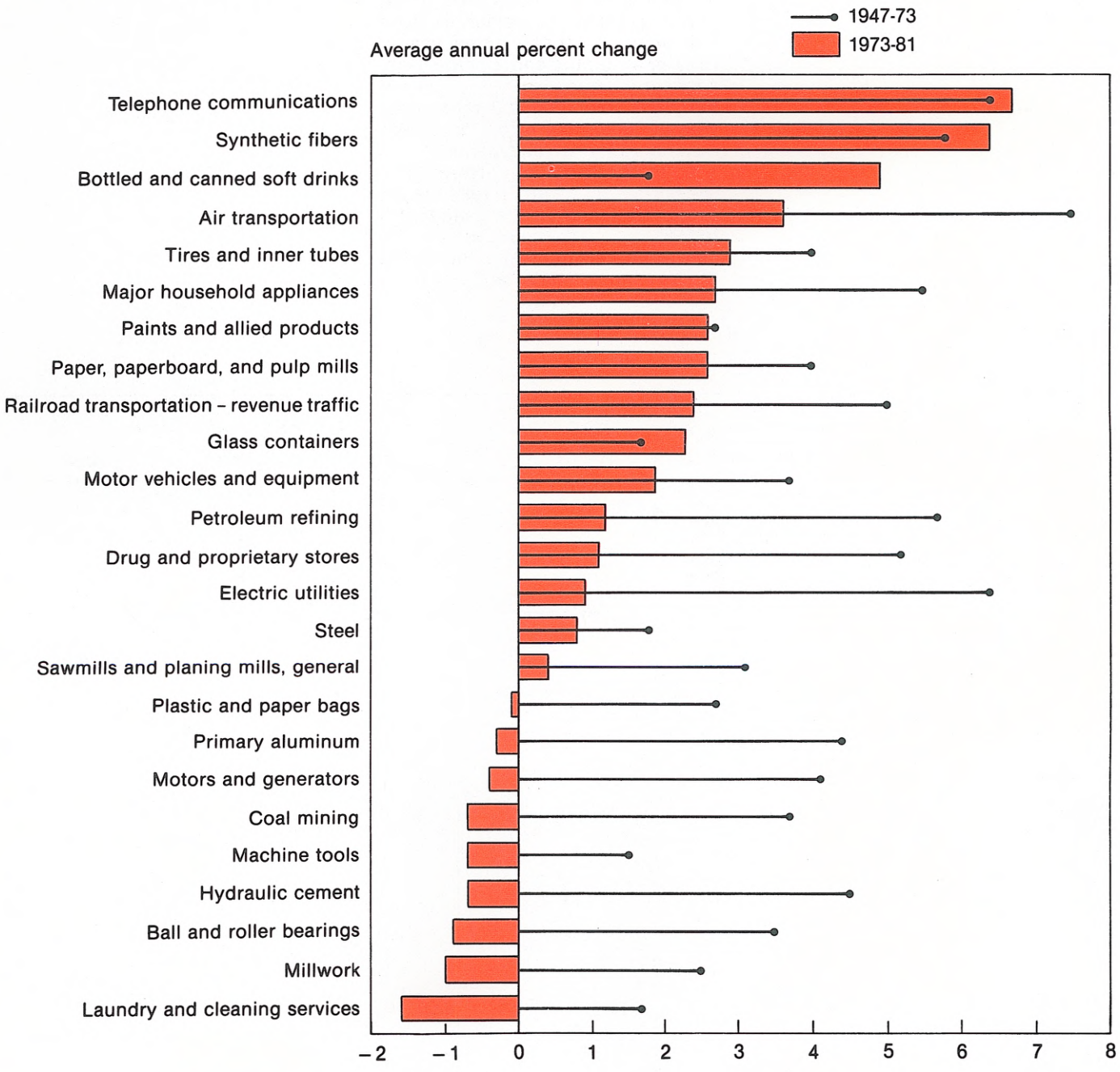
[1] 1963-80.
[2] 1960-80.
[3] 1967-80.

Source: Bureau of Labor Statistics

Industry productivity growth has slowed since the early 1970's

The slowdown in productivity growth in recent years has been pervasive among industries. Four-fifths of the 116 industries for which adequate measures were available up to 1981 experienced lower productivity growth from 1973 forward than they had previously.

Chart 9.
Productivity rates before and after 1973, selected industries



Source: Bureau of Labor Statistics

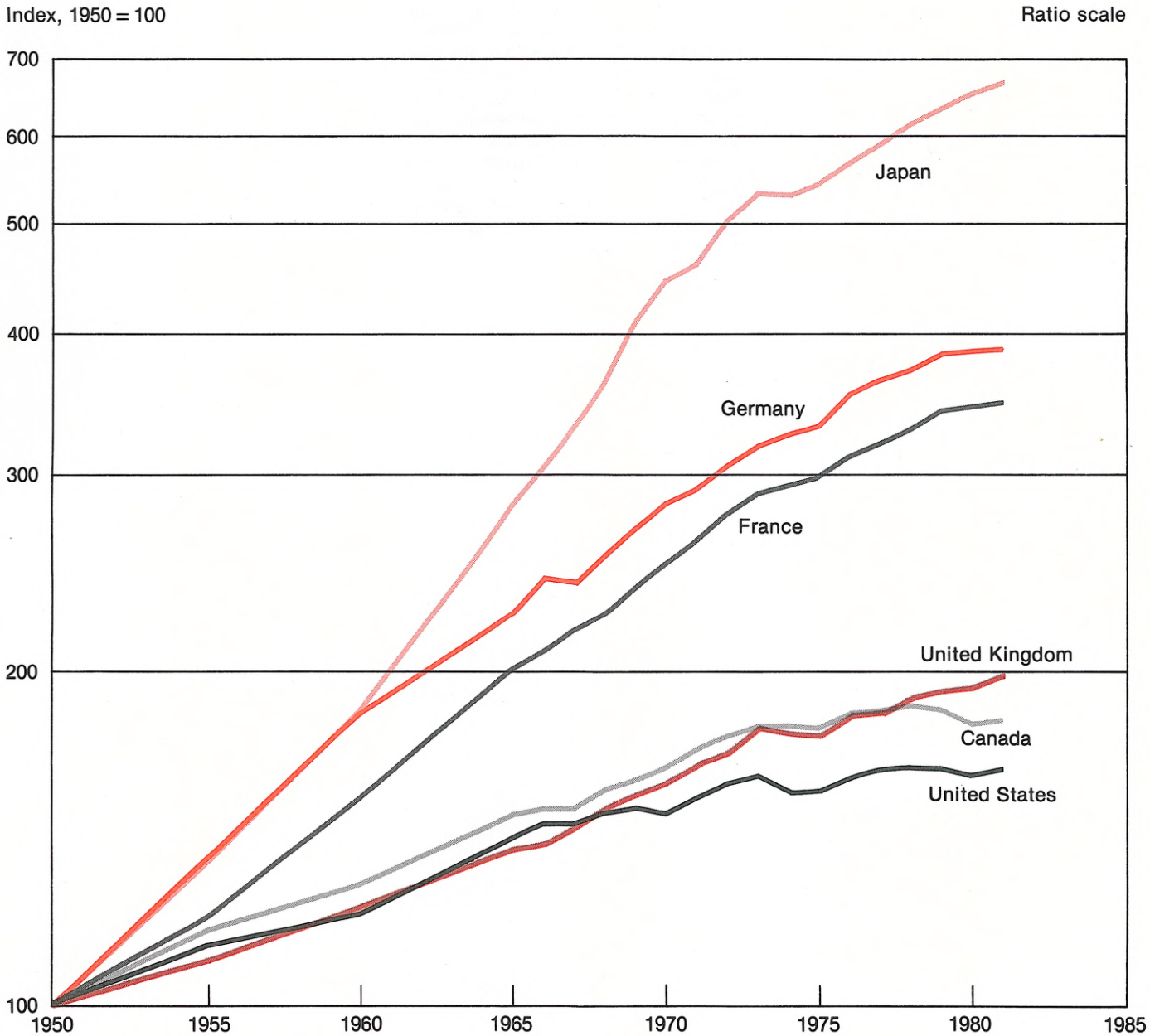
U.S. productivity growth has trailed that of other major industrial countries

Between 1950 and 1981, real gross domestic product (GDP) per employed person increased at substantially different rates among the six major industrial countries compared here. It grew about 1½ percent per year in the United States and 2 percent per year in Canada and the United Kingdom, compared to 6 percent per year in Japan and 4 to 4½ percent per year in France and Germany.

Each country experienced a slower rate of growth in real GDP per employed person in the period 1973 to 1981 than in previous periods. The slowdown was greatest in the United States and Canada and least in France and Germany.

Country	Real gross domestic product per employed person (average annual percent change)		
	1950–81	1965–73	1973–81
United States	1.6	1.6	0.2
Canada	1.9	2.4	.1
France	4.1	4.6	2.4
Germany	4.5	4.3	2.5
Japan	6.3	8.2	2.9
United Kingdom	2.2	3.2	1.3

Chart 10.
Trends in real gross domestic product per employed person, selected countries and years, 1950-81



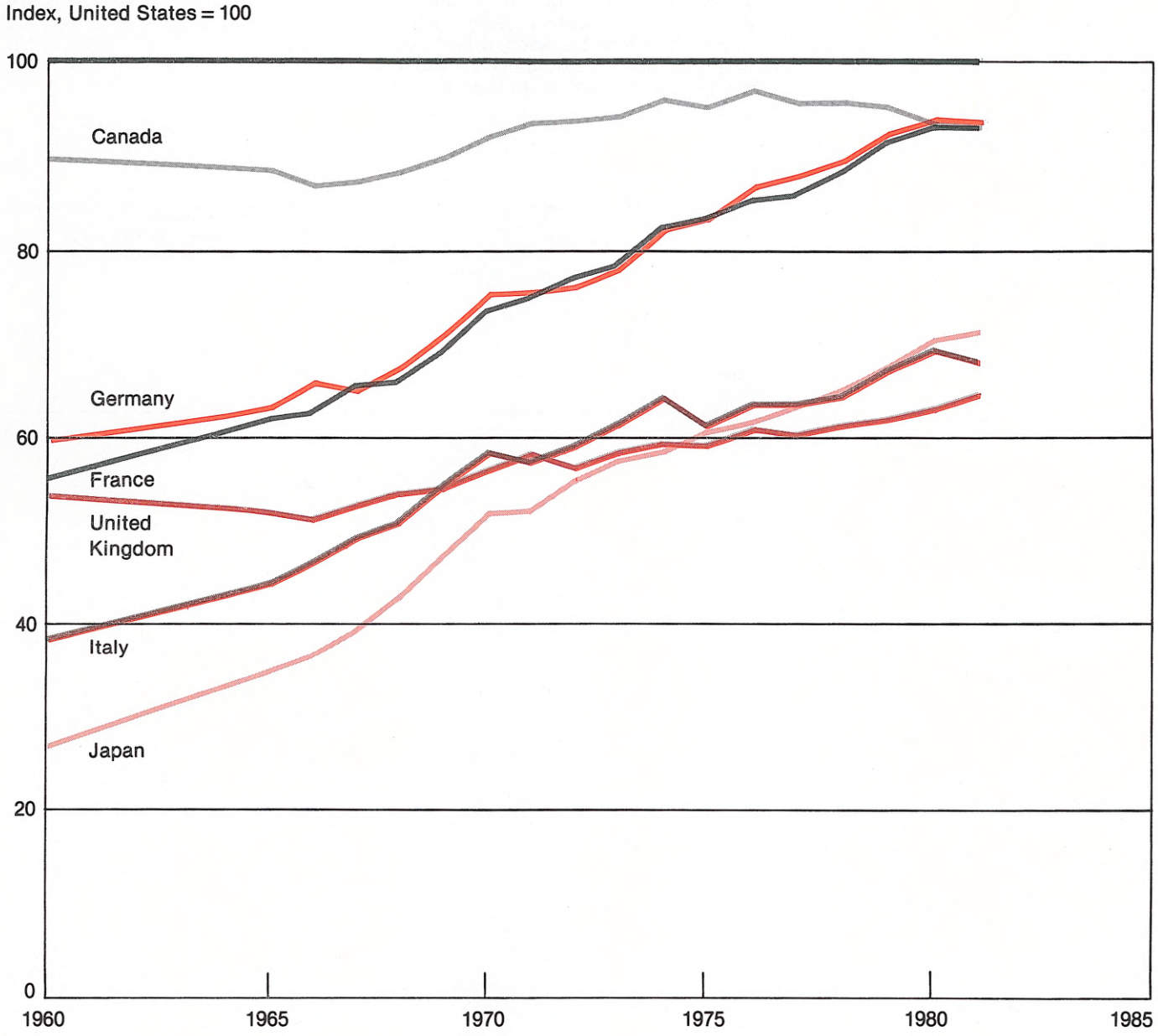
Source: Bureau of Labor Statistics

The U.S. level of output per hour, unlike its trend, is still ahead of that of other major industrial countries

Higher rates of change in real domestic product per employed person may not signify higher levels from one country to another. The United States still has the highest level of real gross domestic product per employed person, even though the gap between the United States and the countries compared here has narrowed significantly since 1960. Japan gained the most over the period, yet its estimated level in 1981 was still comparatively low.

After Germany, Canada comes closest to the United States, but its real product per employed civilian still remains 6 percent below that of the United States.

Chart 11.
Relative levels in real gross domestic product
per employed person, selected countries and years, 1960-81



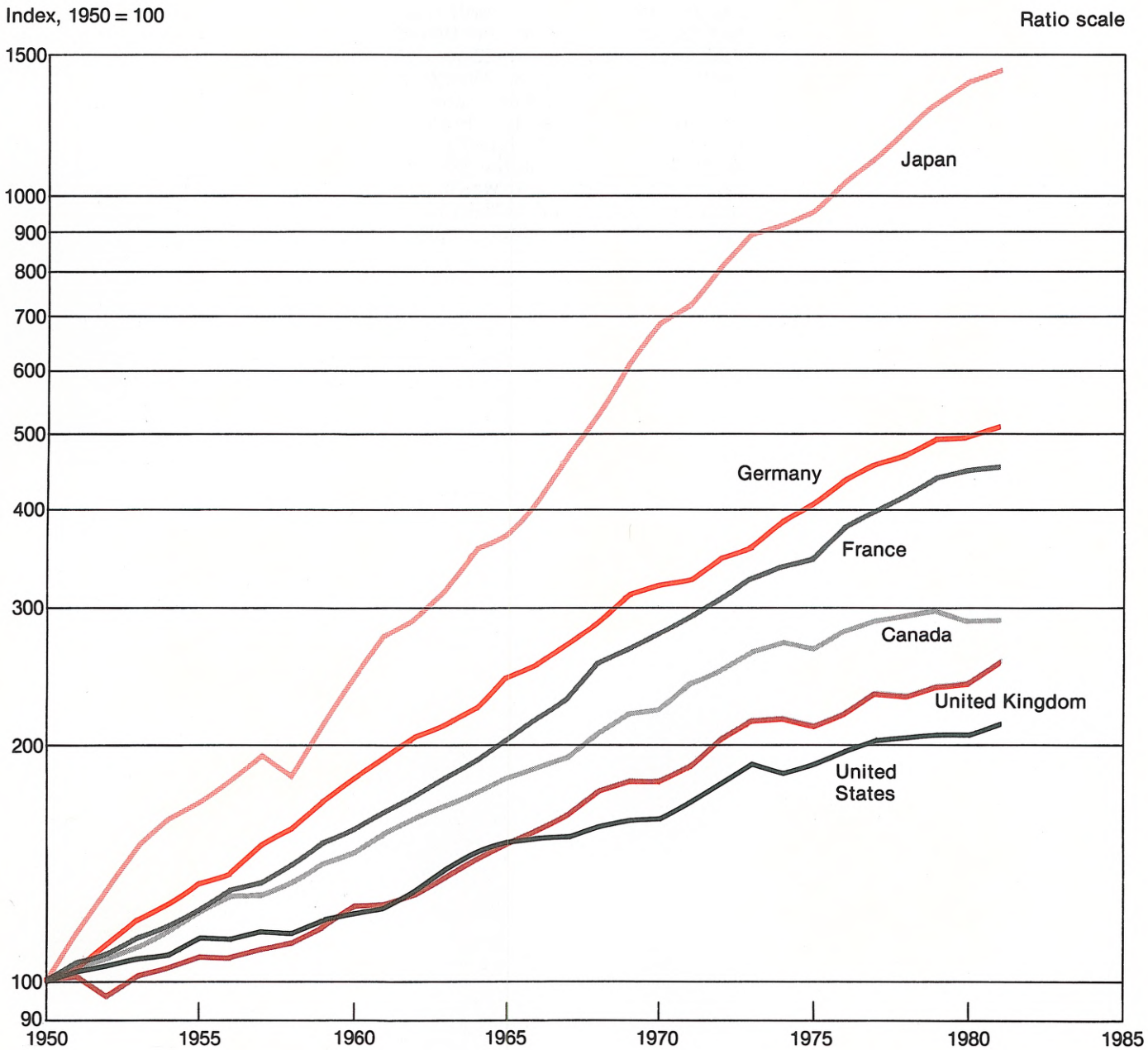
Source: Bureau of Labor Statistics

In all major industrial countries compared, the productivity advance in manufacturing outpaced the United States

Between 1950 and 1981, output per hour in manufacturing rose in all the major industrial countries shown here. But it grew at the slowest rate in the United States (2.6 percent a year), and at the most rapid rate in Japan (9.2 percent a year). It is noteworthy that the second highest rate, 5.3 percent annually for Germany, was less than three-fifths of Japan's.

Country	Manufacturing output per hour, 1950–81 (average annual percent change)
United States	2.6
Canada	3.9
France	5.3
Germany	5.6
Japan	9.2
United Kingdom	3.4

Chart 12.
Output per employee hour in manufacturing,
selected countries, 1950-81

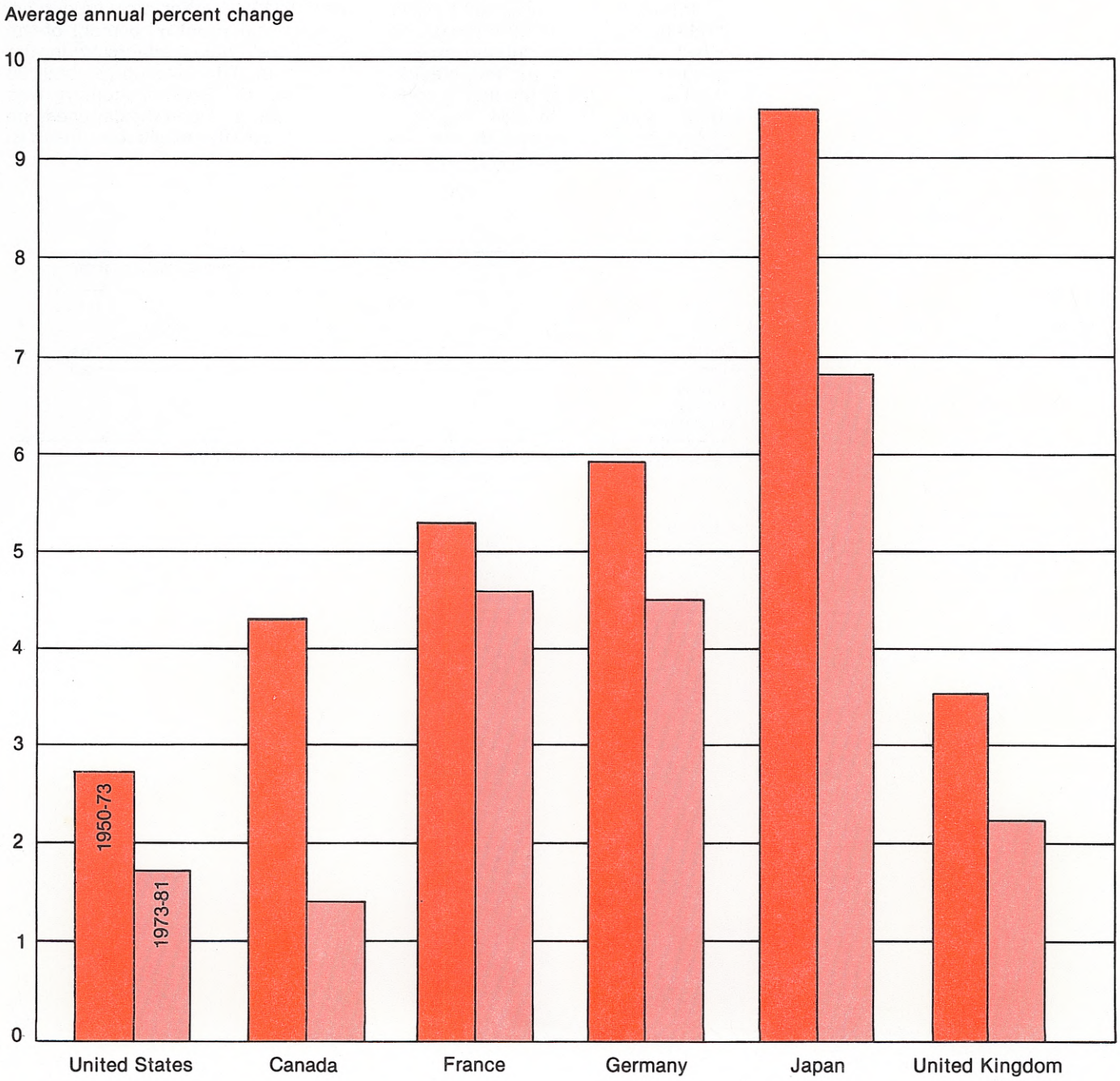


Source: Bureau of Labor Statistics

In all major industrial countries compared, the productivity advance slowed in the 1970's

The slowdown in the rate of growth in output per hour in manufacturing was pervasive in the 1970's, but affected the industrial countries compared here unevenly. Between 1950–73 and 1973–81, the average annual rate of growth dropped by 37 percent in the United States, compared with a 28-percent decline for Japan, a 24-percent decline for Germany, and a 13-percent decline for France. Despite a slowdown, Japan's productivity growth rate in the 1973–81 period, 6.8 percent a year, was higher than the 1950–73 and 1973–81 rates for any of the other countries shown.

Chart 13.
Output per employee hour in manufacturing, selected countries, 1950-73 and 1973-81



Source: Bureau of Labor Statistics

International comparisons of productivity levels in the iron and steel industry

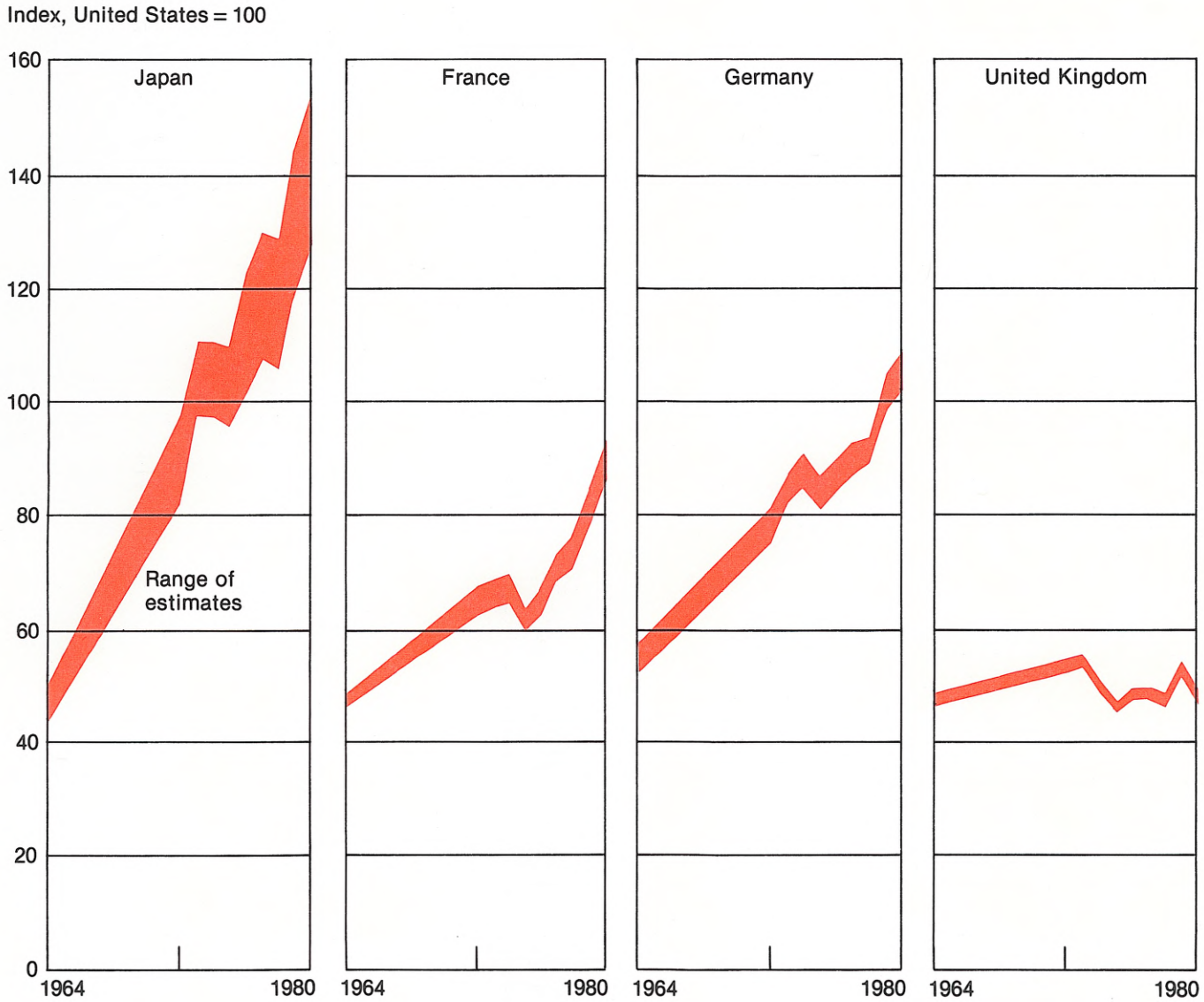
International comparisons of manufacturing productivity by BLS are limited to trends over time. Comparisons of absolute levels of productivity have not been calculated because of the difficulties of developing adequate and comprehensive intercountry measures. However, BLS has calculated levels of productivity in the iron and steel industry in the major producing countries beginning with 1964.

In 1964, productivity in the U.S. iron and steel industry greatly exceeded the levels reached in other major steel-producing countries. Output per hour in Germany was about 55 percent of the U.S. level; in Japan, France, and the United Kingdom, it was about 45–50 percent. In 1980, British steel productivity was still about 50 percent of the U.S. level, but productivity in the French industry was up to about 90 percent, the German industry was about equal to, and the Japanese industry greatly exceeded the U.S. level.

Country	Output per hour (average annual rate of change)[1]		
	1964–80	1964–73	1973–80
United States	1.1	2.2	–0.3
Japan	8.2	11.8	3.8
France	5.1	5.9	4.1
Germany	5.3	7.1	2.9
United Kingdom	1.1	3.7	–2.2

[1] Based on midpoints of minimum and maximum estimates.

Chart 14.
Levels of output per hour in the iron and steel industry, selected countries and years, 1964-80



Source: Bureau of Labor Statistics

Part II.

Changes in productivity: Relationship to costs, prices, and real income, and underlying factors

In this part, productivity change is examined in relation to changes in costs, prices, real income, and employment. Also, trends in multifactor productivity and some factors underlying productivity change are portrayed.

The first several charts demonstrate the role of output per hour as a critical link between the cost of labor and the price of goods and services. Labor costs, which include rates of pay, overtime, and fringe benefits, represent the largest single cost element for most industries. Hence, the trend in labor costs per unit of output plays a major role in determining price. If the effects of an increase in unit labor costs can be reduced by increased productivity, pressure to increase prices will lessen. Of course, increases in the cost of materials or fuels per unit may offset this effect.

Increases in unit labor costs can result from, as well as cause, price increases. If employee purchasing power drops because of higher prices, pressure will develop for higher wages. Should wage increases exceed productivity growth, unit labor costs will rise.

The next set of charts indicates that, adjusted for changes in consumer prices, labor compensation has risen at about the same rate as output per hour in the business sector over the post-World War II period. It also shows that productivity increases can be taken in the form of increased income or increased leisure. They have, in fact, largely been taken in the form of higher income.

The next set of charts examines the relationship between productivity and employment. The effects of productivity on employment depend upon the circumstances in which the productivity change occurs. In expanding industries, increasing productivity has been associated with rising employment; in contracting industries, productivity gains have been associated with declining employment.

The last set of charts bears on some of the forces underlying productivity change. The impact of these forces on productivity cannot always be directly measured. The charts show changes in capital formation per employed person, and in research and development expenditures—both key factors affecting productivity change over time.

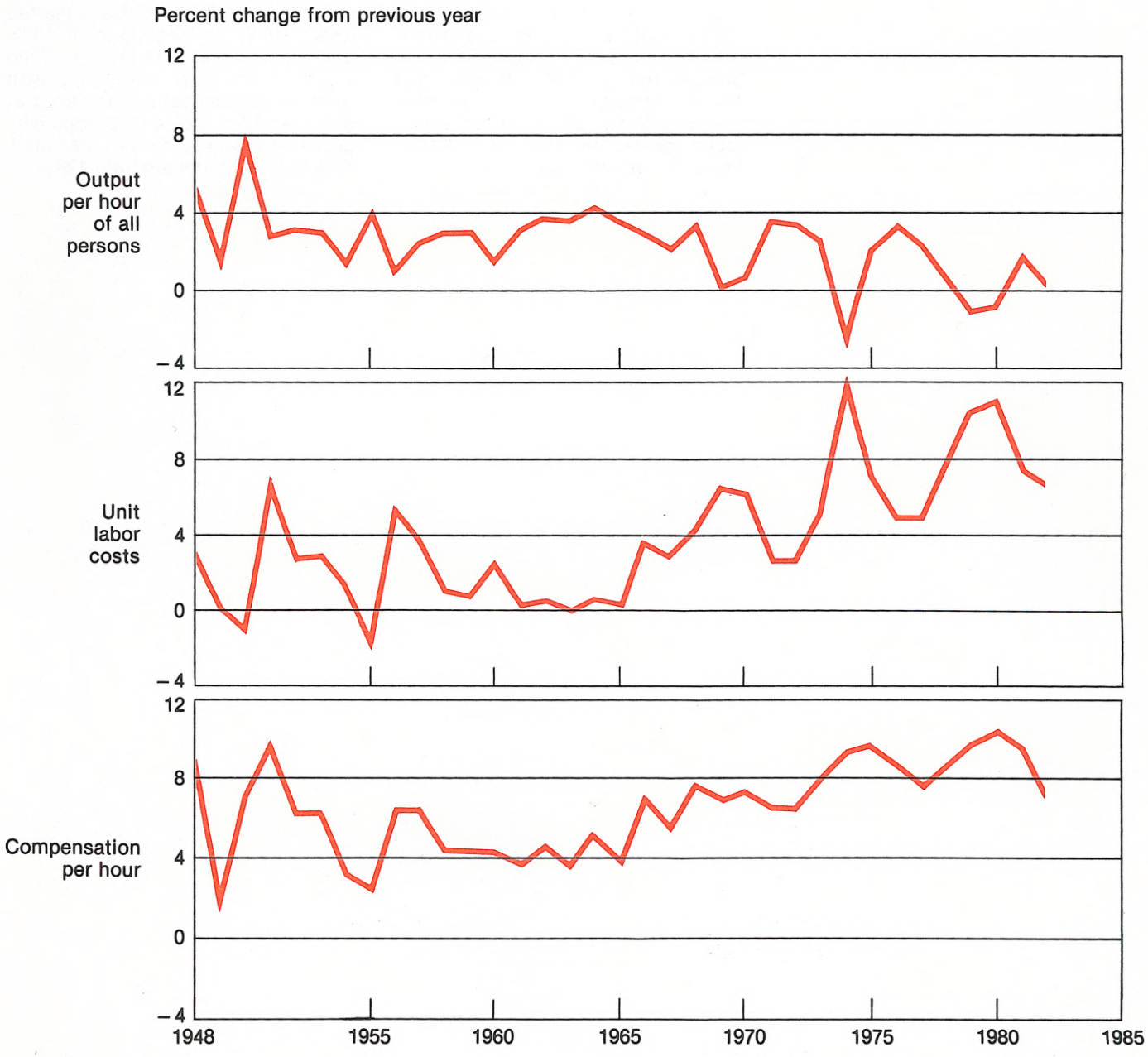
The behavior of unit labor costs is inversely related to changes in productivity

Productivity is an important determinant of cost movements. This is demonstrated by the two top panels of the chart, which are almost mirror images of each other, showing that unit labor costs tend to rise when productivity growth slows, and to slow or decline when productivity growth accelerates.

Hourly compensation rose more after the mid-1960's than before. In addition, the rate of productivity improvement was slower. Hence, unit labor costs rose much more rapidly after the mid-1960's. Between 1973 and 1981, the rate of productivity improvement was particularly slow, while hourly compensation accelerated. Therefore, unit labor costs rose more steeply during this period than in the previous two periods shown in the table.

Period	Average annual percent change		
	Output per hour	Unit labor costs	Compensation per hour
1947–81	2.6	3.4	6.1
1947–65	3.0	2.0	5.1
1965–73	2.2	4.6	6.9
1973–81	1.0	8.0	9.0

Chart 15.
Output per hour of all persons, unit labor costs, and compensation per hour in the business economy, 1948-82



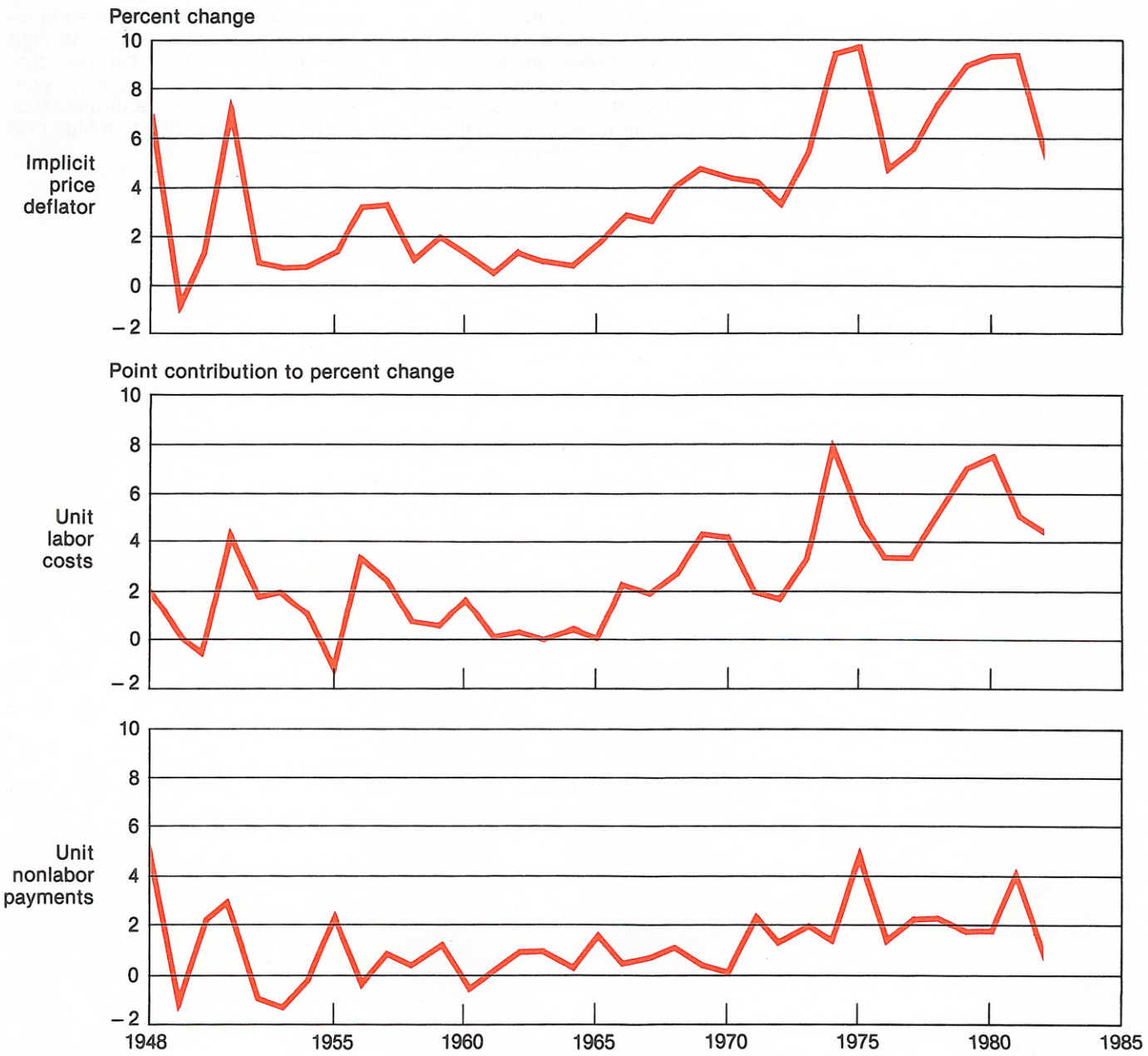
Source: Bureau of Labor Statistics

Changes in unit labor costs are closely associated with changes in prices

Changes in unit labor costs generally are by far the most important component of price changes, as the chart shows. Thus, if productivity growth mitigates increases in unit labor costs, this will in turn mitigate increases in prices.

During periods such as the early 1960's, unit labor costs rose little—mainly because productivity increases kept pace with the growth of hourly compensation. Prices also reflected the small increases in unit labor costs. In the late 1960's, however, hourly compensation increased at a faster rate while productivity growth slowed, with the result that unit labor costs increased, and so did prices. This situation moderated somewhat in the early 1970's, as the normal recovery pattern of increased productivity and reduced unit labor costs asserted itself. However, beginning in 1973, unit labor costs started to climb again, pushing prices along with them as compensation increased at near record rates, and productivity growth slowed and even declined. This pattern persisted until 1981.

Chart 16.
Composition of price changes, business economy, 1948-82



Source: Bureau of Labor Statistics

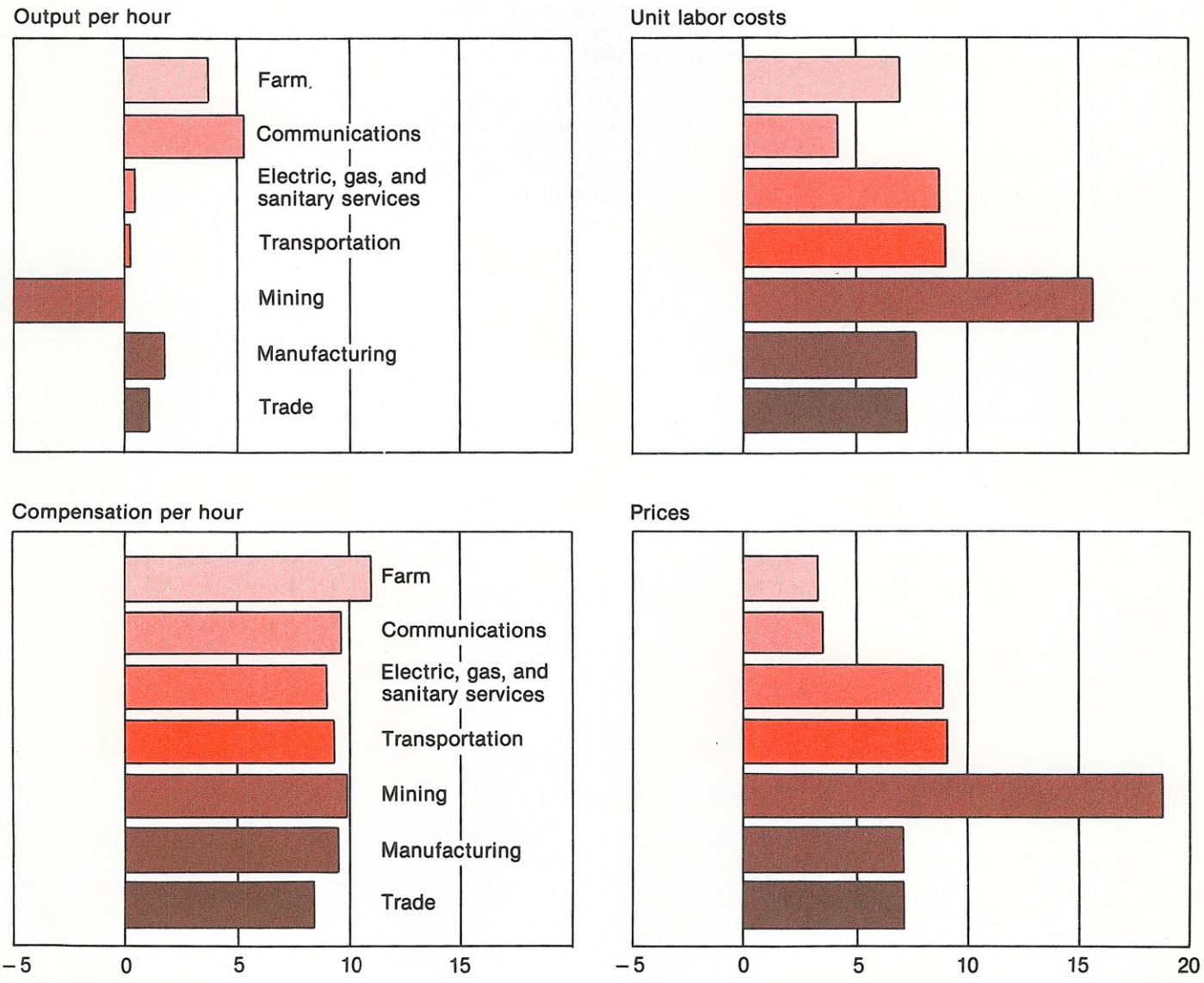
The more rapid the advance in productivity, the slower the increase in unit labor costs and prices

The rate of productivity growth in a sector is generally reflected in the trends of costs and prices of the sector's output. Unit labor costs and prices usually rise most in sectors where productivity is growing slowly, and least in sectors where productivity is growing rapidly.

Between 1973 and 1981, productivity in the communications sector increased at an average annual rate of 5.3 percent. Although compensation per hour rose more in this than in any other nonfarm sector shown—9.7 percent a year—this high rate was in large part offset by the strong productivity advance, yielding relatively low unit labor cost changes. Price increases, therefore, remained comparatively low. The opposite pattern held for the mining sector, where a declining rate of productivity provided no offset to high compensation rates. On the contrary, declining productivity contributed to a steep rate of unit labor costs, and hence also to a high rate of price increase.

Chart 17.
Output per hour of all persons, compensation per hour, unit labor costs, and prices in major sectors, 1973-81

Average annual percent change

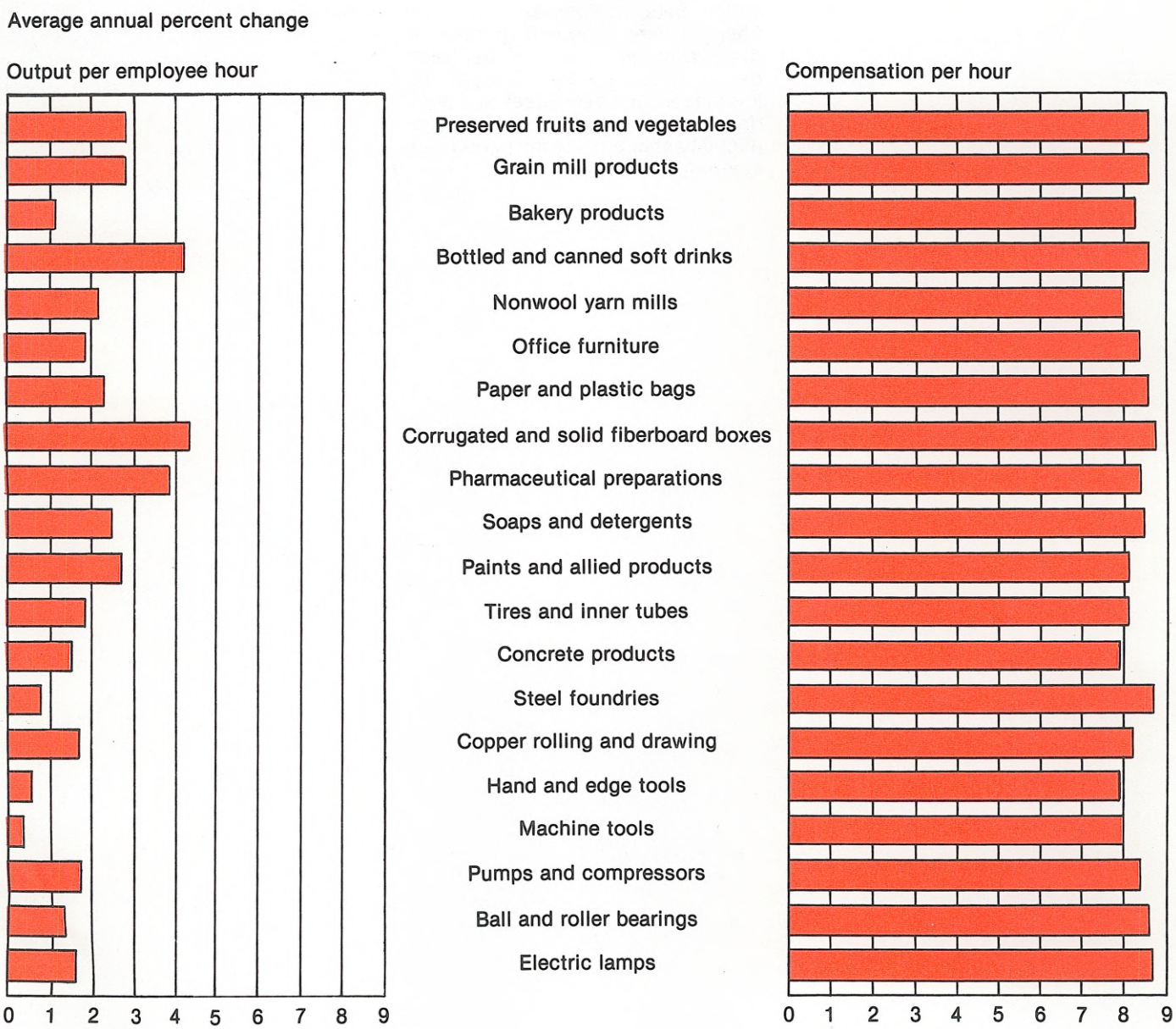


Source: Bureau of Labor Statistics

Changes in hourly compensation and changes in productivity are not closely related

In contrast to prices, the factors influencing changes in compensation in individual industries appear to be independent of the factors influencing changes in productivity. This is shown by the high degree of uniformity in the bars in the chart indicating compensation per hour, as compared with the bars indicating output per employee hour. Hourly compensation increased about as much between 1967 and 1980 in industries with a relatively low rate of productivity growth, such as machine tools and bakery products, as in industries with a high rate of productivity growth, such as soft drinks and pharmaceuticals.

Chart 18.
Output per employee hour and compensation per employee hour, selected industries, 1967-80



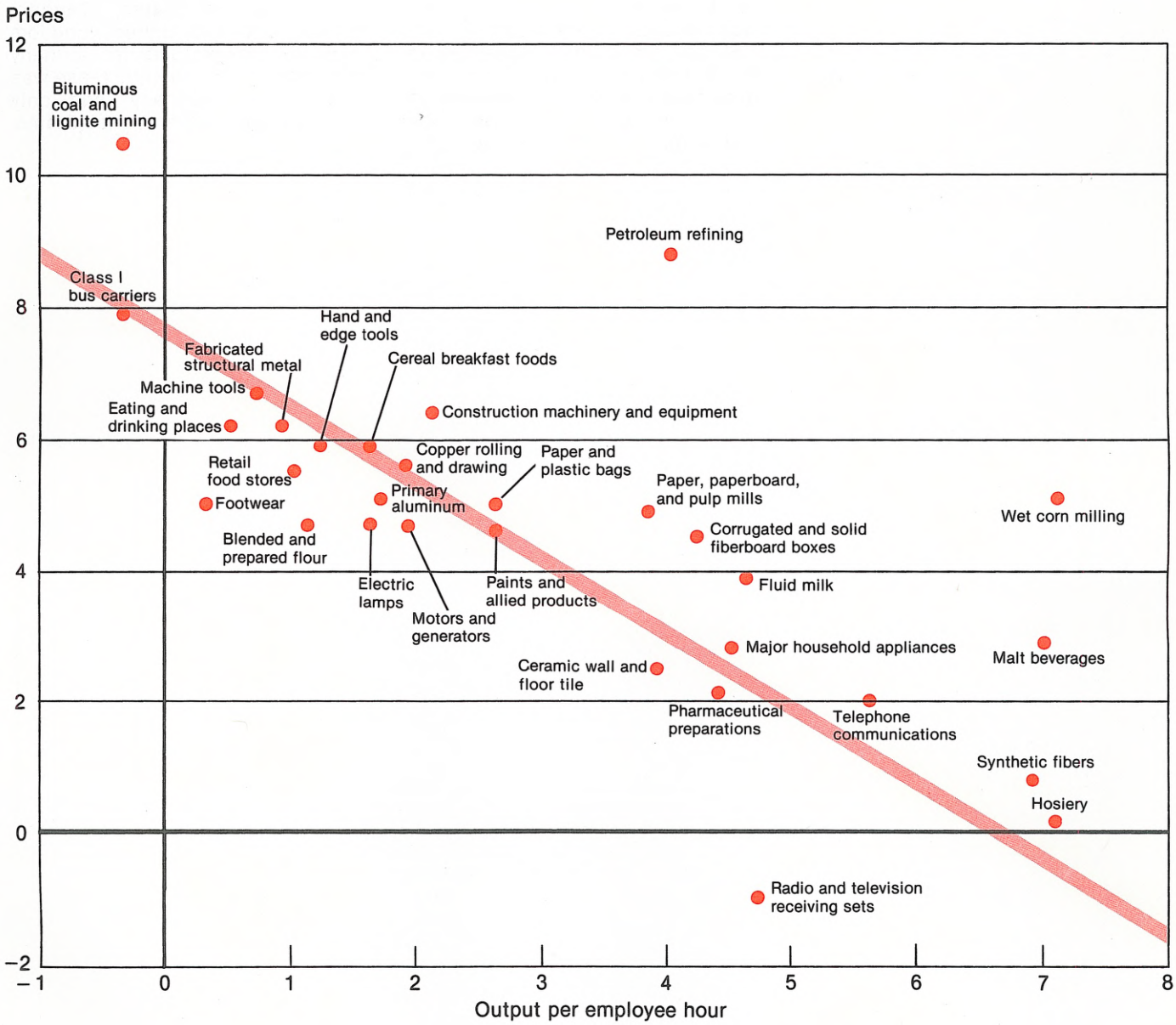
Source: Bureau of Labor Statistics

Prices generally rise more rapidly when productivity increases slowly

A generally inverse relation prevails between price change and productivity change at the industry level. Between 1960 and 1980, prices tended to decline or to increase slowly in such industries as radio and TV sets, hosiery, and synthetic fibers, where productivity rose at above-average rates. In contrast, prices rose strongly in such industries as footwear, steel, and laundry and cleaning services, where productivity change over the period was comparatively low.

Chart 19.
Output per employee hour and prices,
selected industries, 1960-80

Average annual percent change



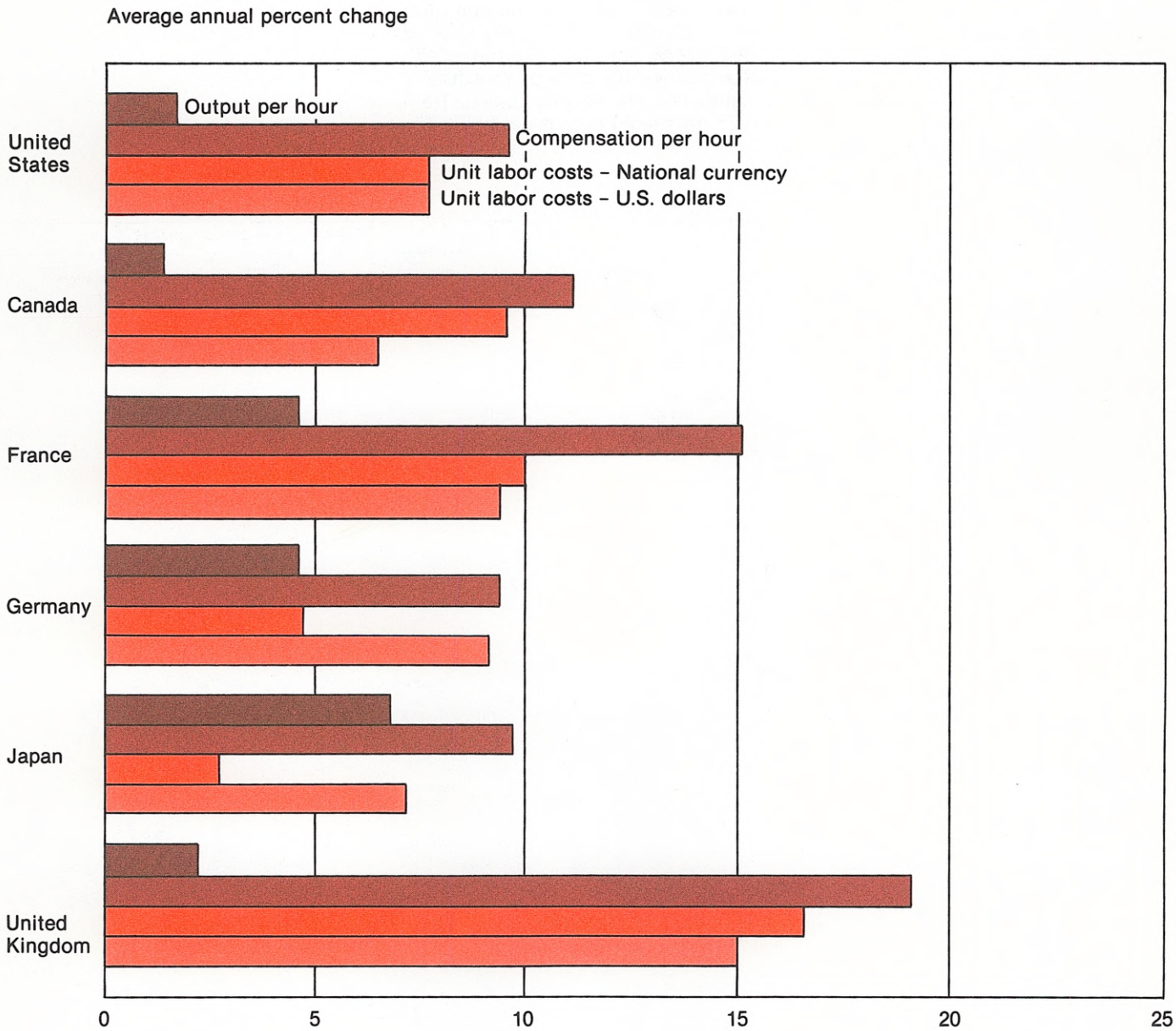
Source: Bureau of Labor Statistics

Unit labor costs in manufacturing have accelerated since 1973 in most industrial countries, as productivity advance slowed

In all countries shown, except Japan, unit labor costs rose sharply between 1973 and 1981. Currency revaluation accentuated unit labor cost increases for Germany and Japan; when expressed in U.S. dollars, these increases were higher than in the United States in all countries but Canada and Japan.

Slower productivity advances in the 1973–81 period than earlier, combined with pronounced increases in compensation per hour, underlay the acceleration in unit labor cost rates. All the countries shown experienced slowing productivity improvements after 1973 in manufacturing, but Japan and the United Kingdom were the most severely affected. Compensation per hour during the 1973–81 span rose at higher rates than earlier in the United States, Canada, France, and the United Kingdom —but at slower rates in Germany and Japan. The rate of increase was smallest for Germany, and only slightly higher for the United States.

Chart 20.
Output per employee hour, compensation per hour, and unit labor costs in manufacturing, selected countries, 1973-81



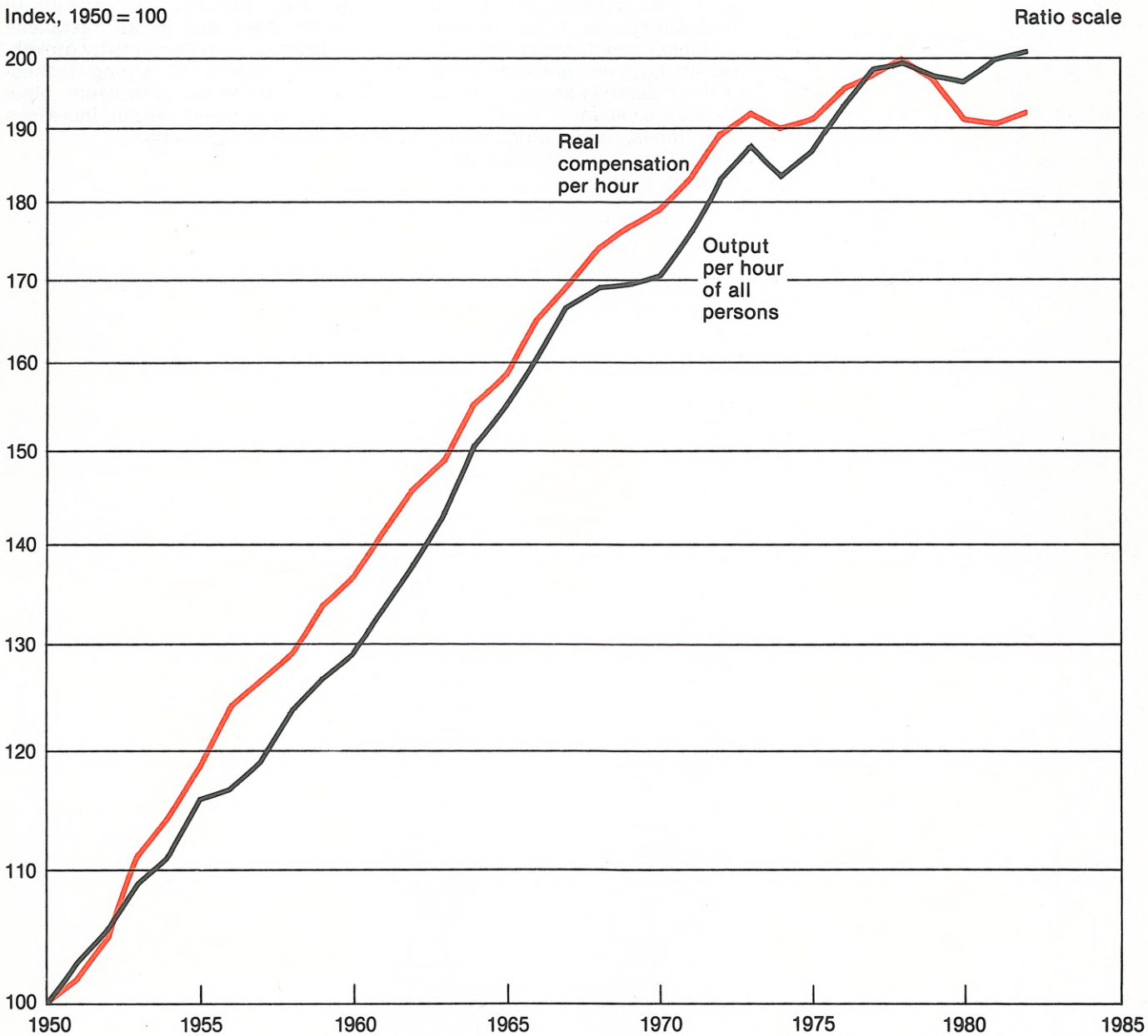
Source: Bureau of Labor Statistics

Real hourly compensation has advanced in line with productivity

Labor has shared in the gains from productivity over the long run. Hourly compensation adjusted for changes in purchasing power—real hourly compensation—has risen at about the same rate as output per hour. In 1981, real hourly compensation stood almost twice as high as in 1947. However, as the table and chart show, the rate of real hourly compensation slowed down from 1965 on, as did output per hour.

Period	Average annual percent change	
	Output per hour of all persons	Real compensation per hour
1947–81	2.6	2.5
1947–65	3.0	3.3
1965–81	1.6	1.2
1965–73	2.2	2.3
1973–81	1.0	.1

Chart 21.
Output per hour of all persons and real compensation per hour in the business economy, 1950-82



Source: Bureau of Labor Statistics

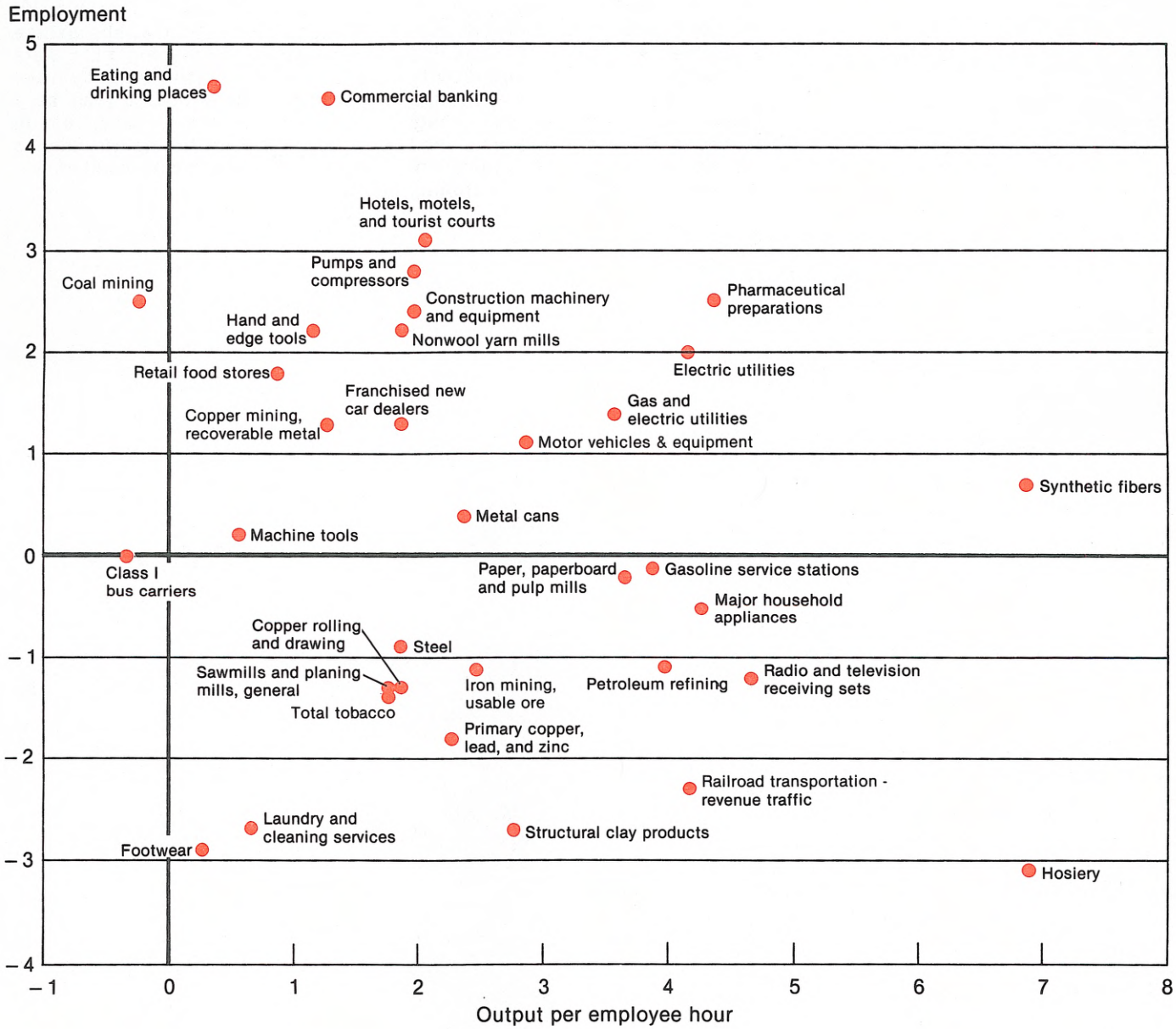
In many industries, employment increases with rising productivity

Increases in productivity are often believed to be associated with decreases in employment. The chart shows this is not necessarily so. In all industries for which BLS has calculated productivity measures, productivity has risen, except for coal mining and class I bus carriers. Yet employment grew in two-thirds of the industries shown here over a 21-year timespan.

At times, large productivity advances are accompanied by comparatively large employment increases, as for example, in air transportation. In a few industries, employment gains exceed productivity improvement, as in eating and drinking places. Reductions in employment are in all instances associated with productivity growth, either because of strong technological progress (petroleum pipelines) or modest output increases (railroad transportation).

Chart 22.
Output per employee hour and employment, selected industries, 1960-81

Average annual percent change



Source: Bureau of Labor Statistics

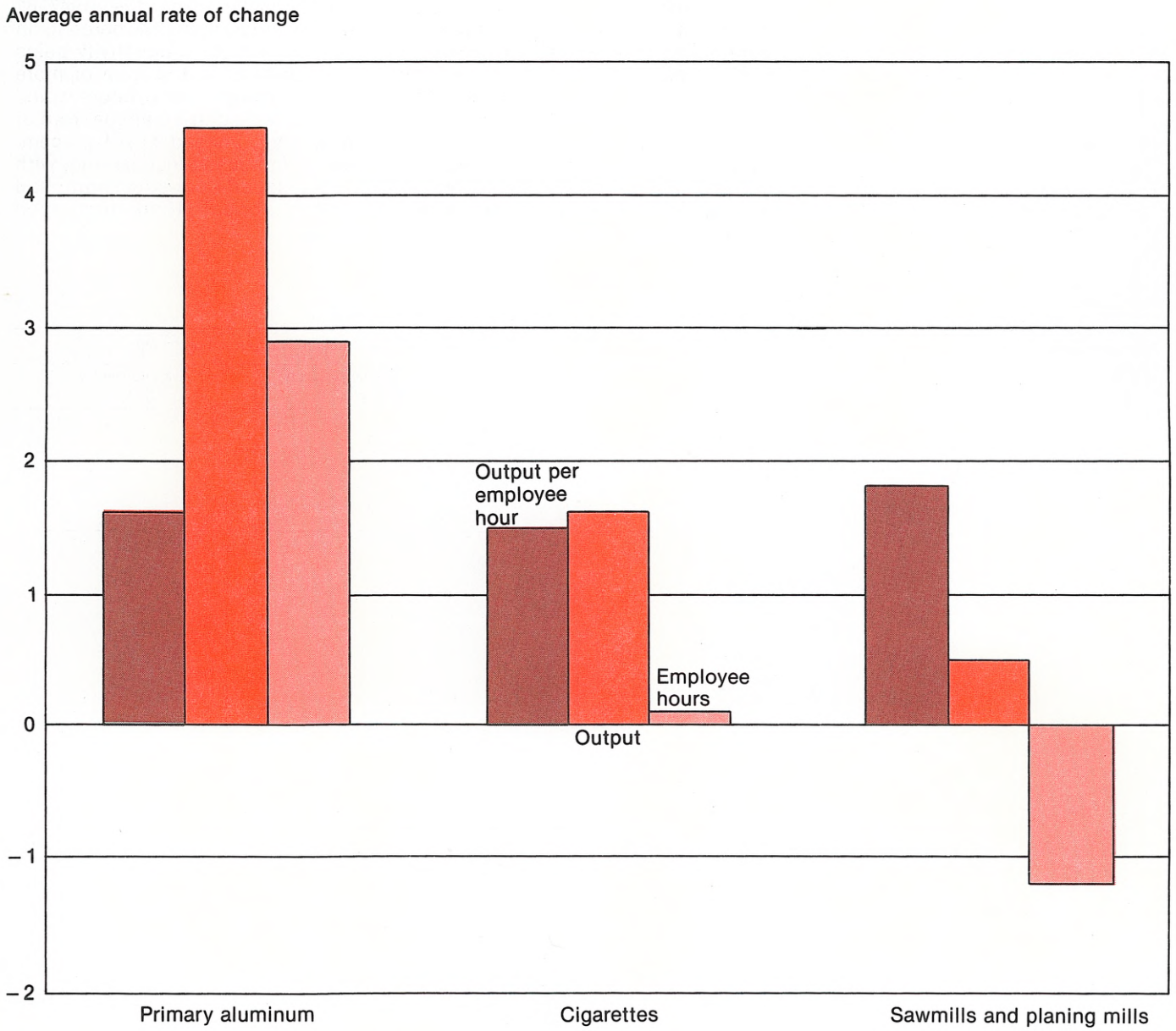
Similar rates of change in industry productivity often reflect differing rates of change in output and employment

The same or nearly the same trend in the labor productivity of different industries is frequently associated with differing trends in output and employee hours.

The chart shows three industries with similar productivity rates for the 1960–81 period. All three averaged annual rates of productivity advance of just below 2 percent. Despite this similarity in labor productivity growth, trends in employment varied widely—rising strongly in primary aluminum, declining in sawmills and planing mills, and remaining unchanged in cigarette manufacturing.

The relation between labor productivity growth and employment trends is basically determined by the climate in which output growth in a given industry occurs. Rapid output growth—as in primary aluminum—was accompanied by comparatively large increases in employment. Weak gains in output, as shown here by sawmills and planing mills, were associated with employment declines. Where output rose at a relatively moderate rate, as in cigarette manufacturing, virtually no change in employment resulted.

Chart 23.
Output and employment in selected industries with similar productivity growth, 1960-81



Source: Bureau of Labor Statistics

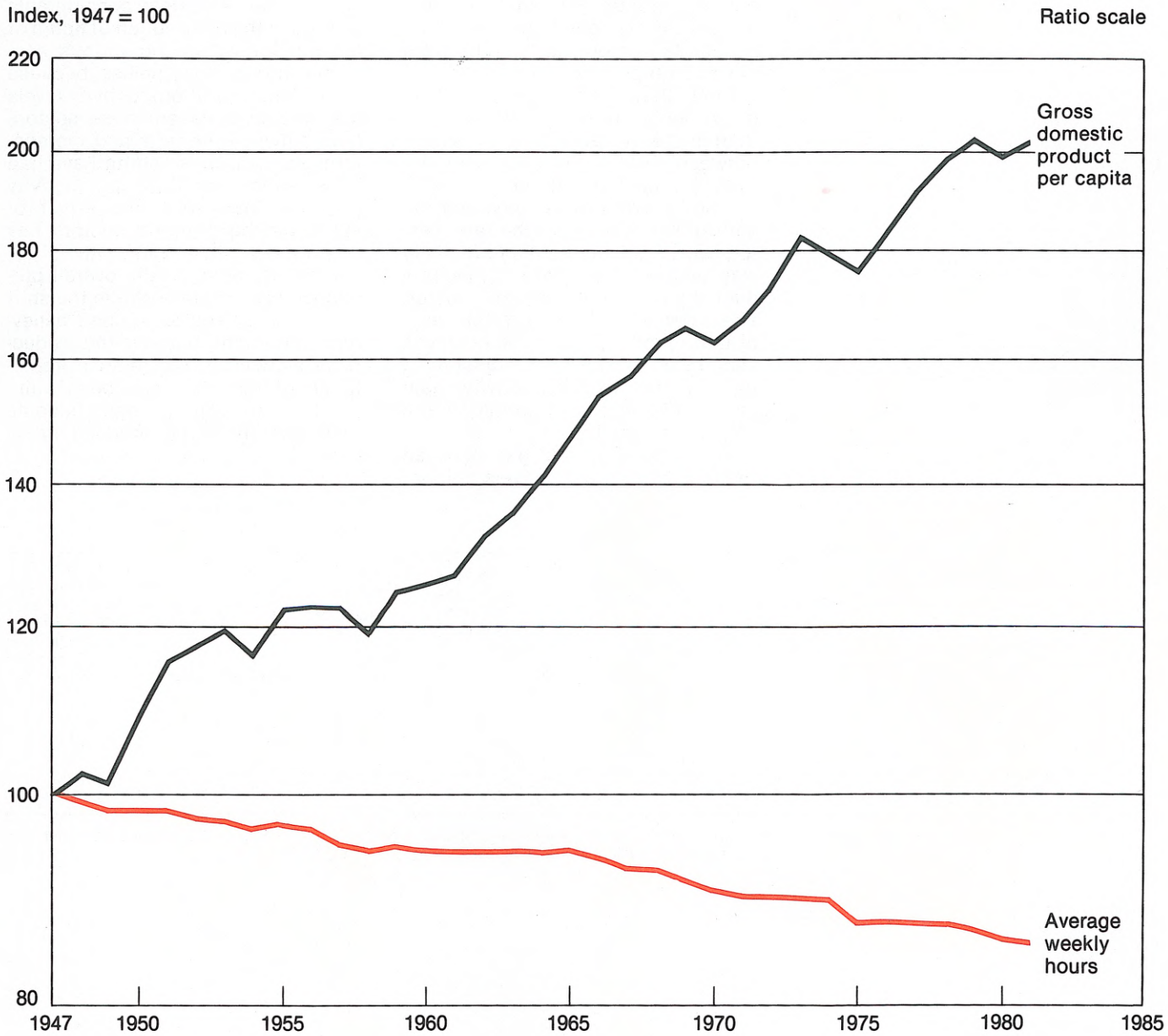
Productivity advance has resulted in higher incomes and consumption, rather than additional leisure

One of the benefits of productivity improvement is that it makes an increasing amount of goods and services available for consumption. This is shown by the steady increase in gross domestic product per person throughout the 1947–81 period. (Employment rose relative to population from the mid-1960's onward; since then, the growth in domestic product per capita has exceeded the growth in productivity.)

Some of the advance in productivity may be taken in the form of leisure (fewer hours worked). In addition to shorter weekly hours, earlier retirement or later entry into the labor force may be options which are preferred over goods and services. Had all the productivity gains of the past 34 years been allocated to increasing product per capita, its growth rate would have been 2.5 percent annually over the 1947–81 period, rather than 2.1 percent. In contrast, had the productivity gains all been taken in the form of more leisure, average weekly hours would have decreased at an annual rate of 2.6 percent, instead of 0.4 percent. Clearly, increased income and, with it, increased consumption had greater appeal than increased leisure.

Period	Average annual percent of change	
	Gross domestic product per capita	Average weekly hours
1947–81	2.1	–0.4
1947–65	1.8	–.4
1965–73	2.3	–.7
1973–81	1.8	–.5

Chart 24.
Gross domestic product per capita and average weekly hours per person engaged in production in the business economy, 1947-81



Source: Bureau of Economic Analysis and Bureau of the Census, U.S. Department of Commerce; Bureau of Labor Statistics

The effect on productivity of shifts in employment between sectors has been minor

Productivity movements in aggregates such as the business and the nonfarm business sectors reflect shifts in the relative importance of their component sectors, as well as changes within them. For example, productivity might increase in the business sector without increasing in any of its component sectors because of employment shifts from low to high productivity sectors.

Chart 2 showed that productivity grew faster in the total business than in the nonfarm business sector between 1947 and 1982. The difference reflected both the greater increase in farm productivity, *and* the shift of workers out of the farm sector, where the *level* of productivity was relatively low, into higher productivity jobs in the nonfarm sector. The chart opposite shows the trend of labor productivity in the business sector before and after adjusting it to exclude the productivity gain associated with the farm/nonfarm employment shift.

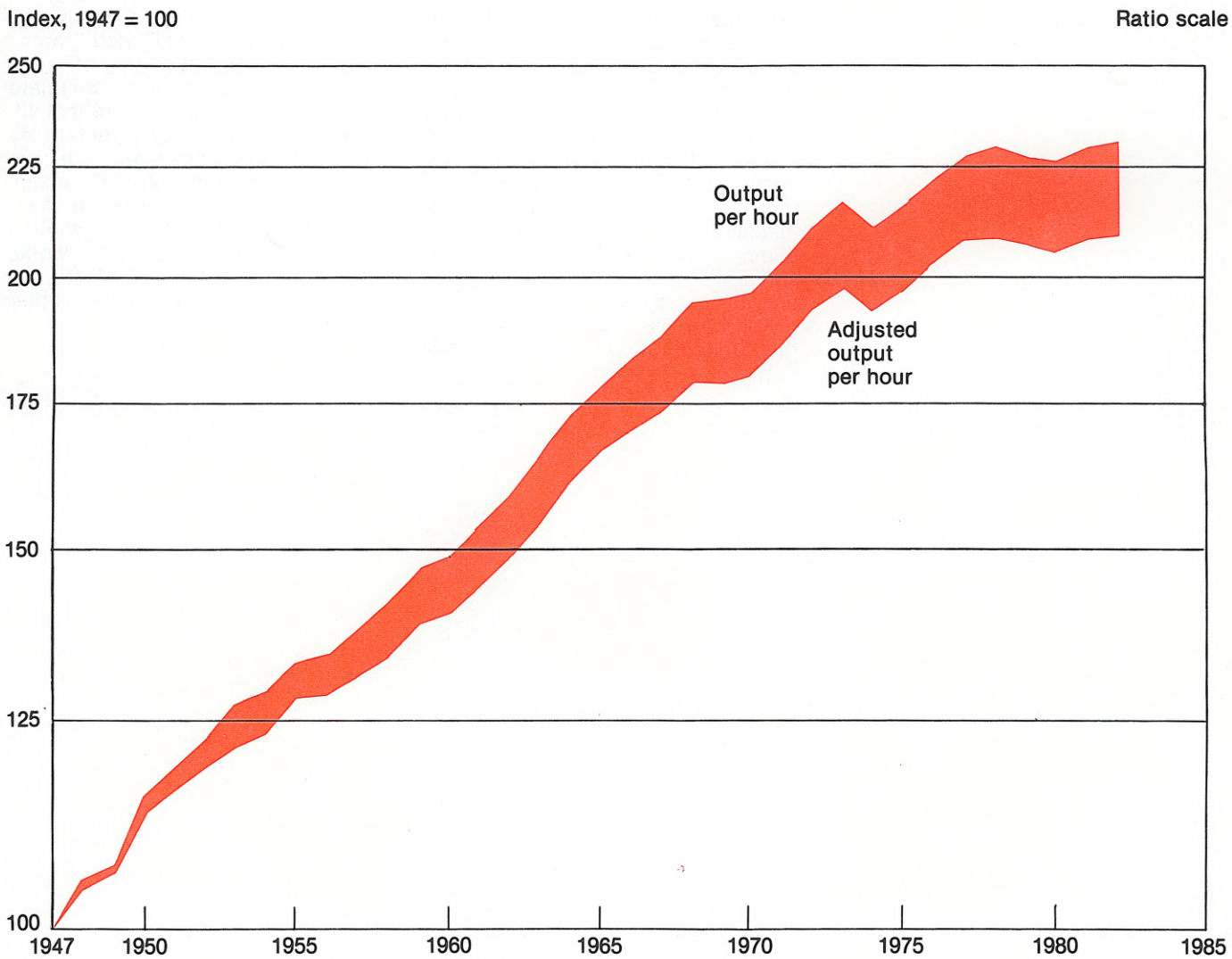
In recent years, the gap between the farm and nonfarm levels of labor productivity has narrowed, and the magnitude of the employment shift has lessened. Consequently, the fraction of productivity change in the business sector (which includes farming) attributable to this shift has declined.

There has also been considerable change in the distribution of hours of labor input within the various nonfarm sectors. Nevertheless, because the differences in productivity levels are smaller between these sectors than between the farm and the nonfarm sectors, these shifts have had little effect on total productivity growth. Since 1947, the effect of shifts among nonfarm sectors has contributed little more than 0.1 percentage point to the overall productivity growth rate. While the shift to the service sector is widely believed to have contributed to the productivity slowdown, the relative importance of the shift has been quite small, although it has become somewhat more pronounced in recent years.

Period	Output per hour in the business sector	Attributed to—		Shift effect as a percent of total productivity change
		Productivity effect	Shift effect	
	Average annual percent change[1]			
1947–81	2.4	2.2	0.2	12
1947–65	3.3	2.9	.4	12
1965–73	2.4	2.2	.2	8
1973–81	.7	.7	.1	11

[1] Average annual rates shown are arithmetic averages of annual percent changes and may differ from rates shown elsewhere in this chartbook.

Chart 25.
Output per hour of all persons in the business economy, adjusted for shifts in employment from the farm to the nonfarm business economy, 1947-82



Source: Bureau of Labor Statistics

U.S. capital formation per employed person has trailed Canada and Japan in recent years

International comparisons of the amount of real resources countries are devoting to increasing their capital stocks, and thereby to improving labor productivity, are difficult to make. The comparative measures of real capital investment depicted in this chart are based on benchmark estimates—for 1970 and 1973, from a United Nations study that covered Japan and the European countries, and for 1965, from a Canadian study. These estimates were extrapolated to the other years shown on the basis of relative trends in real capital investment as measured for each country. These comparative estimates should be considered as approximations; they are not precise measures.

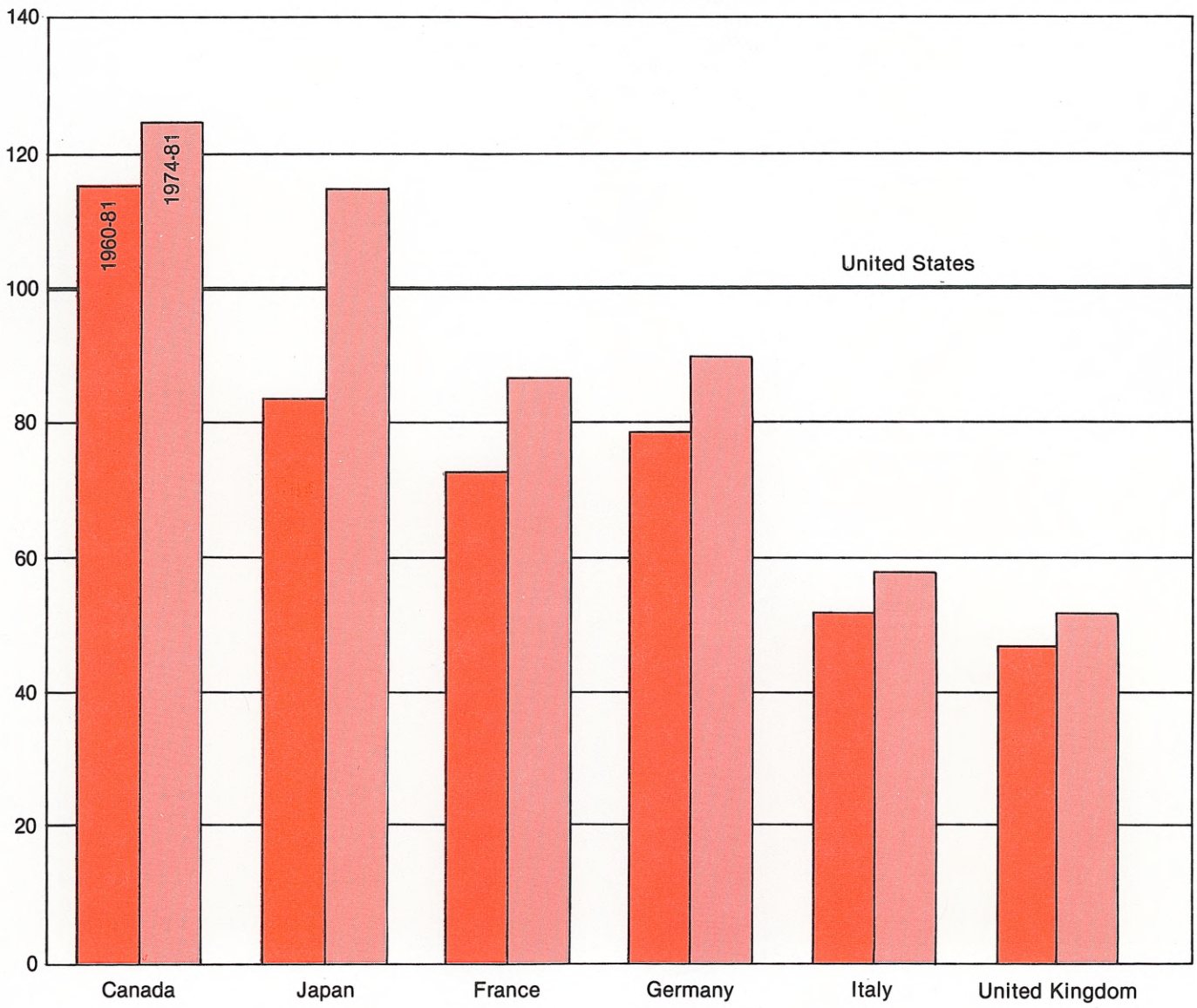
For the 1960–81 period as a whole, the United States had a higher average level of real capital formation (average annual gross additions to nonresidential capital stock) per employed person than any of the other countries shown, except Canada. During the period 1974–81, only Canada's and Japan's levels of capital formation per employed person ran ahead of the United States.

Since these estimates of comparative real capital formation relate to the total economy, they reflect differences in industrial structure as well as differences in industry-specific investment levels. For example, Canada has a much larger share of its investment in such capital-intensive activities as waterworks and the production of electricity, gas, and steam than do the other countries.

Chart 26.
Gross nonresidential capital formation per employed person, selected countries, 1960-81 and 1974-81

Averages for periods

Index, United States = 100

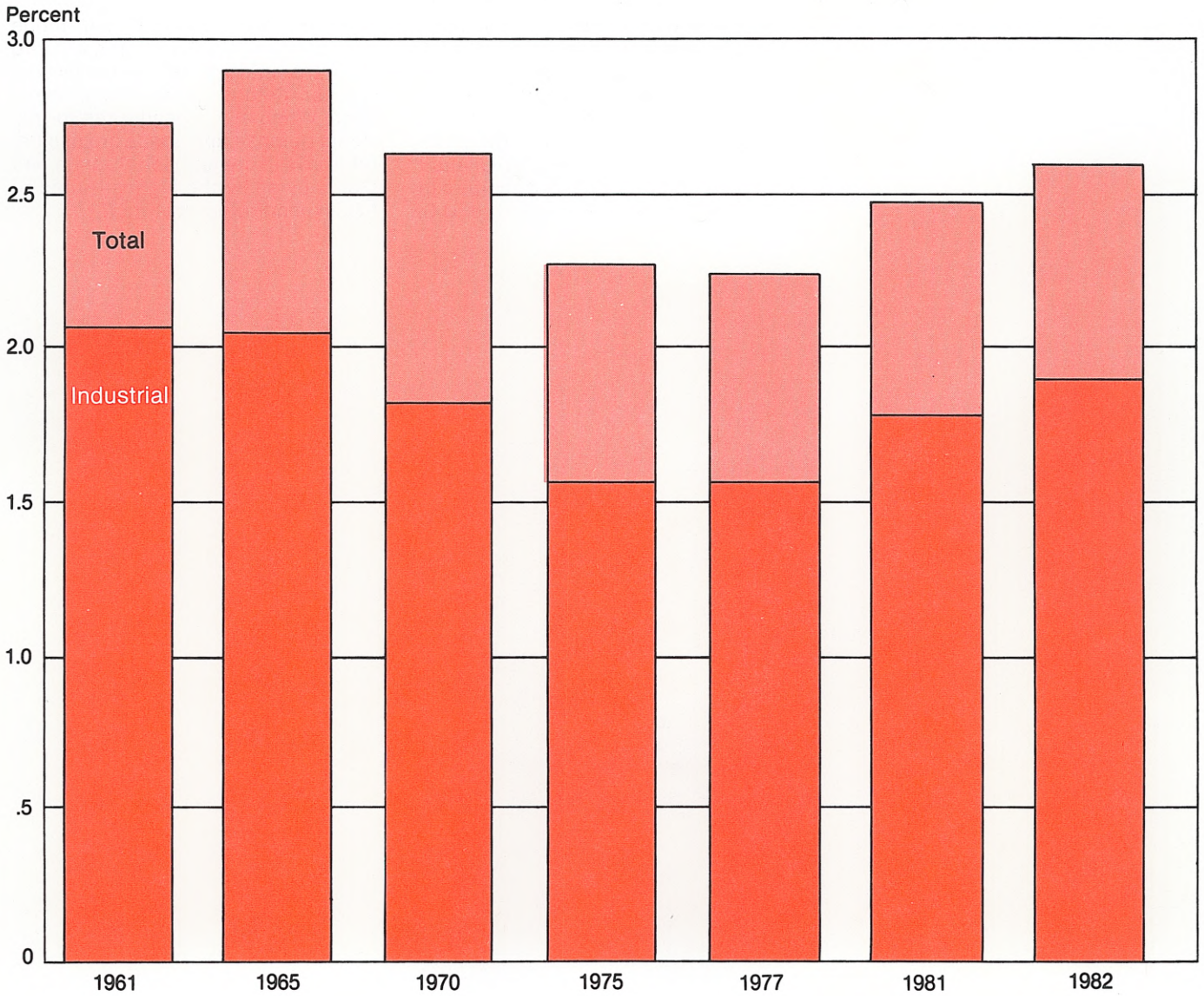


Source: Irving Kravis et al., *A System for International Comparisons of Real Product and Purchasing Power,* and Bureau of Labor Statistics

U.S. research and development expenditures declined somewhat in relation to the gross national product

Expenditures for research and development (R&D) can generate increases in productivity through the development and subsequent application of more efficient equipment and processes. One indicator of the relative importance of R&D is the proportion of gross national product devoted to it. This proportion reached a peak in the midsixties. It slowly declined in the early 1970's, but has increased again since 1977.

Chart 27.
Expenditures for research and development as a percent of gross national product, selected years, 1961-82



Source: National Science Foundation
and U.S. Department of Commerce, Bureau of Economic Analysis

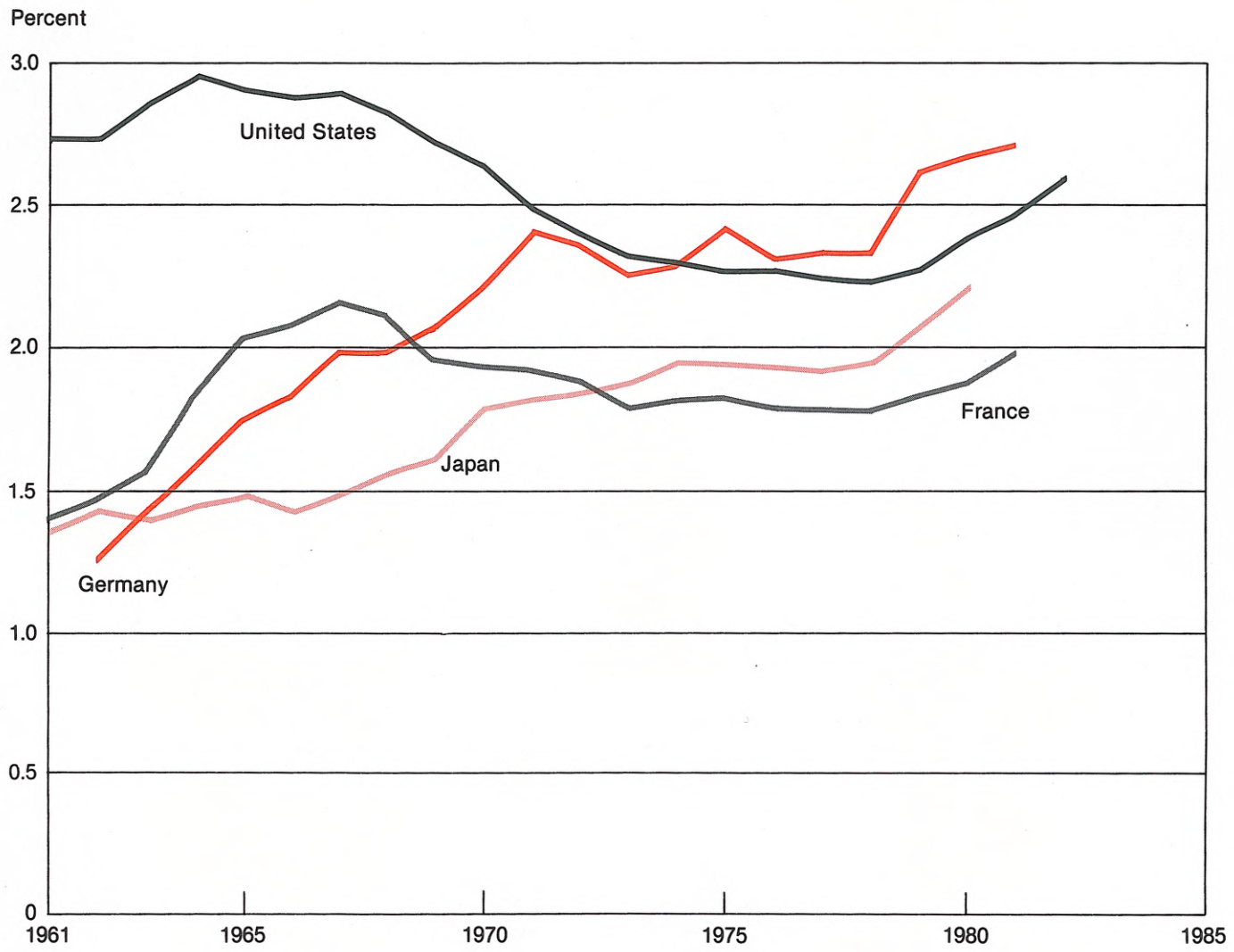
As a percent of gross national product, U.S. R&D expenditures generally have run ahead of other major industrial countries

Statistics on research and development activity are not as readily available for other countries as they are for the United States. Nevertheless, sufficient information exists to make some comparisons possible between the United States and its major trading partners.

R&D expenditures as a proportion of GNP were higher in the United States than in the four other industrial countries compared until 1975, when the rate of expenditure in Germany caught up with the U.S. rate. The latest available data indicate that the proportion of GNP devoted to R&D ranged from 2.7 percent in Germany to 1.9 percent in France.

More than half of U.S. R&D funds are provided by the Government and more than half of these expenditures are for defense and space objectives. When R&D expenditures for national defense and space are excluded from the comparisons, Japan and Germany show the highest ratios of R&D expenditures to output.

Chart 28.
Expenditures for research and development as a percent of gross national product, selected countries, 1961-82



Source: National Science Foundation

Appendix.

Supporting data for charts

Table 1. Output per hour of all persons in the business economy,[1] 1909–82

(Index, 1909 = 100)

Year	Output per hour	Year	Output per hour
1909	100.0	1946	196.4
1910	105.5	1947	195.3
1911	100.7	1948	205.8
1912	103.4	1949	208.8
1913	103.4		
1914	100.0	1950	225.3
		1951	231.5
1915	99.8	1952	239.0
1916	100.9	1953	246.7
1917	97.8	1954	250.6
1918	103.5		
1919	107.6	1955	260.6
		1956	263.3
1920	104.0	1957	269.9
1921	104.6	1958	278.2
1922	114.4	1959	287.1
1923	119.9		
1924	122.0	1960	291.3
		1961	300.9
1925	128.1	1962	312.4
1926	131.5	1963	324.1
1927	131.9	1964	338.0
1928	131.3		
1929	137.8	1965	349.9
		1966	360.8
1930	131.6	1967	368.9
1931	131.0	1968	381.2
1932	124.0	1969	382.0
1933	121.9		
1934	134.9	1970	385.1
		1971	398.8
1935	141.1	1972	412.9
1936	149.5	1973	423.4
1937	149.8	1974	413.3
1938	153.4		
1939	159.8	1975	422.4
		1976	436.3
1940	166.3	1977	446.9
1941	176.8	1978	449.5
1942	178.6	1979	445.2
1943	182.9		
1944	195.0	1980	441.9
		1981	449.8
1945	203.2	1982	451.5

[1] Total private economy until 1946.

Table 2. Output per hour of all persons in the total business and nonfarm business economies, 1947–82

(Index, 1947 = 100)

Year	Output per hour	
	Business	Nonfarm business
1947	100.0	100.0
1948	105.5	104.5
1949	107.7	107.2
1950	115.7	113.3
1951	119.1	115.6
1952	123.1	118.6
1953	127.2	120.8
1954	129.9	123.2
1955	134.8	127.7
1956	136.4	128.3
1957	140.2	130.9
1958	144.9	134.5
1959	149.4	138.8
1960	151.7	140.2
1961	156.9	144.5
1962	162.8	149.7
1963	168.7	154.4
1964	175.6	160.3
1965	181.7	165.2
1966	187.2	169.3
1967	191.2	172.3
1968	197.3	177.7
1969	198.3	177.8
1970	200.3	178.8
1971	207.4	184.8
1972	214.4	191.3
1973	219.7	195.9
1974	215.9	192.4
1975	220.9	196.5
1976	227.6	202.3
1977	233.0	206.8
1978	234.6	208.3
1979	233.1	206.4
1980	232.5	205.6
1981	236.3	208.4
1982	237.3	208.8

Table 3. Output per hour of all persons, output per unit of capital, and multifactor productivity, private business sector, 1948–81

(Index, 1948 = 100)

Year	Output per hour of all persons	Output per unit of capital	Multifactor productivity
1948	100.0	100.0	100.0
1949	101.6	94.4	98.9
1950	109.9	99.6	105.9
1951	113.1	101.0	108.4
1952	116.9	100.2	110.4
1953	120.8	101.5	113.3
1954	122.8	97.1	112.8
1955	127.8	101.8	117.8
1956	129.2	100.8	118.2
1957	132.5	98.7	119.2
1958	136.7	95.1	120.0
1959	141.2	100.1	124.8
1960	143.2	99.3	125.6
1961	148.1	98.8	128.0
1962	153.8	102.0	132.7
1963	159.7	103.4	136.5
1964	166.5	106.1	141.4
1965	172.5	108.7	145.9
1966	177.7	108.9	148.7
1967	181.8	105.7	149.2
1968	188.1	106.3	152.7
1969	188.5	104.5	152.0
1970	190.3	99.4	150.2
1971	197.2	98.9	153.5
1972	204.1	101.8	158.6
1973	209.3	103.8	162.3
1974	204.3	97.3	156.2
1975	208.8	92.7	155.8
1976	215.8	96.9	161.7
1977	221.0	100.8	166.5
1978	222.2	102.6	168.2
1979	220.0	101.2	166.3
1980	218.3	96.1	162.5
1981	222.3	95.8	164.3

Table 4. Output per hour of all persons, capital effects, and multifactor productivity, 1948–73 and 1973–81

(Average annual rate of change, in percent)

Year	Total private business sector[1]							
	Productivity			Output[3]	Inputs			
	Output per hour of all persons	Output per unit of capital	Multifactor productivity[2]		Hours of all persons[4]	Capital[5]	Combined units of labor and capital inputs[6]	Capital per hour of all persons
1948–81	2.4	–0.1	1.5	3.3	0.9	3.5	1.8	2.6
1948–73	3.0	.2	2.0	3.7	.7	3.6	1.7	2.8
1973–81	.8	–1.0	.1	2.2	1.4	3.2	2.0	1.8
	Private nonfarm business sector[1]							
1948–81	2.0	–0.1	1.3	3.4	1.4	3.6	2.1	2.2
1948–73	2.5	.2	1.7	3.9	1.3	3.6	2.1	2.3
1973–81	.6	–1.1	.0	2.1	1.5	3.3	2.1	1.7
	Manufacturing sector							
1948–81	2.6	–0.2	1.8	3.3	0.7	3.6	1.6	2.8
1948–73	2.9	.6	2.2	4.0	1.1	3.5	1.8	2.4
1973–81	1.5	–2.6	.4	1.2	–.2	4.0	.9	4.2

[1] The private business sector includes all of the gross national product except the rest-of-world sector, the rental value of owner-occupied real estate, the output arising in nonprofit organizations, the output of paid employees of private households, government, and the statistical discrepancy in preparing the National Income Accounts. The private nonfarm business sector also excludes farms, but includes agricultural services.

[2] Output per unit of combined labor and capital inputs.

[3] Gross domestic product originating in the sector, in constant dollars.

[4] Paid hours of all employees, plus the hours of proprietors and unpaid family workers engaged in the sector.

[5] A measure of the flow of capital services used in the sector.

[6] Hours of all persons combined with capital input, using labor and capital shares of output as weights.

Table 5. Output per hour of all persons by major sector, 1947–81
(Index, 1947 = 100)

Year	Farm	Mining	Manufacturing	Transportation	Communications	Electric, gas, and sanitary services	Trade
1947	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1948	110.8	103.8	106.2	97.3	101.9	107.5	99.9
1949	109.7	104.8	110.3	94.5	109.1	116.3	101.8
1950	125.1	116.2	116.2	101.1	116.7	112.3	111.2
1951	125.6	122.0	120.2	104.7	123.5	138.8	109.8
1952	135.3	123.7	122.4	102.9	126.6	147.6	112.6
1953	153.9	130.2	124.4	101.8	133.1	155.7	114.7
1954	162.1	137.9	126.2	103.0	136.3	170.6	114.9
1955	164.3	145.9	132.4	108.8	145.5	178.8	122.2
1956	170.2	147.9	131.3	111.6	145.5	188.2	122.6
1957	180.0	149.0	133.8	112.1	154.5	197.8	125.0
1958	202.7	154.6	133.2	113.5	169.9	207.0	126.4
1959	191.6	159.2	139.5	115.9	184.5	225.1	130.9
1960	209.9	166.1	140.4	118.8	193.1	240.3	130.8
1961	220.6	175.9	144.1	121.8	205.8	254.3	133.3
1962	226.5	184.9	150.4	126.0	219.6	266.8	140.7
1963	244.0	197.4	161.2	133.2	235.1	276.8	146.5
1964	251.8	203.8	169.1	135.2	242.7	294.7	151.1
1965	267.9	212.0	174.3	143.7	251.5	300.9	156.6
1966	279.2	223.8	176.7	152.3	262.0	319.6	163.4
1967	304.4	234.0	176.6	150.0	276.9	326.7	168.2
1968	305.0	246.8	182.9	160.9	293.5	353.0	175.6
1969	327.4	249.8	186.1	161.1	301.1	363.3	173.8
1970	366.2	260.6	185.7	159.3	312.1	362.8	175.3
1971	399.2	260.8	197.1	160.7	335.0	393.7	181.0
1972	386.4	359.4	206.9	170.4	349.6	397.4	190.8
1973	391.1	256.4	217.9	177.7	363.9	403.6	196.9
1974	394.4	239.0	212.8	180.1	370.5	383.1	192.4
1975	433.7	217.9	219.0	178.6	419.9	423.0	194.9
1976	433.3	207.5	228.7	183.9	454.2	423.6	199.9
1977	454.2	201.0	234.4	187.4	470.4	429.5	203.3
1978	439.9	197.5	236.5	192.1	490.7	422.4	207.9
1979	473.2	184.1	238.0	188.3	498.3	418.7	208.8
1980	488.2	175.5	238.5	179.8	524.4	414.5	203.7
1981	554.8	163.6	245.1	177.1	547.4	398.4	208.7

Table 6. Output per employee year, output, and employee years in the Federal Government, measured sample, fiscal years 1967–81

(Index, 1967 = 100)

Fiscal year	Output per employee year	Output	Employee years
1967	100.0	100.0	100.0
1968	101.2	103.7	102.6
1969	103.6	107.1	103.4
1970	104.0	107.4	103.2
1971	105.8	108.8	102.9
1972	106.4	109.0	102.5
1973	109.4	110.8	101.3
1974	108.9	111.0	102.0
1975	110.4	112.8	102.2
1976	112.3	113.8	101.2
1977	115.6	115.7	100.1
1978	117.7	118.5	100.7
1979	118.6	119.7	100.9
1980	121.2	123.3	101.7
1981	124.2	125.1	100.8

Table 7. Output per employee year by functional grouping, Federal Government, fiscal years 1967–81

(Average annual percent change)

Functional grouping	Output per employee year
Total	1.5
Audit of operations	1.8
Buildings and grounds maintenance	3.3
Communications[1]	11.6
Education and training[2]	2.0
Electric power production and distribution	–.3
Equipment maintenance[2]	.7
Finance and accounting	2.5
General support services	4.0
Information services	.5
Legal and judicial activities	–.4
Library services	5.2
Loans and grants	4.2
Medical services	.1
Military base services	.1
Natural resources and environmental management	1.0
Personnel investigations	3.8
Personnel management	1.6
Postal service	1.3
Printing and duplication	–.8
Procurement	3.0
Records management	3.5
Regulation-compliance and enforcement	2.1
Regulation-rulemaking and licensing	2.3
Social services and benefits	2.4
Specialized manufacturing	3.0
Supply and inventory control	1.6
Traffic management[3]	3.1
Transportation	2.9

[1] Fiscal years 1973–81.
[2] Fiscal years 1968–81.
[3] Fiscal years 1972–81.

Table 8. Output per employee hour in selected industries, 1960–81

Industry	Average annual percent change	Industry	Average annual percent change
Synthetic fibers	6.9	Household furniture[1]	2.3
Hosiery	6.9	Nonmetallic minerals, except fuels	2.3
Malt beverages	6.9	Primary copper, lead, and zinc	2.3
Telephone communications	5.7	Gas utilities	2.3
Air transportation	5.7	Hydraulic cement	2.2
Petroleum pipelines	5.7	Hotels, motels, and tourist courts	2.1
Aluminum rolling and drawing	4.8	Gray iron foundries	2.1
Radio and television receiving sets[1]	4.7	Intercity trucking	2.0
Fluid milk	4.6	Pumps and compressors[1]	2.0
Pharmaceutical preparations[2]	4.4	Bakery products	2.0
Major household appliances	4.3	Construction machinery and equipment	2.0
Electric utilities	4.2	Folding paperboard boxes[5]	1.9
Railroad transportation-revenue traffic	4.2	Ball and roller bearings	1.9
Corrugated and solid fiberboard boxes	4.1	Nonwool yarn mills	1.9
Drug and proprietary stores	4.1	Franchised new car dealers	1.9
Candy and confectionery products[3]	4.1	Copper rolling and drawing	1.9
Petroleum refining[1]	4.0	Steel	1.9
Gasoline service stations	3.9	Sawmills and planing mills, general	1.8
Cosmetics and other toiletries[1]	3.8	Total tobacco	1.8
Paper, paperboard, and pulp mills	3.7	Motors and generators	1.7
Veneer and plywood[1]	3.6	Office furniture[1]	1.7
Gas and electric utilities	3.6	Primary aluminum	1.6
Grain mill products[2]	3.1	Electric lamps	1.6
Bottled and canned soft drinks	3.0	Copper mining, recoverable metal	1.3
Preserved fruits and vegetables[1]	3.0	Commercial banking[6]	1.3
Motor vehicles and equipment	2.9	Hand and edge tools[1]	1.2
Soaps and detergents[1]	2.8	Ready-mixed concrete[1]	1.2
Structural clay products	2.8	Millwork[1]	1.2
Sugar	2.8	Retail food stores	.9
Farm and garden machinery[1]	2.8	Fabricated structural metal	.9
Concrete products[1]	2.7	Steel foundries	.9
Tires and inner tubes	2.7	Laundry and cleaning services	.7
Paper and plastic bags[1]	2.6	Machine tools	.6
Paints and allied products	2.5	Farm machinery[7]	.6
Iron mining, usable ore	2.5	Eating and drinking places	.4
Transformers[2]	2.5	Footwear	.3
Lighting fixtures[4]	2.4	Coal mining	–.2
Metal cans	2.4	Class I bus carriers[1]	–.3
Glass containers	2.4		

[1] 1960–80.
[2] 1963–80.
[3] 1960–78.
[4] 1961–80.
[5] 1963–81.
[6] 1967–80.
[7] 1972–80.

Table 9. Productivity rates before and after 1973: Change from 1947-73 to 1973-81, selected industries

Industry	1947–73	1973–81	Advance or falloff from 1947–73 to 1973–81
Telephone communications[1]	6.4	6.7	0.4
Synthetic fibers	5.8	6.4	.5
Malt beverages	5.2	6.0	.8
Fluid milk	4.0	5.1	1.1
Radio and television recieving sets[2]	4.9	5.0	.1
Bottled and canned soft drinks	1.8	4.9	3.1
Hosiery	5.6	4.3	–1.2
Grain mill products[3]	3.4	4.0	.6
Office furniture[2]	2.0	3.8	1.8
Metal cans	2.3	3.8	1.5
Air transportation	7.5	3.6	–3.9
Pharmaceutical preparations[3]	5.4	3.3	–2.1
Corrugated and solid fiber board boxes[4]	3.7	3.3	–.4
Primary copper, lead, and zinc	2.3	3.2	.9
Gasoline service stations[4]	3.8	3.1	–.6
Tires and inner tubes	4.0	2.9	–1.1
Copper mining, recoverable metal	1.8	2.8	1.0
Major household appliances	5.5	2.7	–2.7
Transformers[3]	3.7	2.7	–.9
Paints and allied products[4]	2.7	2.6	.0
Paper, paperboard, and pulp mills	4.0	2.6	–1.4
Railroad transportation–revenue traffic	5.0	2.4	–2.5
Glass containers	1.7	2.3	.6
Electric lamps[5]	2.0	2.3	.3
Candy and confectionery[6]	3.6	2.2	–1.4
Copper rolling and drawing	3.1	2.2	–1.0
Nonwool yarn mills[4]	2.4	1.9	–.5
Motor vehicles and equipment[7]	3.7	1.9	–1.9
Sugar	4.1	1.8	–2.2
Total tobacco	3.2	1.7	–1.4
Veneer and plywood[2]	4.9	1.7	–3.2
Preserved fruits and vegetables	2.9	1.6	–1.3
Iron mining, usable ore[8]	4.0	1.5	–2.4
Petroleum refining	5.7	1.2	–4.5
Hotels, motels, and tourist courts[4]	2.4	1.1	–1.3
Drug and proprietary stores[4]	5.2	1.1	–4.1
Aluminum rolling and drawing[4]	5.6	1.0	–4.6
Pumps and compressors[2]	2.4	1.0	–1.5
Electric utilities[4]	6.4	.9	–5.5
Soaps and detergents[2]	2.9	.8	–2.1
Lighting fixtures[9]	3.0	.8	–2.2
Household furniture[2]	2.5	.8	–1.7
Steel	1.8	.8	–1.0
Nonmetallic minerals, except fuels[4]	3.4	.7	–2.6
Commercial banking[10]	2.1	.7	–1.3
Structural clay products[4]	3.4	.7	–2.7
Franchised new car dealers[4]	2.6	.6	–2.0
Farm and garden machinery[2]	2.5	.5	–2.0
Intercity trucking[5]	2.7	.5	–2.2
Hand and edge tools[2]	2.0	.5	–1.5
Sawmills and planing mills, general[4]	3.1	.4	–2.6
Concrete products[11]	3.3	.4	–2.9
Gas and electric utilities	6.7	.4	–6.3
Bakery products	2.4	.3	–2.1
Footwear	1.3	.1	–1.2
Folding paperboard boxes[12]	2.0	.1	–1.9
Construction machinery and equipment[4]	2.1	.1	–2.0
Paper and plastic bags[13]	2.7	–.1	–2.8
Cosmetics and other toiletries[2]	4.7	–.1	–4.8
Gray iron foundries	2.3	–.2	–2.5
Primary aluminum	4.4	–.3	–4.7
Motors and generators	4.1	–.4	–4.4
Gas utilities	4.8	–.4	–5.2
Class I bus carriers[13]	1.1	–.4	–1.6
Fabricated structural metal[4]	2.3	–.4	–2.8
Retail food stores[4]	2.8	–.6	–3.4
Ready-mixed concrete[2]	2.0	–.7	–2.7
Coal mining[8]	3.7	–.7	–4.4
Petroleum pipelines[4]	9.4	–.7	–10.1
Machine tools[4]	1.5	–.7	–2.2
Hydraulic cement	4.5	–.7	–5.2
Ball and roller bearings[4]	3.5	–.9	–4.4
Millwork[2]	2.5	–1.0	–3.5
Eating and drinking places[4]	1.4	–1.3	–2.3
Steel foundires[5]	1.4	–1.6	–3.0
Laundry and cleaning services[4]	1.7	–1.6	–3.3

[1] 1951–73 as well as 1973–81.
[2] 1958–73 as well as 1973–80.
[3] 1963–73 as well as 1973–80.
[4] 1958–73 as well as 1973–81.
[5] 1954–73 as well as 1973–81.
[6] 1954–73 as well as 1973–78.
[7] 1957–73 as well as 1973–81.
[8] 1955–73 as well as 1973–81.
[9] 1961–73 as well as 1973–80.
[10] 1967–73 as well as 1973–80.
[11] 1947–73 as well as 1973–80.
[12] 1963–73 as well as 1973–81.
[13] 1954–73 as well as 1973–80.

Table 10. Trend in real gross domestic product per employed person, selected countries and years, 1950–81

(Index, 1950 = 100)

Year	United States	Canada	France	Germany	Japan	United Kingdom
1950	100.0	100.0	100.0	100.0	100.0	100.0
1955	114.0	118.5	122.2	137.3	137.6	111.4
1960	122.0	129.8	154.9	184.1	187.7	123.2
1965	142.2	149.4	201.0	227.7	284.2	138.3
1966	146.5	151.0	209.4	243.2	307.7	140.8
1967	146.9	151.9	218.6	241.1	334.0	146.0
1968	150.5	157.5	226.2	256.3	369.7	152.9
1969	151.1	160.8	238.4	272.2	411.0	155.0
1970	149.9	163.3	251.1	284.9	446.1	159.2
1971	154.2	170.8	263.5	293.3	463.6	166.4
1972	158.2	175.7	277.6	305.0	503.3	169.0
1973	161.6	180.1	288.9	319.2	533.8	178.2
1974	157.5	179.1	295.9	327.0	530.3	176.0
1975	157.9	178.1	299.4	332.1	544.6	175.6
1976	160.7	184.6	312.8	352.5	568.1	183.2
1977	163.7	185.7	319.8	363.9	590.0	184.6
1978	164.6	186.9	330.8	372.9	612.3	190.2
1979	164.0	185.5	341.7	384.1	635.7	192.3
1980	162.6	180.4	345.1	387.5	656.6	193.3
1981	164.1	181.1	348.1	389.7	670.7	198.2

Table 11. Relative levels in gross domestic product per employed person,[1] selected countries and years, 1960–81

(Index, United States = 100)

Year	Canada	Japan	France	Germany	Italy	United Kingdom
1960	89.8	26.9	55.8	59.7	38.5	53.7
1965	88.8	35.0	62.1	63.4	44.6	51.8
1966	87.1	36.8	62.9	65.7	46.9	51.2
1967	87.3	39.8	65.4	65.0	49.5	52.9
1968	88.4	43.0	66.0	67.4	51.7	54.1
1969	89.9	47.6	69.4	71.3	55.1	54.6
1970	92.0	52.1	73.6	75.2	58.4	56.5
1971	93.6	52.6	75.1	75.3	57.8	57.4
1972	93.8	55.7	77.1	76.3	59.3	56.9
1973	94.2	57.8	78.6	78.2	61.6	58.7
1974	96.1	58.9	82.6	82.2	64.6	59.5
1975	95.3	60.4	83.4	83.3	61.7	59.2
1976	97.0	61.8	85.5	86.8	63.7	60.7
1977	95.8	63.1	85.9	88.0	63.5	60.1
1978	95.9	65.1	88.3	89.7	64.6	61.5
1979	95.5	67.8	91.6	92.7	67.2	62.4
1980	93.7	70.7	93.3	94.3	69.4	63.3
1981[2]	93.3	71.5	93.2	94.0	68.4	64.3

[1] Output based on international price weights.

[2] Data are based on preliminary estimates.

Table 12. Output per employee hour in manufacturing, selected countries, 1950–81

(Index, 1950 = 100)

Year	United States	Canada	France	Germany	Japan	United Kingdom
1950	100.0	100.0	100.0	100.0	100.0	100.0
1951	103.4	104.1	105.2	103.0	125.0	100.2
1952	105.3	106.9	108.7	112.8	131.2	96.3
1953	107.1	110.6	114.4	120.8	149.1	100.9
1954	108.7	115.4	117.8	125.8	160.0	104.3
1955	114.1	122.8	123.5	133.9	168.1	107.8
1956	113.3	128.0	131.6	137.4	178.7	107.8
1957	115.6	128.9	133.7	149.5	195.6	110.6
1958	115.1	133.3	138.9	157.0	182.7	112.7
1959	120.6	140.5	149.0	169.7	212.9	117.1
1960	121.4	145.5	156.7	181.6	245.0	124.1
1961	124.7	153.3	163.9	191.4	277.6	125.2
1962	130.1	161.3	171.5	203.6	289.5	128.4
1963	139.4	167.5	181.7	212.8	312.8	135.2
1964	146.2	174.9	190.9	229.7	354.6	144.8
1965	150.8	181.5	201.8	244.7	369.5	149.5
1966	152.4	187.7	216.0	253.3	406.9	155.2
1967	152.4	193.7	228.0	269.8	466.9	162.3
1968	157.7	206.9	253.9	288.3	525.6	174.0
1969	160.4	219.1	263.2	305.1	607.2	178.3
1970	160.1	222.2	276.4	310.1	684.5	179.7
1971	169.9	238.0	291.1	322.9	727.7	186.8
1972	178.4	248.6	307.8	344.0	810.7	201.3
1973	188.1	264.3	324.7	364.2	893.8	213.8
1974	183.7	270.2	336.0	384.0	915.6	215.4
1975	189.0	263.2	346.3	404.3	951.0	211.2
1976	197.4	277.3	374.7	433.2	1,040.4	219.6
1977	202.3	288.5	393.7	454.5	1,114.9	233.2
1978	204.1	293.1	416.0	469.3	1,202.5	230.6
1979	205.5	298.1	436.5	492.2	1,309.4	238.2
1980	205.8	288.2	443.6	499.2	1,397.8	239.7
1981	211.5	289.1	450.8	512.6	1,442.9	253.9

Table 13. Output per employee hour in manufacturing, selected countries, 1950–73 and 1973–81

(Average annual rate of change, in percent)

Country	Manufacturing—output per hour	
	1950–73	1973–81
United States	2.7	1.7
Canada	4.3	1.4
France	5.3	4.6
Germany	5.9	4.5
Japan	9.5	6.8
United Kingdom	3.5	2.2

Table 14. Levels[1] of output per hour in the iron and steel industry, selected countries and years, 1964–80

(Index, United States = 100)

Year	Japan	France	Germany	United Kingdom
1964	44– 51	47–49	53– 58	47–49
1972	83– 98	63–68	76– 82	53–55
1973	98–116	64–69	82– 87	54–56
1974	98–116	65–70	85– 91	49–51
1975	96–115	60–64	81– 87	45–47
1976	102–124	63–68	84– 90	48–50
1977	108–130	69–74	87– 93	48–50
1978	106–129	71–77	89– 94	47–49
1979	119–145	79–86	99–105	52–54
1980	128–155	86–93	102–109	47–49

[1] Range of estimates.

Table 15. Output per hour of all persons, unit labor costs, and compensation per hour in the business economy, 1948–82

(Percent change from previous year)

Year	Output per hour of all persons	Unit labor costs	Compensation per hour
1948	5.3	3.0	8.5
1949	1.5	.1	1.6
1950	7.9	–.8	7.1
1951	2.8	6.9	9.8
1952	3.2	3.0	6.4
1953	3.2	3.1	6.4
1954	1.6	1.6	3.2
1955	4.0	–1.4	2.5
1956	1.0	5.5	6.5
1957	2.5	3.9	6.5
1958	3.1	1.3	4.4
1959	3.2	1.0	4.3
1960	1.5	2.7	4.2
1961	3.3	.5	3.8
1962	3.8	.7	4.6
1963	3.7	.0	3.7
1964	4.3	.8	5.2
1965	3.5	.3	3.9
1966	3.1	3.8	7.0
1967	2.2	3.0	5.5
1968	3.3	4.4	7.8
1969	.2	6.7	7.0
1970	.8	6.4	7.3
1971	3.6	2.9	6.6
1972	3.5	2.9	6.5
1973	2.6	5.3	8.0
1974	–2.4	12.1	9.4
1975	2.2	7.3	9.6
1976	3.3	5.1	8.6
1977	2.4	5.1	7.7
1978	.6	8.0	8.6
1979	–.9	10.7	9.7
1980	–.7	11.2	10.4
1981	1.8	7.7	9.6
1982	.4	6.9	7.3

Table 16. Composition of price changes, business economy, 1948–82
(Percent change)

Year	Implicit price deflator	Point contribution to percent change	
		Unit labor costs	Unit nonlabor payments[1]
1948	7.0	2.0	4.9
1949	−1.0	.1	−1.1
1950	1.6	−.5	2.1
1951	7.4	4.4	3.0
1952	1.1	1.9	−.8
1953	.9	2.0	−1.2
1954	1.0	1.1	−.1
1955	1.6	−1.0	2.5
1956	3.3	3.5	−.2
1957	3.5	2.6	.9
1958	1.3	.9	.5
1959	2.0	.7	1.3
1960	1.4	1.8	−.3
1961	.6	.3	.2
1962	1.5	.5	1.0
1963	1.1	.0	1.1
1964	1.0	.6	.4
1965	1.9	.2	1.7
1966	3.0	2.4	.6
1967	2.7	2.0	.8
1968	4.0	2.8	1.2
1969	4.9	4.4	.5
1970	4.5	4.3	.2
1971	4.4	2.0	2.5
1972	3.4	1.9	1.5
1973	5.5	3.5	2.0
1974	9.5	8.0	1.5
1975	9.8	4.9	4.9
1976	4.7	3.4	1.4
1977	5.8	3.4	2.2
1978	7.5	5.3	2.3
1979	9.0	7.1	1.9
1980	9.4	7.6	1.9
1981	9.5	5.3	4.2
1982	5.5	4.6	.9

[1] Unit nonlabor payments include corporate profit and the profit component of proprietors' income, as well as capital consumption allowances (replacement basis), net interest, and rental income of persons.

NOTE: Figures in the second and third columns may not add up to figures in the first column because of rounding.

Table 17. Output per hour of all persons, compensation per hour, unit labor costs, and prices in major sectors, 1973–81

(Average annual percent change)

Sector	Output per hour of all persons	Compensation per hour	Unit labor costs	Prices
Communications	5.3	9.7	4.2	3.4
Farm	3.8	11.0	7.0	3.3
Manufacturing	1.7	9.6	7.8	7.1
Transportation	.2	9.3	9.0	9.1
Trade	1.0	8.5	7.4	7.1
Electric, gas, and sanitary services	.3	9.1	8.8	9.0
Mining	–5.0	9.9	15.8	18.8

Table 18. Output per employee hour and compensation per employee hour, selected industries, 1967–80

(Average annual percent change)

Industry	Output per employee hour	Compensation per hour	Industry	Output per employee hour	Compensation per hour
Fluid milk	5.1	7.8	Footwear	.3	6.6
Preserved fruits and vegetables	2.8	8.6	Glass containers	2.1	10.0
Grain mill products	2.8	8.6	Hydraulic cement	1.1	9.9
Bakery products	1.1	8.3	Structural clay products	2.8	7.9
Sugar	2.6	9.1	Concrete products	1.5	7.9
Candy and confectionery products[1]	4.5	8.5	Ready-mixed concrete	.3	8.2
Malt beverages	7.3	9.2	Steel	1.6	10.4
Bottled and canned soft drinks	4.2	8.6	Gray iron foundries	2.0	9.5
Total tobacco	1.7	11.7	Steel foundries	.8	8.7
Hosiery	6.9	7.1	Primary copper, lead, and zinc	2.9	11.3
Nonwool yarn mills	2.2	8.0	Primary aluminum	1.2	11.1
Sawmills and planing mills, general	1.1	9.5	Copper rolling and drawing	1.7	8.2
Millwork	.0	7.9	Aluminum rolling and drawing	4.8	10.1
Veneer and plywood	2.8	9.2	Metal cans	2.7	10.0
Household furniture	2.2	7.3	Hand and edge tools	.6	7.9
Office furniture	1.9	8.4	Fabricated structural metal	.0	7.6
Paper, paperboard, and pulp mills	3.4	9.8	Farm and garden machinery	2.7	9.5
Paper and plastic bags	2.3	8.6	Construction machinery and equipment	1.9	9.5
Folding paperboard boxes	2.0	8.3	Machine tools	.4	8.0
Corrugated and solid fiberboard boxes	4.4	8.8	Pumps and compressors	1.8	8.4
Synthetic fibers	7.7	9.4	Ball and roller bearings	1.4	8.6
Pharmaceutical preparations	3.9	8.4	Transformers	2.2	6.9
Soaps and detergents	2.5	8.5	Motors and generators	.9	7.5
Cosmetics and other toiletries	3.5	8.0	Major household appliances	4.0	7.7
Paints and allied products	2.7	8.1	Electric lamps	1.6	8.7
Petroleum refining	2.8	9.7	Lighting fixtures	2.2	8.0
Tires and inner tubes	1.9	8.1	Radio and television receiving sets	4.8	9.1
			Motor vehicles and equipment	2.8	9.7

[1] 1967–78.

Table 19. Output per employee hour and prices, selected industries, 1960–80

(Average annual percent change)

Industry	Output per employee hour	Prices
Bituminous coal and lignite mining	-0.3	10.5
Fluid milk	4.6	3.9
Preserved fruits and vegetables	3.0	4.7
Grain mill products[1]	3.1	4.9
Flour and other grain mill products	3.5	4.2
Cereal breakfast foods[1]	1.6	5.9
Rice milling[1]	2.3	5.1
Blended and prepared flour[1]	1.1	4.7
Wet corn milling[1]	7.1	5.1
Prepared feeds for animals and fowls[1]	2.9	4.9
Bakery products	2.1	5.4
Sugar	2.9	6.4
Candy and confectionery products[2]	4.1	5.0
Malt beverages	7.0	2.9
Bottled and canned soft drinks	3.0	5.7
Cigarettes, chewing, and smoking tobacco	1.5	5.2
Cigars	2.6	2.2
Hosiery	7.1	.2
Nonwool yarn mills	2.0	3.6
Sawmills and planing mills, general	1.9	8.0
Millwork	1.2	6.3
Veneer and plywood	3.6	5.4
Wood household furniture	2.2	3.3
Upholstered household furniture	1.9	4.0
Metal household furniture	2.0	3.8
Mattresses and bedsprings	4.1	2.8
Wood office furniture	1.6	5.3
Metal office furniture	1.6	5.4
Paper, paperboard, and pulp mills	3.8	4.9
Paper and plastic bags	2.6	5.0
Folding paperboard boxes[1]	2.1	3.4
Corrugated and solid fiberboard boxes	4.2	4.5
Synthetic fibers	6.9	.8
Pharmaceutical preparations[1]	4.4	2.1
Soaps and detergents	2.8	4.0
Cosmetics and other toiletries	3.8	3.0
Paints and allied products	2.6	4.6
Petroleum refining	4.0	8.8
Tires and inner tubes	2.6	4.2
Footwear	.3	5.0
Glass containers	2.4	5.8
Hydraulic cement	2.5	6.1
Structural clay products	3.0	4.8
Clay construction products	3.0	4.6
Brick and structural clay tile	2.3	5.6
Ceramic wall and floor tile	3.9	2.5
Clay refractories	3.0	5.5
Concrete products	2.7	5.0
Ready-mixed concrete	1.2	5.4
Steel	1.9	6.3
Gray iron foundries	2.2	6.4
Steel foundries	1.1	5.6
Primary copper, lead, and zinc	2.1	6.1
Primary copper	2.0	5.7
Primary aluminum	1.7	5.1
Copper rolling and drawing	1.9	5.6
Aluminum rolling and drawing	5.1	4.4
Metal cans	2.4	6.3
Hand and edge tools	1.2	5.9
Fabricated structural metal	.9	6.2
Farm and garden machinery	2.8	5.3
Construction machinery and equipment	2.1	6.4
Machine tools	.7	6.7
Metal-cutting machine tools	1.0	6.6
Metal-forming machine tools	-.3	7.1
Pumps and compressors	2.0	5.5
Ball and roller bearings	2.1	4.2
Transformers[1]	2.5	2.6
Motors and generators	1.9	4.7
Major household appliances	4.5	2.8
Household cooking equipment	4.0	3.4
Household refrigerators and freezers	5.0	2.5
Household laundry equipment	4.4	2.7
Household appliances, n.e.c.	3.3	2.8
Electric lamps	1.6	4.7
Lighting fixtures[3]	2.4	3.9
Radio and television receiving sets	4.7	1.1
Motor vehicles and equipment	3.0	4.1
Railroad transportation-revenue traffic[4]	4.3	9.5
Class I bus carriers[5]	-.3	7.9
Air transportation[5]	5.9	6.1
Telephone communications	5.6	2.0
Gas and electric utilities	3.8	5.5
Electric utilities	4.5	4.7
Gas utilities	2.5	6.3
Retail food stores	1.0	5.5
Franchised new car dealers	1.9	3.4
Gasoline service stations	4.0	5.9
Eating and drinking places	.5	6.2
Drug and proprietary stores	4.3	2.9
Hotels, motels, and tourist courts	2.3	5.7
Laundry and cleaning services	.9	5.7

[1] 1963–80 (output per employee hour).
[2] 1960–78 (output per employee hour).
[3] 1961–80 (output per employee hour).
[4] 1969–80 (prices).
[5] 1964–80 (prices).
n.e.c. = not elsewhere classified.

Table 20. Output per employee hour,compensation per hour, and unit labor costs in manufacturing, selected countries, 1973–81

(Average annual percent change)

Country	Output per hour 1973–81	Compensation per hour 1973–81	Unit labor costs	
			National currency 1973–81	U.S. dollars 1973–81
United States	1.7	9.6	7.7	7.7
Canada	1.4	11.1	9.5	6.5
France	4.6	15.1	10.0	9.4
Germany	4.6	9.4	4.7	9.1
Japan	6.8	9.7	2.7	7.2
United Kingdom	2.2	19.1	16.6	15.0

Table 21. Output per hour of all persons and real compensation per hour in the business economy, 1950–82

(Index, 1950 = 100)

Year	Output per hour of all persons	Real compensation per hour
1950	100.0	100.0
1951	102.8	101.7
1952	106.1	105.8
1953	109.5	111.8
1954	111.2	114.9
1955	115.7	118.2
1956	116.9	124.0
1957	119.8	127.7
1958	123.5	129.7
1959	127.5	134.2
1960	129.3	137.6
1961	133.6	141.3
1962	138.7	146.1
1963	143.9	149.6
1964	150.0	155.3
1965	155.3	158.7
1966	160.1	165.0
1967	163.7	169.0
1968	169.2	174.9
1969	169.6	177.6
1970	170.9	179.8
1971	177.0	183.8
1972	183.3	189.6
1973	187.9	192.7
1974	183.4	190.0
1975	187.5	190.8
1976	193.7	195.9
1977	198.4	198.1
1978	199.5	199.9
1979	197.6	197.0
1980	196.2	191.5
1981	199.7	190.2
1982	200.4	192.2

Table 22. Output per employee hour and employment, selected industries, 1960–81

(Average annual percent change)

Industry	Output per employee hour	Employment	Industry	Output per employee hour	Employment
Iron mining, usable ore	2.5	−1.1	Steel foundries	.9	1.4
Copper mining, recoverable metal	1.3	1.3	Primary copper, lead, and zinc	2.3	−1.8
Coal mining	−.2	2.5	Primary aluminum	1.6	3.0
Nonmetallic minerals, except fuels	2.3	.0	Copper rolling and drawing	1.9	−1.3
Fluid milk	4.6	−4.1	Aluminum rolling and drawing	4.8	.9
Preserved fruits and vegetables[1]	3.0	.8	Metal cans	2.4	.4
Bakery products	2.0	−1.5	Hand and edge tools[1]	1.2	2.2
Sugar	2.8	−1.0	Fabricated structural metal	.9	1.3
Candy and confectionery products[2]	4.1	−.8	Farm and garden machinery[1]	2.8	1.8
Malt beverages	6.9	−2.4	Construction machinery and equipment	2.0	2.4
Bottled and canned soft drinks	3.0	1.2	Machine tools	.6	.2
Total tobacco	1.8	−1.4	Pumps and compressors[1]	2.0	2.8
Hosiery	6.9	−3.1	Ball and roller bearings	1.9	.3
Nonwool yarn mills	1.9	2.2	Transformers[4]	2.5	1.2
Sawmills and planing mills, general	1.8	−1.3	Motors and generators	1.7	−.2
Millwork[1]	1.2	1.7	Major household appliances	4.3	−.5
Veneer and plywood[1]	3.6	.3	Electric lamps	1.6	1.3
Household furniture[1]	2.3	1.2	Lighting fixtures[5]	2.4	1.4
Office furniture[1]	1.7	3.8	Radio and television receiving sets[1]	4.7	−1.2
Paper, paperboard, and pulp mills	3.7	−.2	Motor vehicles and equipment	2.9	1.1
Paper and plastic bags[1]	2.6	1.3	Railroad transportation-revenue traffic	4.2	−2.3
Folding paperboard boxes[3]	1.9	−1.1	Class I bus carriers[1]	−.3	.0
Corrugated and solid fiberboard boxes	4.1	1.0	Intercity trucking-general freight	2.0	1.6
Synthetic fibers	6.9	.7	Air transportation	5.7	3.7
Pharmaceutical preparations[4]	4.4	2.5	Petroleum pipelines	5.7	−.5
Soaps and detergents[1]	2.8	.8	Telephone communications	5.7	2.4
Cosmetics and other toiletries[1]	3.8	3.0	Gas and electric utilities	3.6	1.4
Paints and allied products	2.5	.3	Electric utilities	4.2	2.0
Petroleum refining[1]	4.0	−1.1	Gas utilities	2.3	.2
Tires and inner tubes	2.7	.7	Retail food stores	.9	1.8
Footwear	.3	−2.9	Franchised new car dealers	1.9	1.3
Glass containers	2.4	.7	Gasoline service stations	3.9	−.1
Hydraulic cement	2.2	−1.2	Eating and drinking places	.4	4.6
Structural clay products	2.8	−2.7	Drug and proprietary stores	4.1	1.0
Concrete products[1]	2.7	.7	Commercial banking[6]	1.3	4.5
Ready-mixed concrete[1]	1.2	1.8	Hotels, motels, and tourist courts	2.1	3.1
Steel	1.9	−.9	Laundry and cleaning services	.7	−2.7
Gray iron foundries	2.1	.7			

[1] 1960–80.
[2] 1960–78.
[3] 1963–81.
[4] 1963–80.
[5] 1961–80.
[6] 1967–80.

Table 23. Output and employment in selected industries with similar productivity growth, 1960–81

(Average annual rate of change)

Industry	Output per employee hour	Output	Employee hours
Primary aluminum	1.6	4.5	2.9
Cigarettes	1.5	1.6	.1
Sawmills and planing mills	1.8	.5	−1.2
Gasoline service stations	3.9	4.0	−1.3
Cosmetics and other toiletries	3.8	6.9	3.0
Paper, paperboard, and pulp mills	3.7	3.2	−.5
Mattresses and bedsprings	4.1	3.0	−1.0
Household cooking equipment	4.0	5.8	1.7
Railroad transportation-revenue traffic	4.2	1.4	-2.6

Table 24. Gross domestic product per capita and average weekly hours per person engaged in production in the business economy, 1947–81

(Index, 1947 = 100)

Year	GDP per capita	Average weekly hours
1947	100.0	100.0
1948	102.4	99.4
1949	101.1	98.3
1950	108.0	98.3
1951	115.1	98.3
1952	117.3	97.8
1953	119.8	97.3
1954	116.3	96.4
1955	121.9	97.0
1956	122.3	96.3
1957	122.3	95.0
1958	119.8	94.3
1959	124.9	95.0
1960	125.5	94.5
1961	126.7	94.1
1962	132.0	94.4
1963	135.4	94.3
1964	140.5	94.1
1965	147.1	94.3
1966	154.1	93.8
1967	156.6	92.6
1968	162.2	92.2
1969	165.1	91.7
1970	162.8	90.3
1971	166.3	90.0
1972	173.8	89.9
1973	182.1	89.8
1974	179.3	88.7
1975	175.4	87.8
1976	183.2	87.8
1977	191.4	87.6
1978	198.8	87.3
1979	202.2	86.9
1980	199.2	86.0
1981	201.2	85.8

Table 25. Output per hour of all persons in the business economy, adjusted for shifts in employment from the farm to the nonfarm business economy, 1947–82

(Index, 1947 = 100)

Year	Output per hour	Shift-adjusted output per hour
1947	100.0	100.0
1948	105.3	104.7
1949	106.9	106.6
1950	115.3	113.6
1951	118.5	115.5
1952	122.3	118.5
1953	126.3	121.2
1954	128.3	123.1
1955	133.4	127.8
1956	134.8	128.3
1957	138.2	130.8
1958	142.4	134.6
1959	147.0	138.5
1960	149.1	140.1
1961	154.0	144.4
1962	159.9	149.5
1963	165.9	154.6
1964	173.0	160.6
1965	179.1	165.8
1966	184.7	170.1
1967	188.8	173.6
1968	195.1	179.2
1969	195.6	179.1
1970	197.1	180.3
1971	204.2	186.6
1972	211.3	193.1
1973	216.7	197.7
1974	211.6	193.0
1975	216.2	197.3
1976	223.4	203.5
1977	228.8	208.2
1978	230.1	209.3
1979	227.9	207.1
1980	226.2	205.5
1981	230.3	209.1
1982	231.1	209.9

Table 26. Gross nonresidential capital formation per employed person, selected countries, averages for periods, 1960–81, and 1974–81

(Index, United States = 100 each period)

Year	1960–81	1974–81
Canada	115.9	124.8
Japan	83.9	114.8
France	73.1	87.5
Germany	79.4	90.3
Italy	52.6	58.5
United Kingdom	47.2	52.0

NOTE: Comparative levels of real investment are based on international price weights.

Table 27. Expenditures for research and development as a percent of gross national product, selected years, 1961–82

Year	Total	Industrial
1961	2.73	2.07
1965	2.90	2.05
1970	2.63	1.82
1975	2.27	1.56
1977	2.24	1.56
1981	2.47	1.78
1982[1]	2.59	1.90

[1] Preliminary estimates.

Table 28. Expenditures for research and development as a percent of gross national product, selected countries, 1961–82

Year	United States	France	Germany	Japan	United Kingdom
1961	2.73	1.38	n.a.	1.39	2.45
1962	2.73	1.46	1.25	1.47	n.a.
1963	2.86	1.55	1.41	1.44	n.a.
1964	2.96	1.81	1.57	1.48	2.29
1965	2.90	2.01	1.73	1.52	n.a.
1966	2.88	2.06	1.81	1.46	2.31
1967	2.90	2.13	1.97	1.52	2.29
1968	2.82	2.08	1.97	1.60	2.25
1969	2.72	1.94	2.05	1.64	2.22
1970	2.63	1.91	2.18	1.81	n.a.
1971	2.48	1.90	2.38	1.85	n.a.
1972	2.40	1.86	2.33	1.86	2.05
1973	2.32	1.76	2.22	1.90	n.a.
1974	2.29	1.79	2.26	1.97	n.a.
1975	2.27	1.80	2.38	1.96	2.05
1976	2.27	1.77	2.29	1.95	n.a.
1977	2.24	1.76	2.31	1.93	n.a.
1978	2.23	1.76	2.31	1.96	2.13
1979	2.27	1.81	2.59	2.09	n.a.
1980	2.39	1.85	2.65	2.23	n.a.
1981	2.47	1.97	2.68	n.a.	n.a.
1982	[1]2.59	n.a.	n.a.	n.a.	n.a.

[1] Preliminary estimates.

n.a. = not available.

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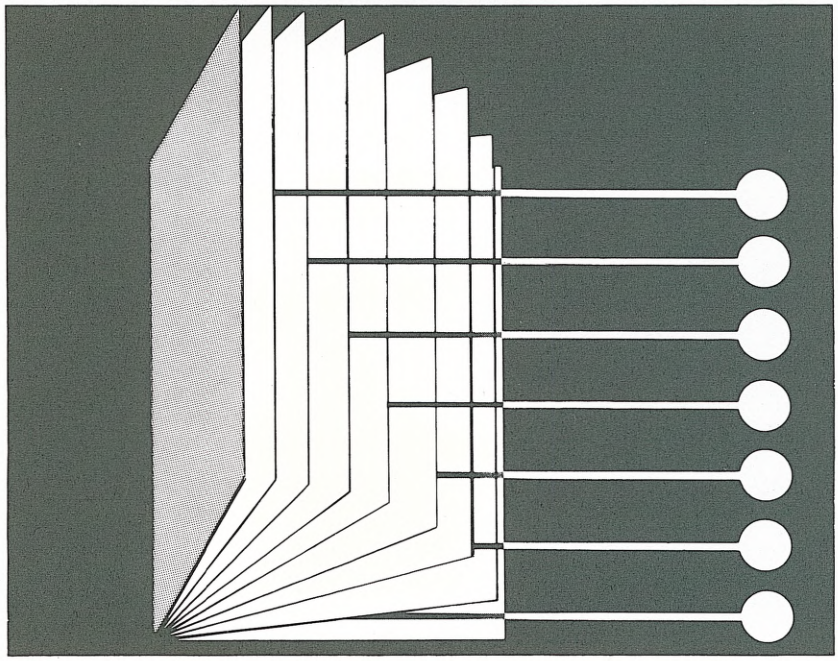

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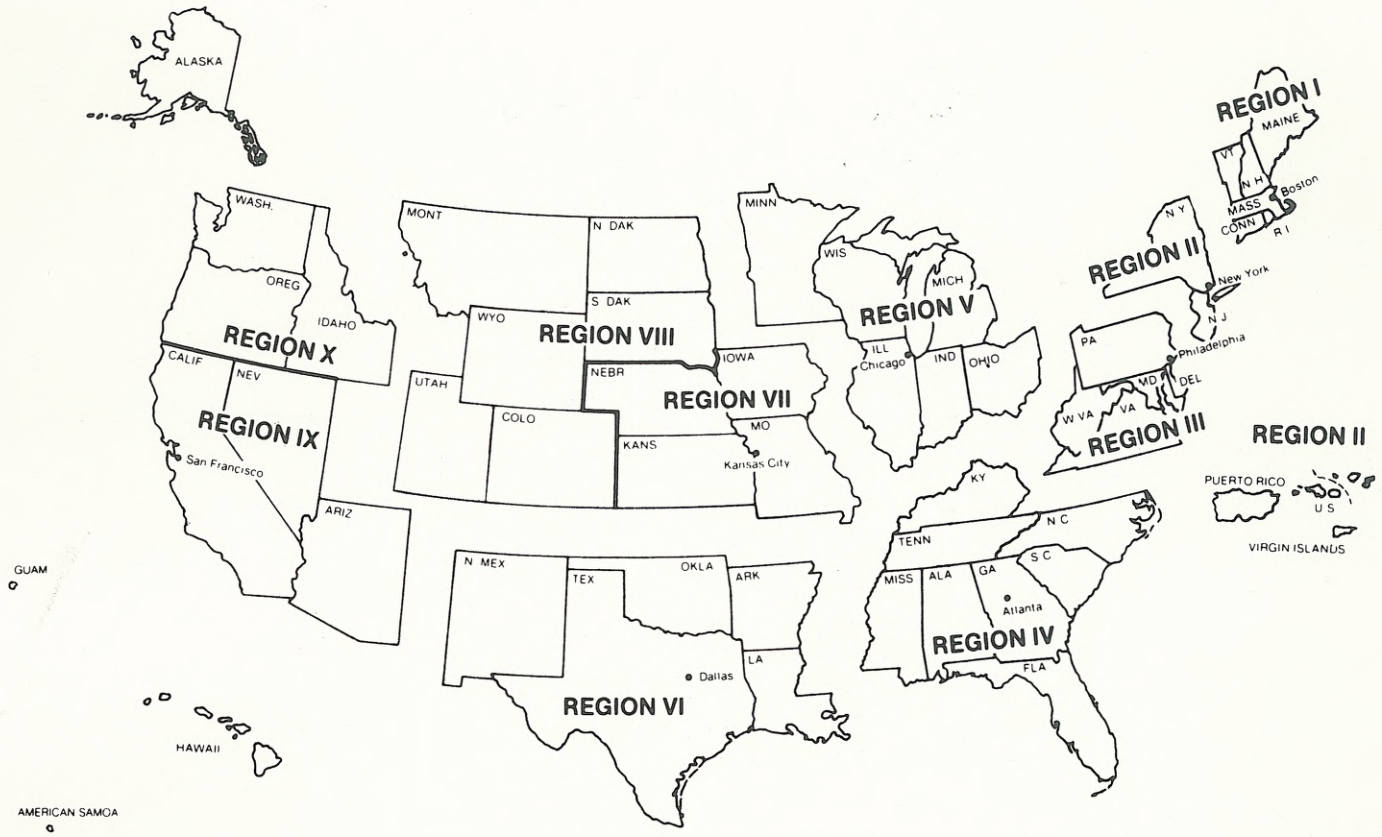

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