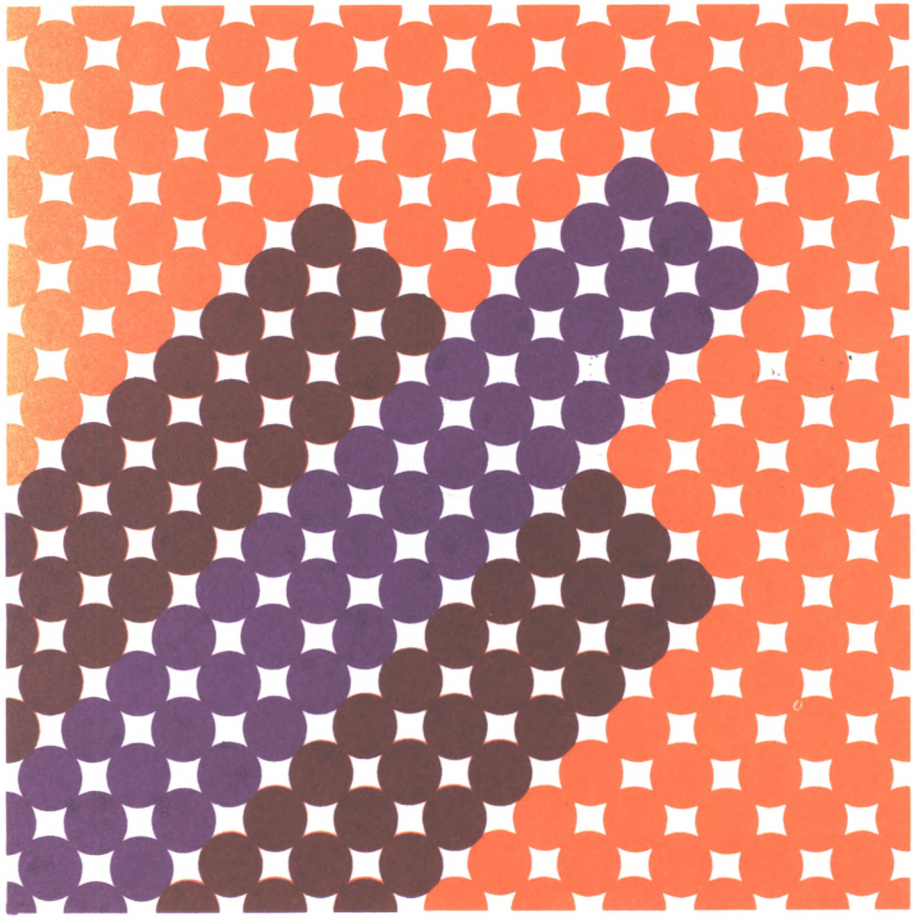
Productivity and the Economy

U.S. Department of Labor
Bureau of Labor Statistics
1977

Bulletin 1926



Productivity and the Economy

U.S. Department of Labor
Ray Marshall, Secretary
Bureau of Labor Statistics
Julius Shiskin, Commissioner
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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, for example, attention centers on the relationship between productivity, wages, and costs. During periods of economic slowdown, interest turns to the relationship between productivity and employment, taking into consideration such factors as the role of technological change. In addition to the short-term economic outlook, economists are concerned with productivity in relation to long-term economic growth.

This chartbook is designed to show what productivity is and how it interacts with other aspects of the economy. With this end in view, the book is divided into three parts. The first part shows how productivity has developed over time, the second presents changes in factors that are influenced by productivity, and the third traces trends in the various factors that influence productivity. Wherever possible, comparisons are made with foreign countries in order to add an international perspective to a subject that is often treated within a solely national framework.

In order to create a better understanding of productivity, this chartbook draws on the best available information, using a variety of sources in addition to material produced by the Bureau of Labor Statistics (BLS). This presentation in no way implies that the Bureau endorses all the measures and concepts involved, but indicates rather its hope of broadening the scope of discussion of that essential element of the Nation's economic well-being—productivity.

This chartbook was produced in the Office of Productivity and Technology of the Bureau of Labor Statistics under the direction of Jerome A. Mark, Assistant Commissioner. It was prepared by Martha Farnsworth Riche, under the supervision of Chester Myslicki.

CONTENTS

PART I

Trends in productivity

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—inputs. 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 way relates output to a composite of inputs, combined to reflect 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 for analyzing productivity, labor costs, real income, and employment trends. Measuring labor productivity can be done readily at several levels: the private economy, its component sectors, industries, or plants. For these reasons, the productivity measures used in this chartbook are expressed in terms of output per hour. Depending on the components of the measure used, 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 when the context makes it clear whether it is a question of a specific measure or labor productivity in general.

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 interrelated 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, labor relations, competitive pressure, 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 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.

Historical trends in the total private economy and the nonfarm sector

Official U.S. measures of productivity begin with the year 1909 and continue to the present. In general, productivity has moved upward. In 1975 productivity in the private economy was more than four times its 1909 level.

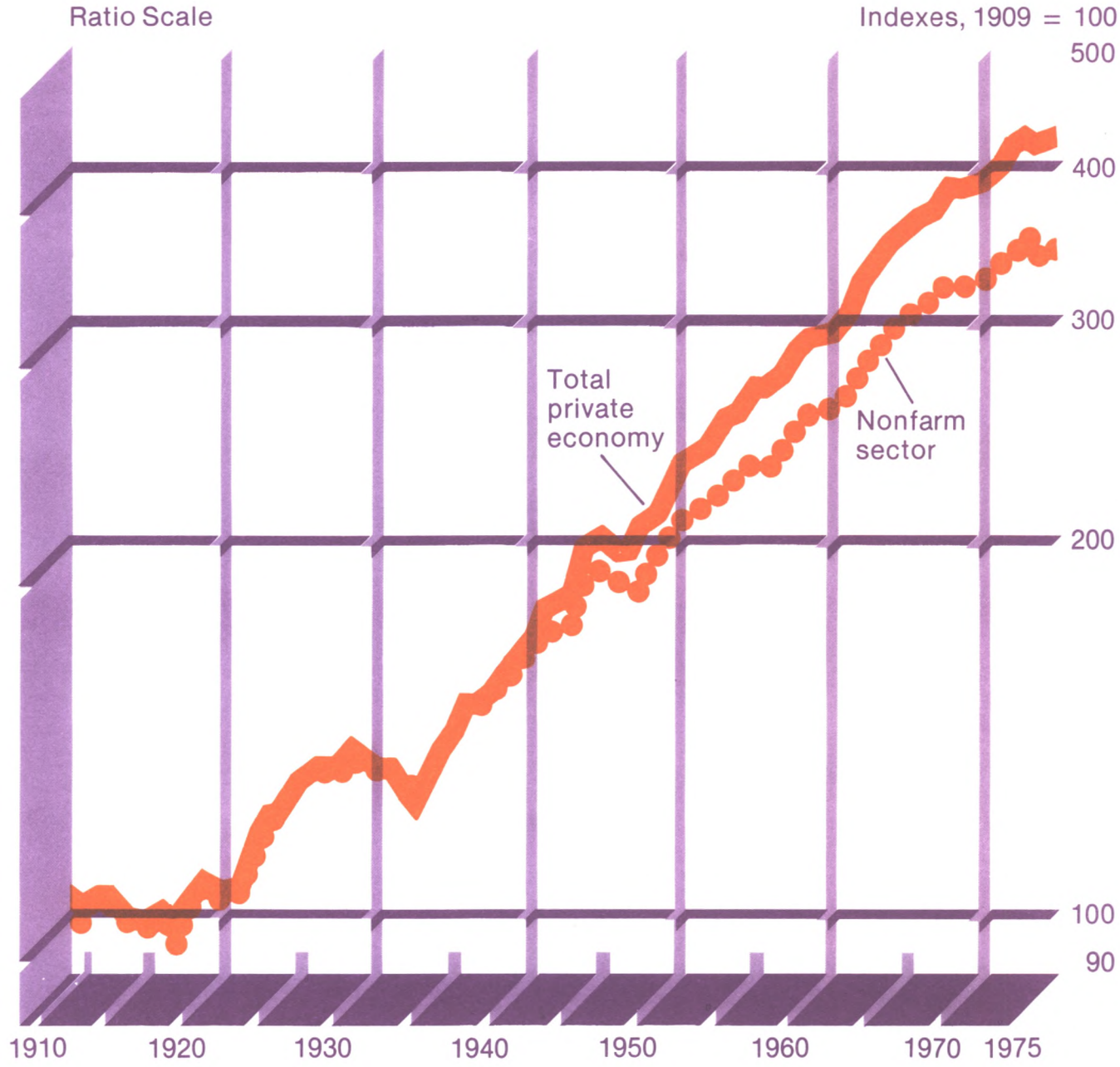
Productivity grew more slowly in the nonfarm sector than in the total private economy throughout the period. The largest differences between the rates of growth of the two measures occurred between 1941 and 1968.

Period	Output per hour of all persons (average annual percent change)	
	Total private economy	Nonfarm sector
1909-75	2.5	2.2
1909-29	1.6	1.7
1929-47	2.9	2.4
1947-75	2.8	2.4

1.

Output per hour of all persons in the total private economy and the nonfarm sector, 1909-75.

Source:
Bureau of Labor Statistics



Trends in the private and nonfarm business sectors

Over the last 25 years, productivity grew at an average rate of 2.8 percent a year in the private business sector and 2.3 percent a year in the nonfarm business sector. (The private and the nonfarm business sectors are terms which will be used throughout the remainder of this chartbook. They differ from the terms used in the first chart—the total private economy and the nonfarm sector—in that they exclude households, nonprofit institutions, and the gross housing product of owner-occupied dwellings, as well as the statistical discrepancy.)

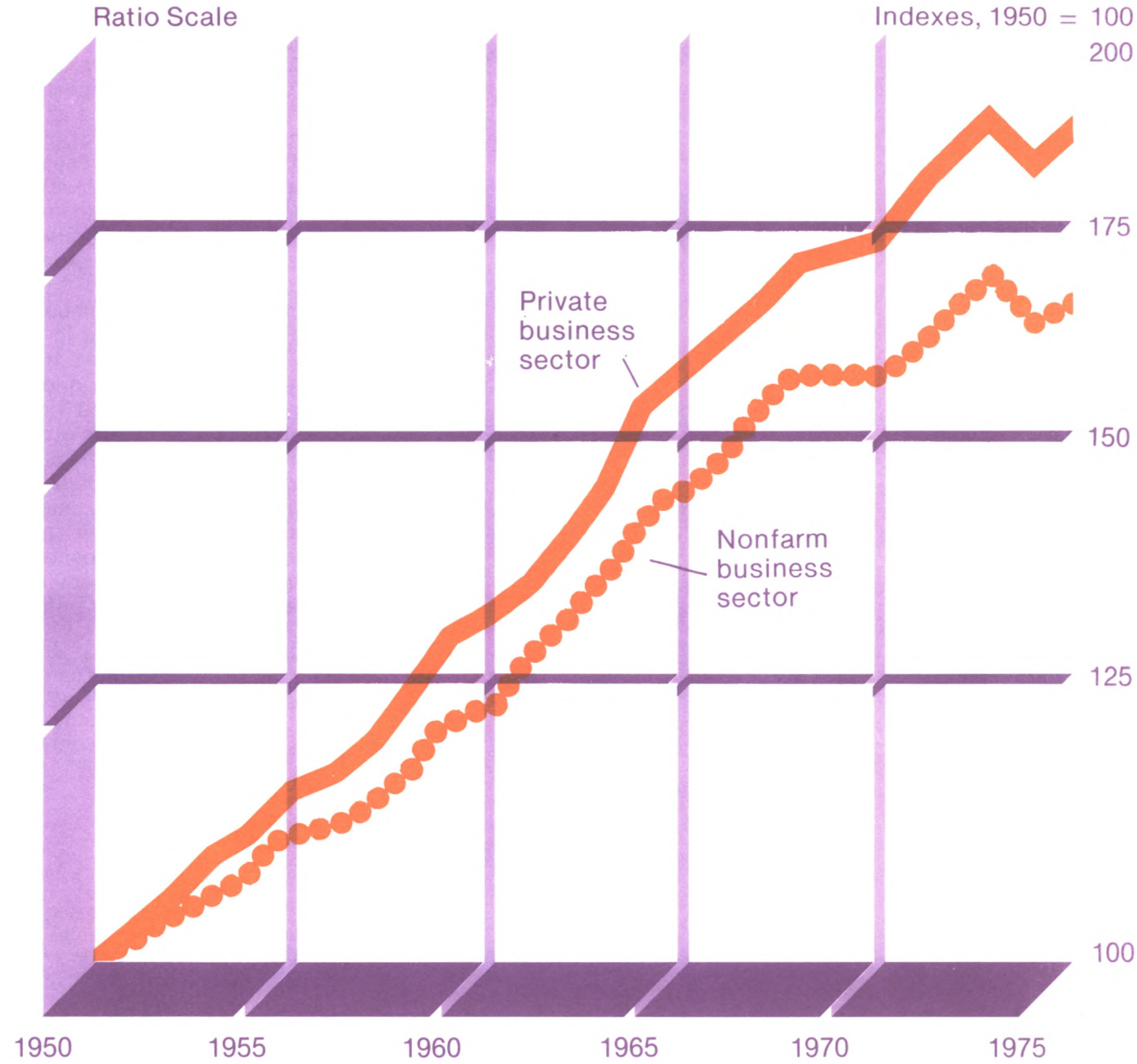
These long-term rates mask changes that took place during the period, especially after 1966. Productivity growth rates, which had averaged 3.1 percent a year in the private business sector and 2.6 percent a year in the nonfarm business sector between 1950 and 1967, fell to 1.4 and 1.2 percent a year, respectively, between 1967 and 1975.

Period	Output per hour of all persons (average annual percent change)	
	Private business sector	Nonfarm business sector
1950-75	2.8	2.3
1950-67	3.1	2.6
1967-75	1.4	1.2

2.

Output per hour of all persons in the private and nonfarm business sectors, 1950-75.

Source:
Bureau of Labor Statistics



The effect of employment shifts on productivity

Productivity movements in aggregates such as the private 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 private business sector without increasing in any of its component sectors just because employment shifted from low- to high-productivity sectors.

The preceding chart showed that productivity grew faster in the private than in the nonfarm business sector between 1950 and 1975. This situation reflected both the greater increase in farm productivity and the shift of workers out of the farm sector, where the level of productivity is relatively low, into higher productivity jobs in the nonfarm sector. The chart opposite shows the trend of labor productivity in the private 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 private business sector 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 1950, the effect of shifts among nonfarm sectors has contributed little more than 0.1 percentage point to the overall productivity growth rate.

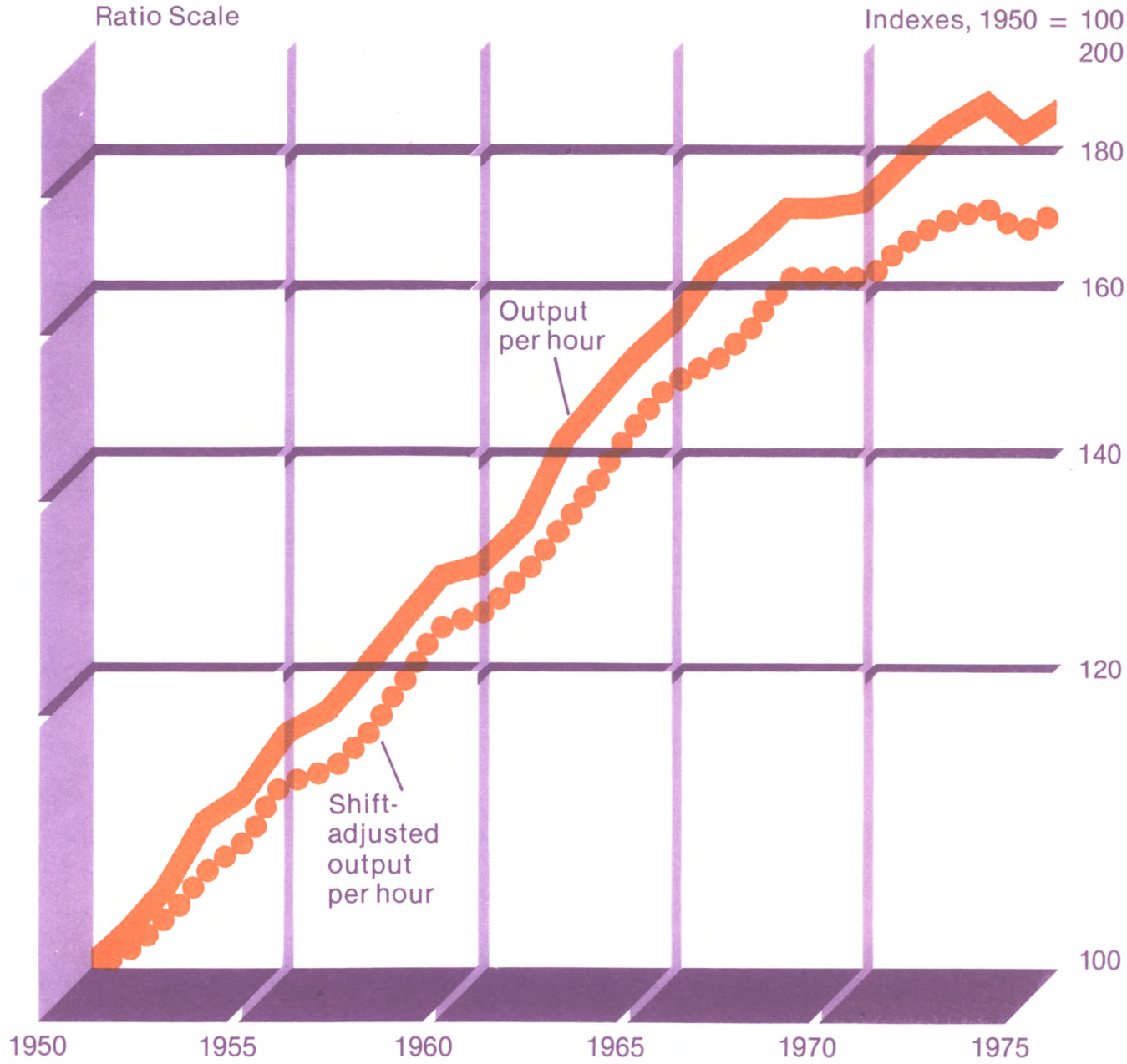
Period	Output per hour in the private business sector (average annual percent change)	Attributed to—		Shift effect as a percent of total productivity change
		Productivity effect	Shift effect	
1909-75	[1]2.3	2.0	0.3	12
1909-47	1.9	1.6	.3	14
1947-75	2.8	2.5	.3	11
1967-75	[1]1.5	1.4	.1	6

[1] These numbers differ slightly from those used elsewhere in the chartbook because they were computed as an average of annual rates of change rather than by the linear least squares method.

3.

Output per hour of all persons in the private business sector, adjusted for shifts in employment from the farm to the nonfarm business sector, 1950-75.

Source:
Bureau of Labor Statistics



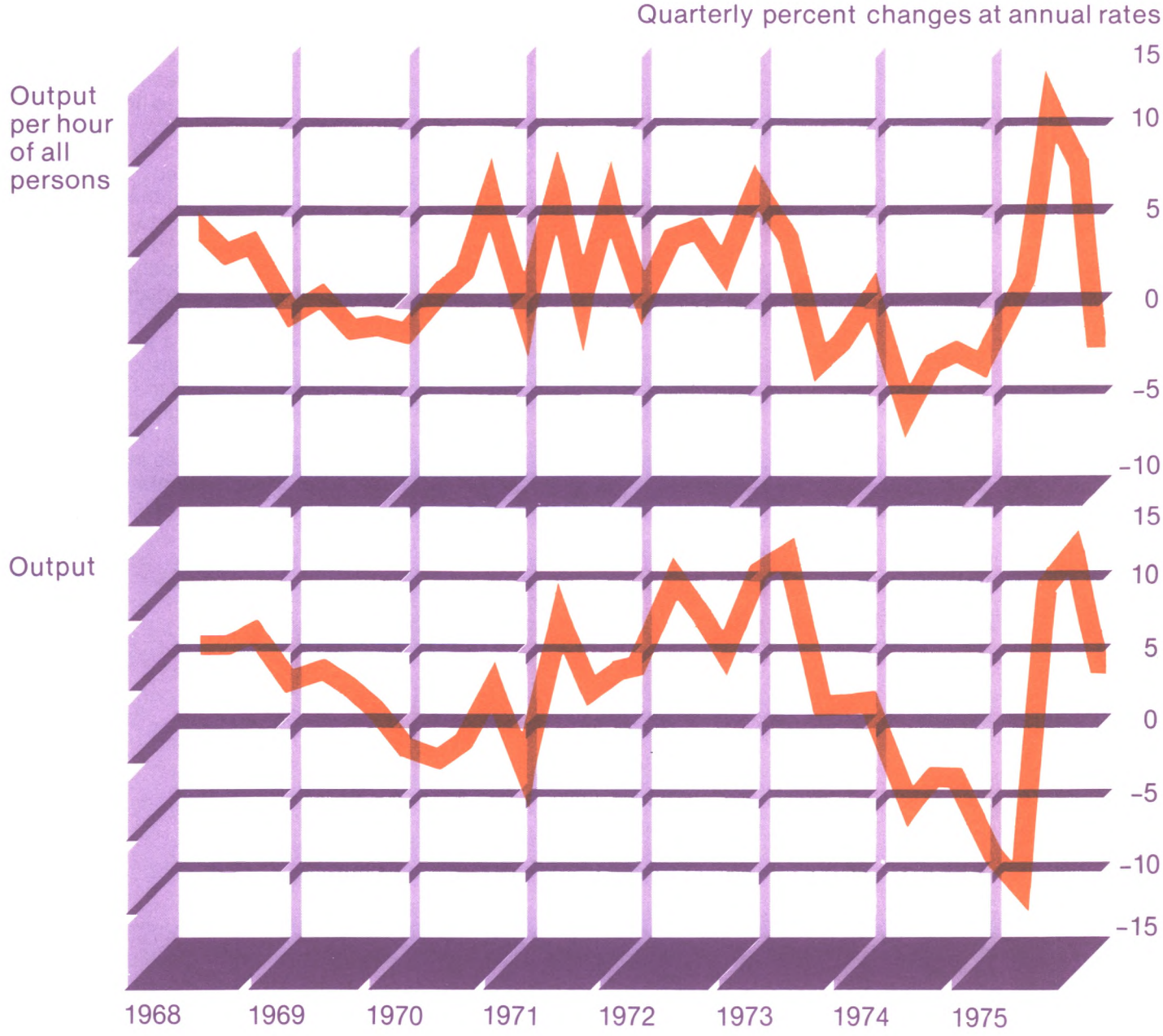
Recent trends

Productivity analysis varies with the length of the period studied: Long-term movements reveal secular trends; short-term movements, primarily cyclical effects. The chart shows that short-term changes in productivity generally parallel short-term changes in output, changes which in turn are closely associated with the business cycle. In the most recent contraction, for example, productivity began to decline in the second quarter of 1973 when output stagnated. It was not until the second quarter of 1975 that output, and consequently productivity, recovered.

4.

Output per hour of all persons and output in the private business sector, 1968-75.

Source:
Bureau of Labor Statistics



Productivity changes during the business cycle

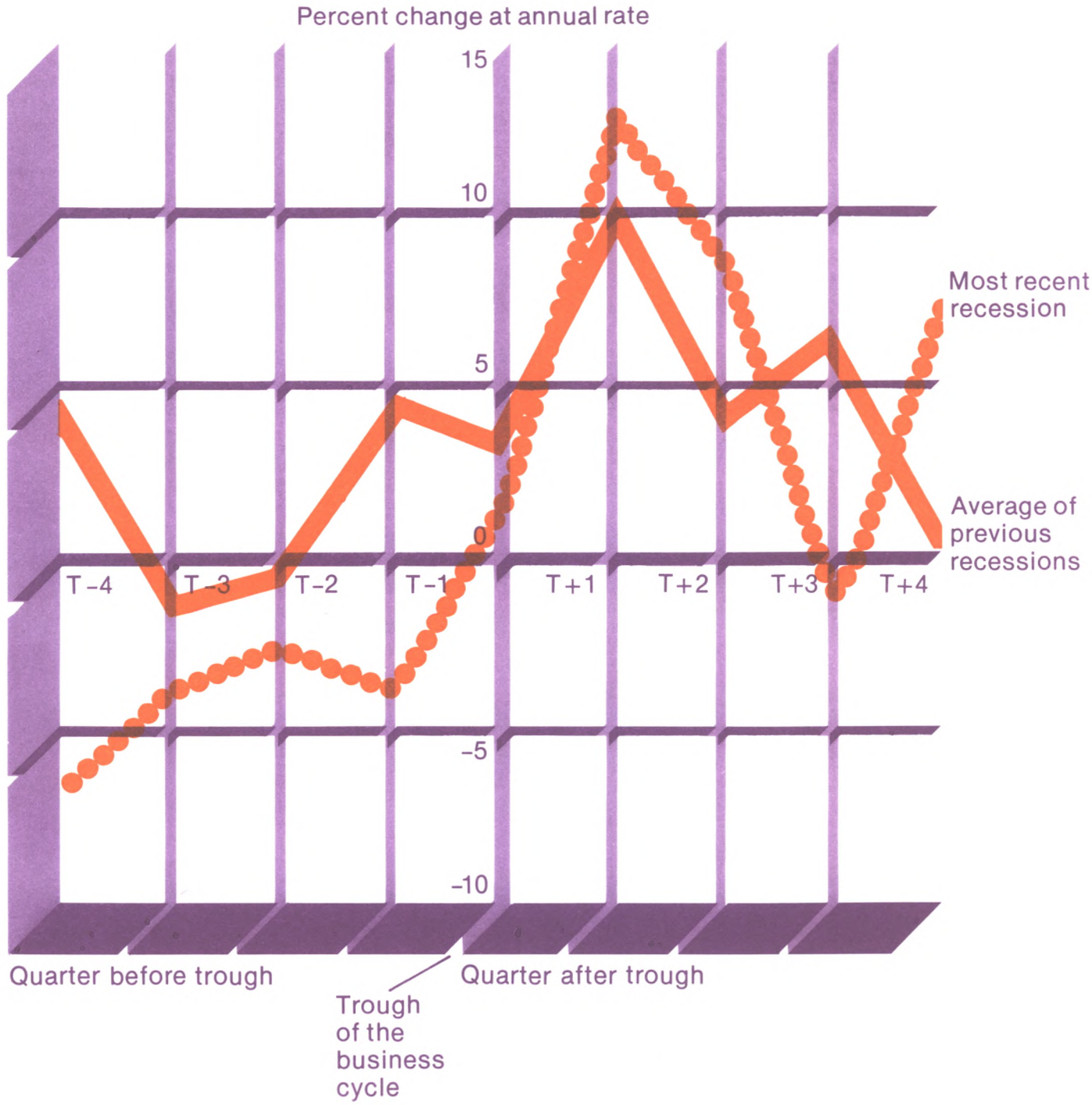
The chart shows the typical pattern of productivity movements during a recession and the subsequent recovery. In the most recent recession, productivity declined in six of the seven quarters preceding the trough reached in the first quarter of 1975. Productivity suffered more in the 1974-75 recession than it did in previous ones, due to the severe drop in output in this recession compared to the much smaller declines that characterized earlier recessions. Typically, productivity movements follow a pattern in the course of a business cycle. When business activity starts to decline, output per hour generally drops sharply, as capacity utilization falls below optimum rates and the level of labor input is maintained despite a decline in output. Once cost-cutting efforts get underway, adjustments are made and the decline in productivity is accordingly arrested or reversed. When business activity picks up again, output per hour increases at a faster rate because of higher capacity utilization. Then, after a sustained period of production increase, bottlenecks emerge, less efficient resources are brought into use, and the rate of productivity advance declines again.

Productivity rose significantly in the second and third quarters of 1975 and by the fourth quarter had almost regained its 1973 level. Although the "lost" productivity was almost made up, the recession meant that the growth in output and employment that could have occurred in the absence of a recession did not take place.

5.

Output per hour of all persons in the private business sector during the most recent and previous recessions.

Source:
Bureau of Labor Statistics



Trends in major sectors

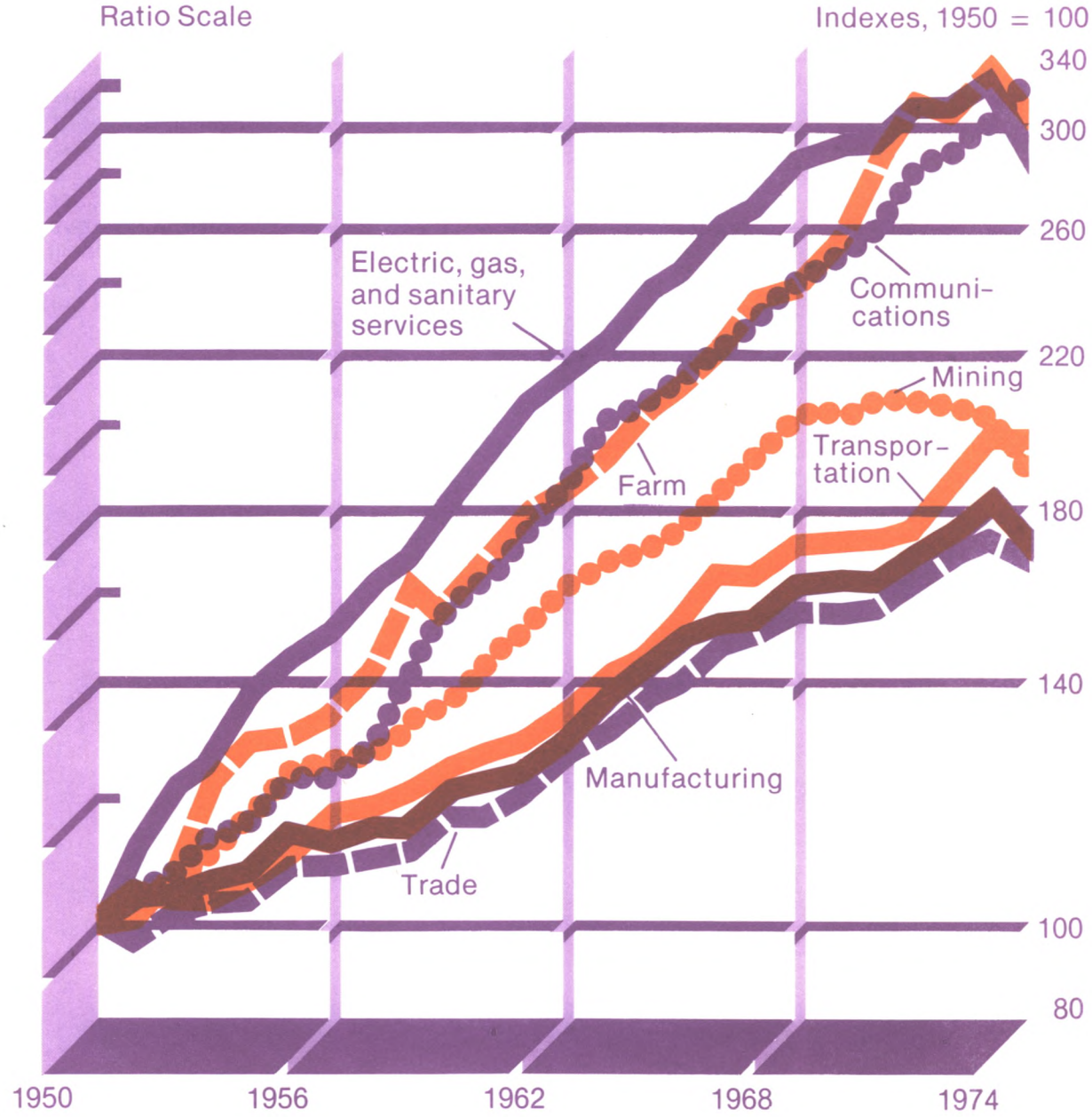
Productivity growth varies from sector to sector as well, over both the short and the long term. Between 1950 and 1974, the average improvement in labor productivity for sectors shown in the chart ranged from 5.2 percent a year in communications to 2.6 percent a year in manufacturing and trade. Sectors for which adequate productivity information is not yet available—services, construction, and finance, insurance, and real estate—are estimated to have had even lower long-term rates of productivity growth.

Sector	Output per hour (average annual percent change)		
	1950-74	1950-67	1967-74
Communications	5.2	5.5	4.6
Electricity, gas, and sanitary services	4.9	5.9	1.4
Farm	5.1	5.2	4.6
Manufacturing	2.6	2.7	2.2
Mining	3.3	3.9	−0.1
Trade	2.6	2.6	2.0
Transportation	3.1	3.0	2.7

6.

Output per hour of all persons by major sector, 1950-74.

Source:
Bureau of Labor Statistics



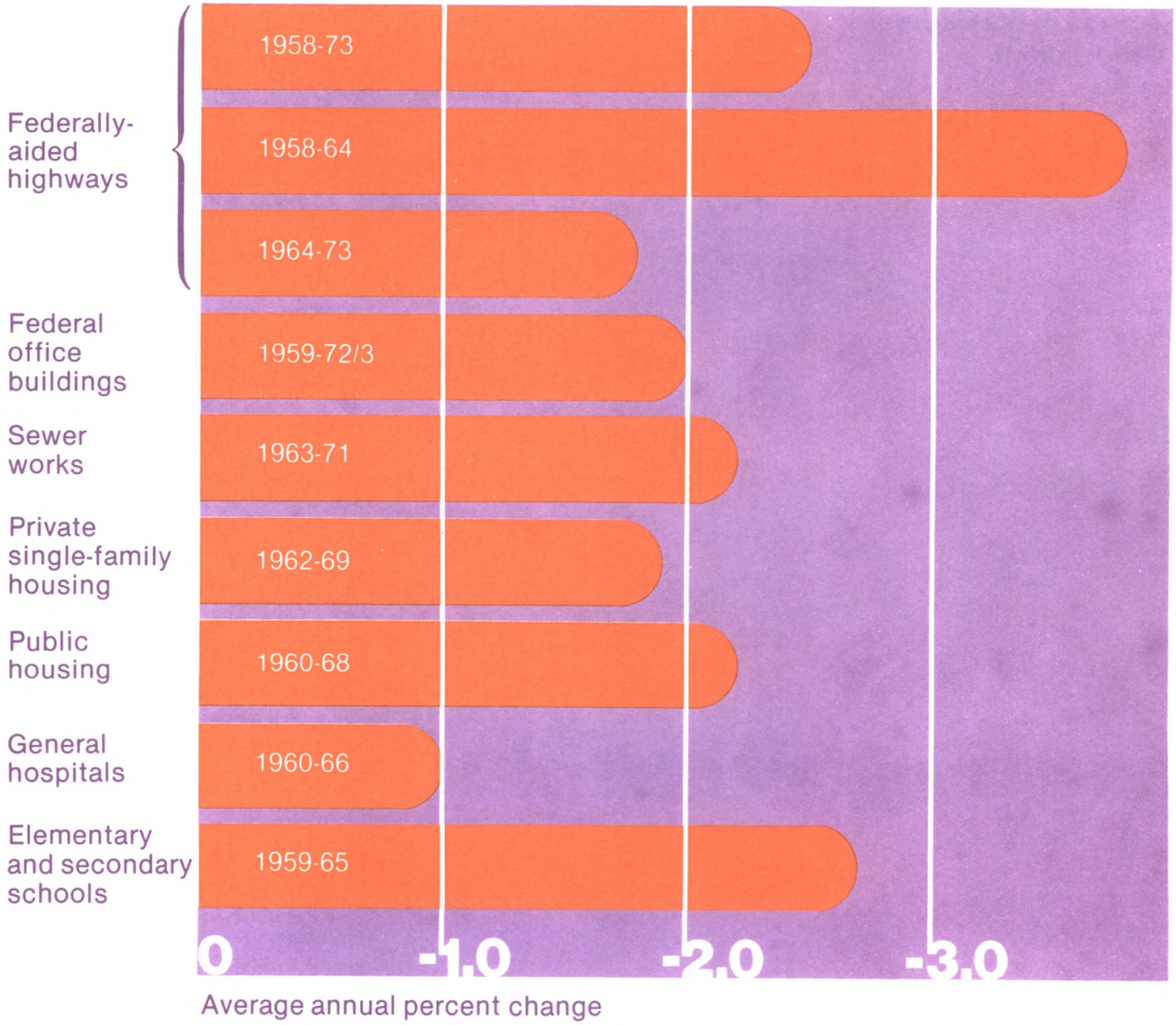
Trends in construction labor requirements

Technical problems still impede development of an adequate productivity measure for the construction sector. Consequently, the best available insight into changes in construction productivity is provided by comparing labor and materials requirements for various types of construction over time. Labor requirements declined for all types of construction studied by the BLS during recent periods, but the rates of decline in labor requirements varied considerably by type of construction. The sharpest decline occurred in highway construction in the early 1960's; the decline continued, but at a slackened pace after 1964. The average decline for building construction was about 2 percent a year, ranging from 1 percent for general hospitals to 2.7 percent for elementary schools.

7.

Decline in onsite labor requirements for various types of new construction, selected periods.

Source:
Bureau of Labor Statistics



Trends in the Federal Government

The public sector is still another sector for which productivity information has been lacking until recently. As this sector accounts for 1 out of every 6 jobs in the economy, its productivity has a significant impact on the Nation's economic performance.

In recent years, BLS has developed and refined productivity measures for a substantial portion of the Federal sector, which employs 20 percent of all government workers. Currently, these measures cover about 65 percent of Federal civilian employment. Productivity increased in the measured sample at a rate of 1.3 percent a year between 1967 and 1975, a combination of a 1.3 percent annual increase in output with unchanged employment.

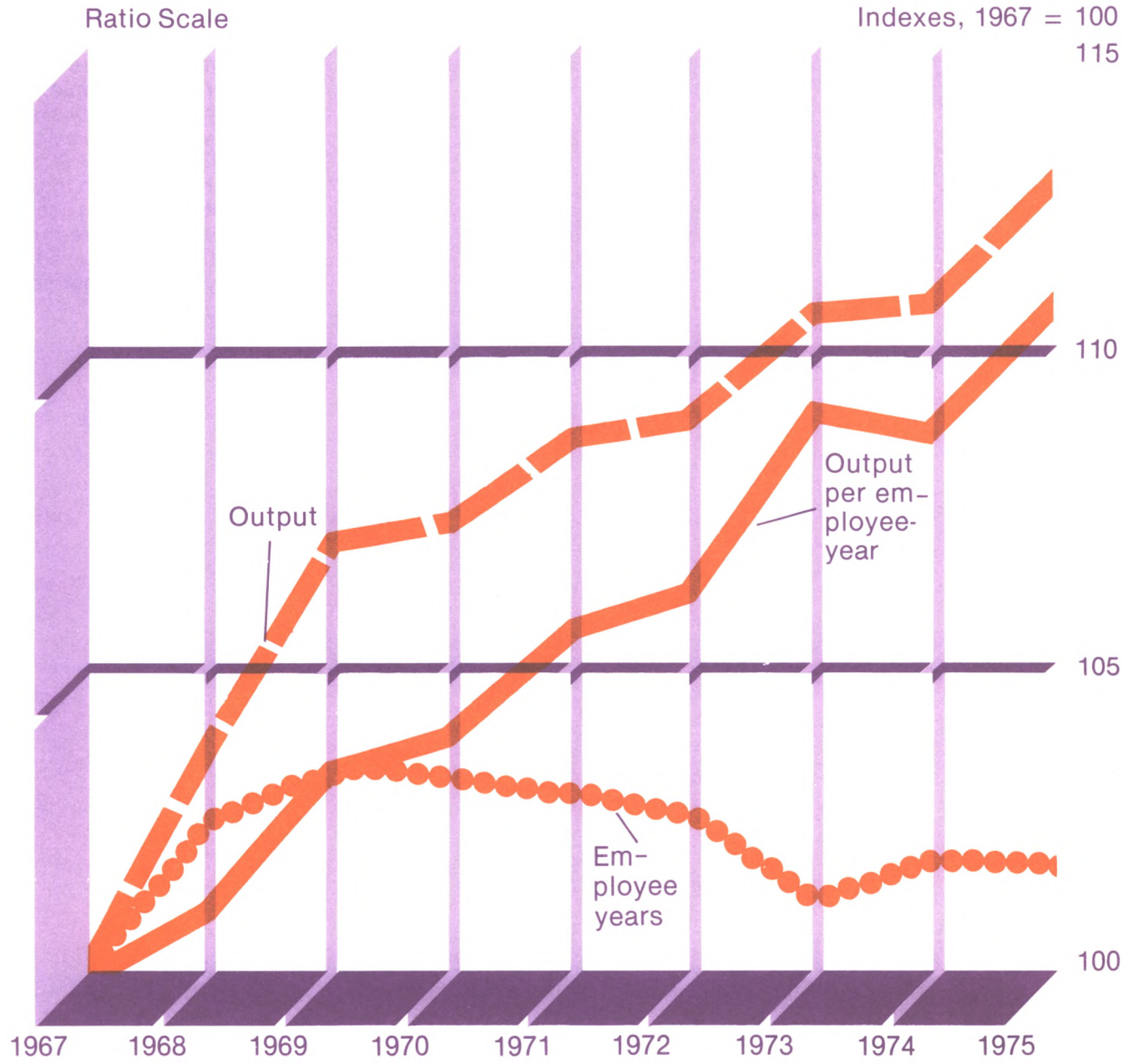
The overall productivity rate masks a variety of rates found in the different functional groupings for which productivity is measured. Growth in output per employee-year between 1967 and 1975 ranged from an annual increase of 6.5 percent for general support services to an annual decrease of 2.4 percent in standard printing.

Functional grouping	Output per employee-year, 1967-75 (average annual percent change)
Total	1.3
Agriculture and natural resources	1.8
Citizens' records	2.7
Education and training	.3
Facilities maintenance	.6
Finance and accounting	1.5
General support services	6.5
Internal audit	2.7
Library services	4.2
Loans and grants	5.6
Medical services	— .4
Military base services	—2.0
Overhaul, repair of equipment, and vehicle maintenance	.6
Personnel management	2.1
Postal Service	1.1
Power—production and distribution	2.5
Procurement	1.3
Reference services	— .1
Regulation—finance	3.8
Regulation—inspection and enforcement	3.2
Regulation—employment and labor relations	3.2
Regulation—rulemaking and licensing	2.4
Specialized manufacturing	2.7
Standard printing	—2.4
Supply	1.4
Transportation	2.5

8.

Output per employee-year, output, and employee years in the Federal Government, total measured sample, fiscal years 1967-75.

Source:
Bureau of Labor Statistics



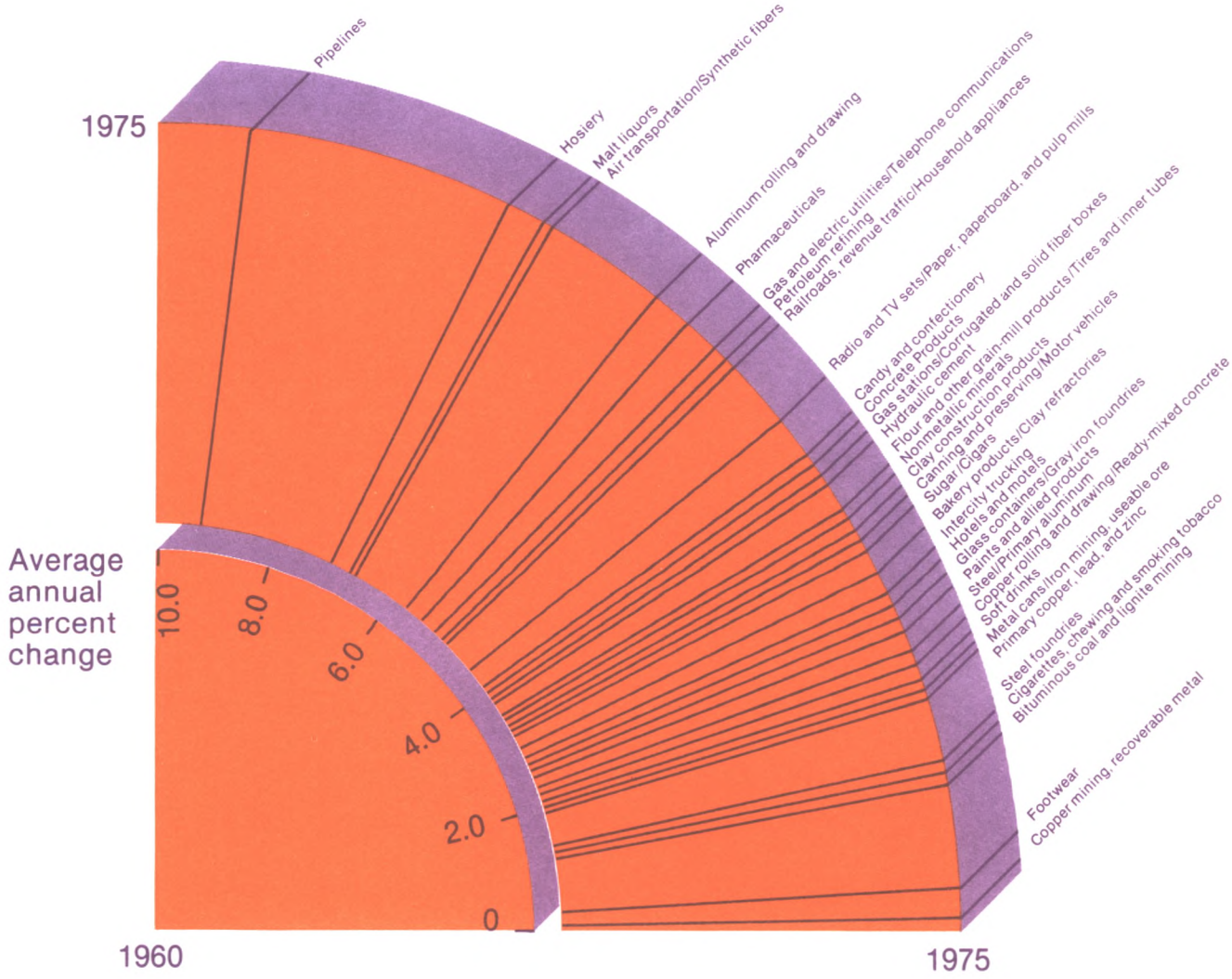
Trends in industries

Productivity growth varies from industry to industry for a variety of reasons, many of them unique to the industry. For example, the large advance in productivity in air transportation was caused by the introduction of jets in the 1960's and the consequent expansion in traffic. An equivalent increase in productivity in hosiery manufacture arose from a combination of increased demand caused by fashion change and increased production efficiency due to new, advanced machinery. At the other extreme, the lack of productivity growth in the footwear industry results from the fact that footwear producers have found adoption of mass-production methods difficult. Low productivity gains in copper mining reflect the declining proportion of recoverable ore available once the richest veins were exhausted.

9.

Output per employee-hour in selected industries, 1960-75.

Source:
Bureau of Labor Statistics



International comparisons: Trends in output per employed civilian

The rate of change in real gross domestic product (GDP) per employee between 1950 and 1975 varied substantially among the countries compared. Productivity grew slowly in Canada, the United States, and the United Kingdom in comparison with the other countries, especially Japan.

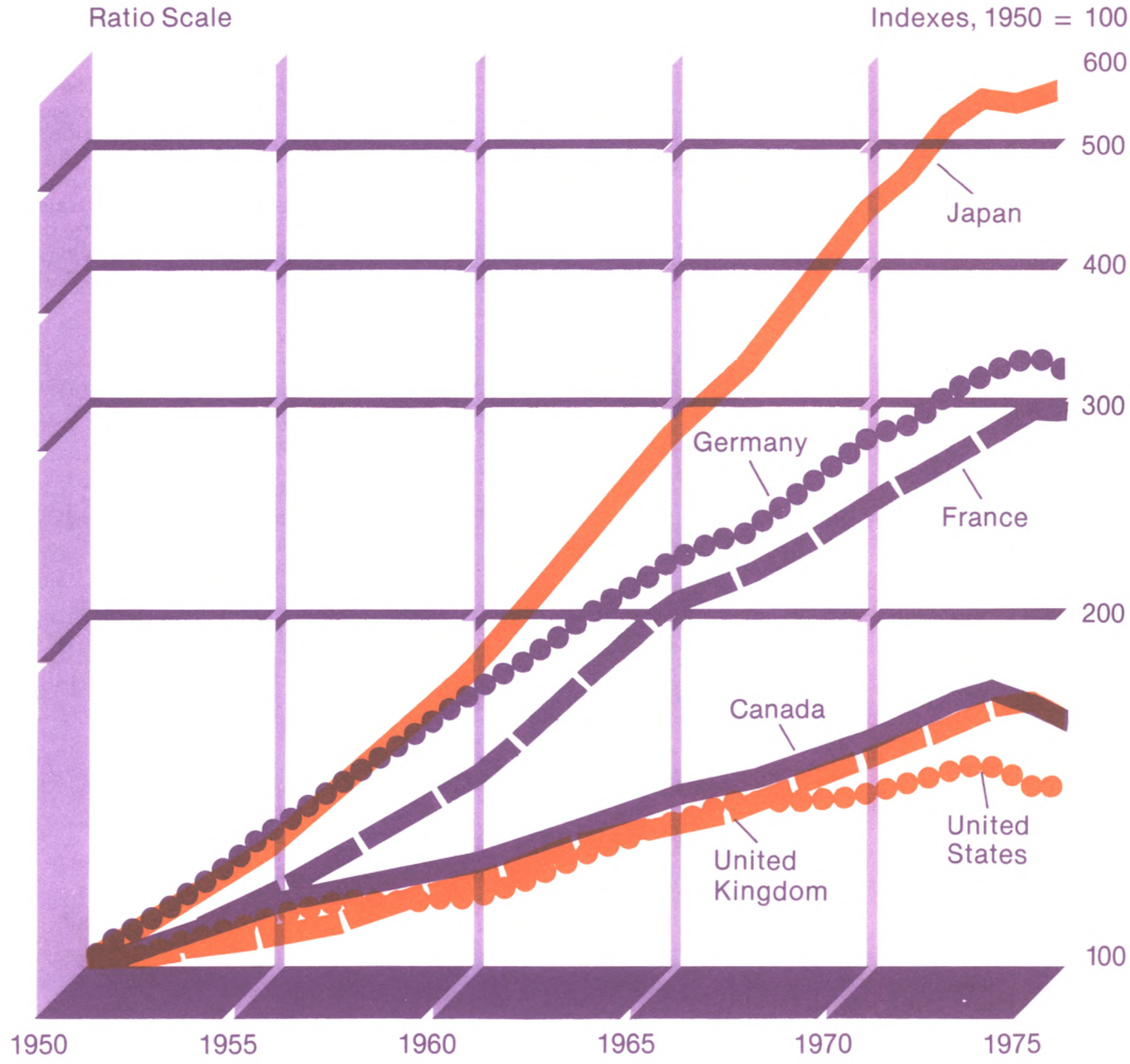
The rate of growth varied within the same period for each country, largely reflecting the effect of the business cycle. All the countries compared had a lower rate of growth between 1967 and 1975 than they did between 1950 and 1967. The 1975 recession was primarily responsible for the slowdown in Japan and the European countries shown and was an important contributing factor for the United States and Canada as well.

Country	Real gross domestic product per employed civilian (average annual percent change)		
	1950-75	1950-67	1967-75
United States	1.7	2.4	0.4
Canada	2.2	2.6	1.4
France	4.4	4.7	3.8
Germany	4.8	5.2	4.0
Japan	7.2	7.4	6.9
United Kingdom	2.2	2.4	2.0

10.

Real gross domestic product (GDP) per employed civilian in selected countries, 1950-75.

Source:
Bureau of Labor Statistics



International comparisons: Trends in manufacturing

Manufacturing productivity has grown since 1950 at substantially different rates in the major industrialized countries. Between 1950 and 1975, average annual gains in output per employee-hour ranged from 2.6 percent in the United States to 9.2 percent in Japan. In spite of the U.S. growth rate's being the lowest among the countries compared, available evidence indicates that the United States continues to have the highest level of manufacturing productivity, though this may not be true for all industries.

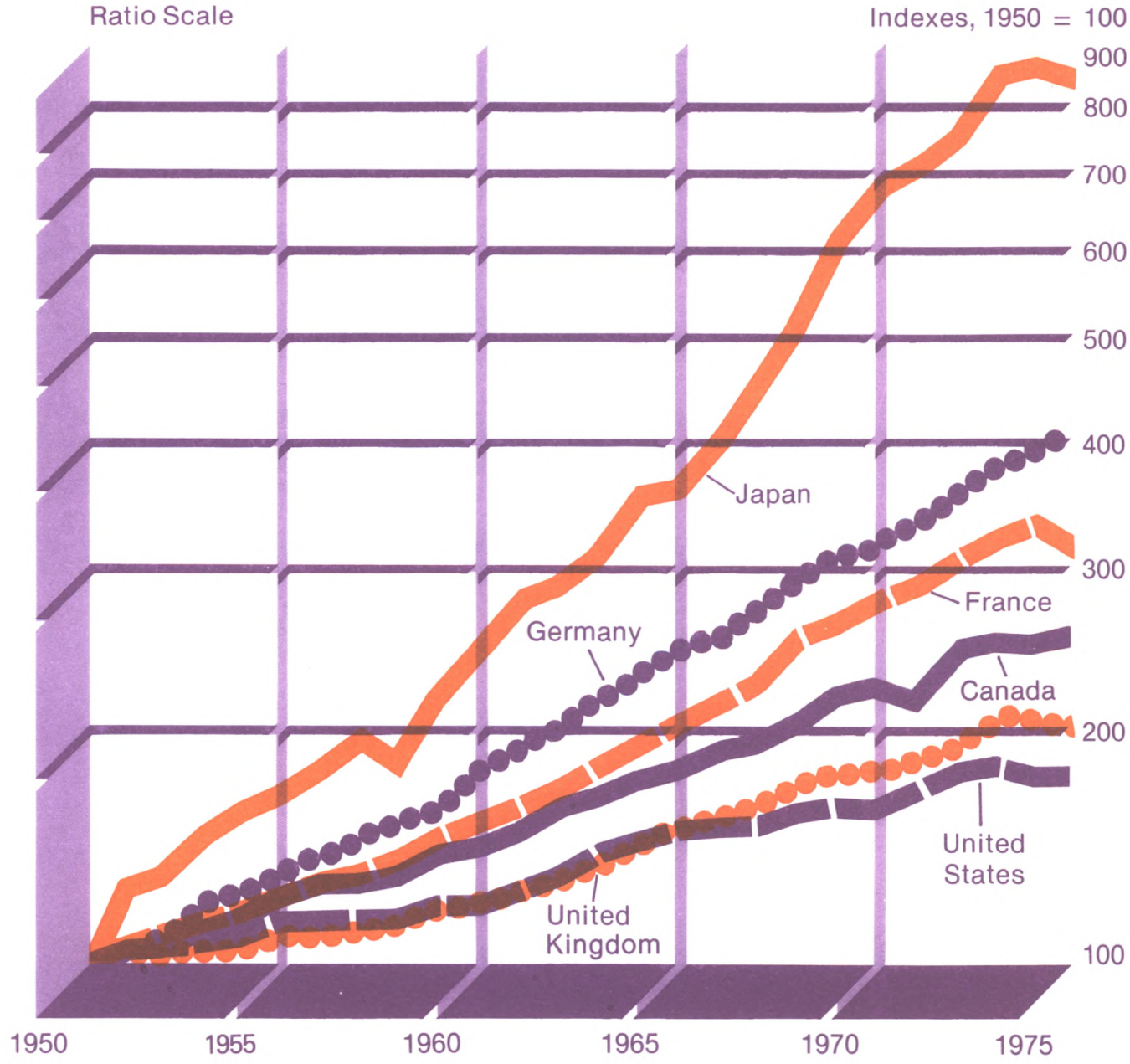
The 1975 recession affected all the countries compared and resulted in a general lowering of productivity growth rates for the 1967-75 period compared to 1950-67. (The rates for the 1967-74 period were slightly higher than those for 1950-67.)

Country	Output per employee-hour (average annual percent change)		
	1950-75	1950-67	1967-75
United States	2.6	2.7	2.1
Canada	4.1	4.1	3.6
France	5.3	4.9	4.6
Germany	6.0	6.2	5.2
Japan	9.2	8.6	8.2
United Kingdom	3.4	3.0	3.2

11.

Output per employee-hour in manufacturing in selected countries, 1950-75.

Source:
Bureau of Labor Statistics



International comparisons: Productivity levels in the iron and steel industry

In a very few industries, sufficient data exist to permit comparing not only the change in productivity over time but also the level of productivity at different times. BLS has made such comparisons in the iron and steel industry going back to 1964.

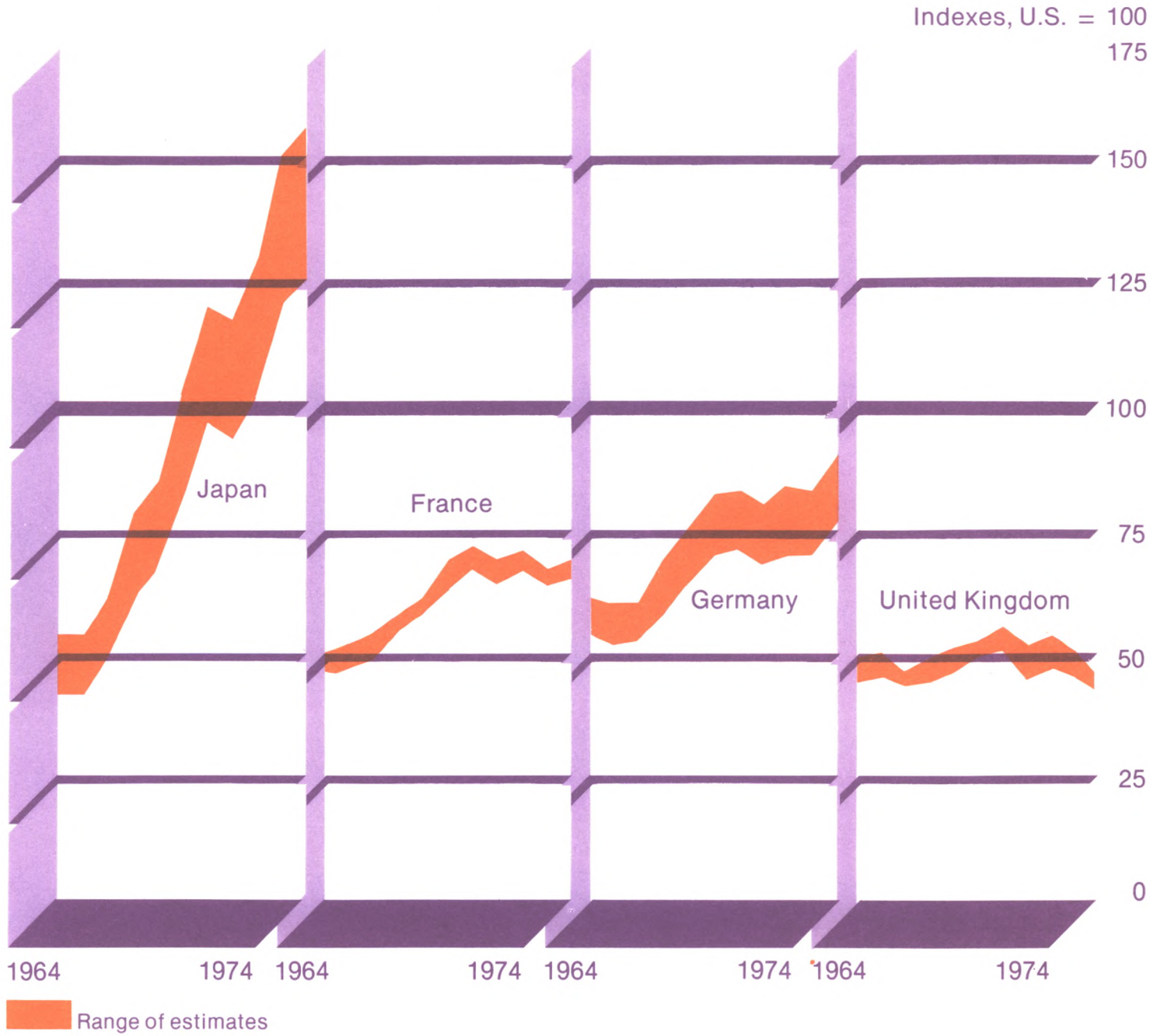
In 1964, U.S. productivity greatly exceeded the levels reached in other major steel-producing countries. Output per employee-hour in Germany was only about 60 percent of the U.S. level, and in France, Japan, and the United Kingdom, it was around 50 percent. By 1974, however, though labor productivity in the British steel industry was still about half the U.S. level, the French industry was up to two-thirds, the German industry had reached over three-fourths, and the Japanese industry had exceeded the U.S. level.

Country	Output per employee-hour, 1964-74 (average annual percent change)
United States	2.1
France	5.9
Germany	6.3
Japan	14.6
United Kingdom	2.2

12.

Levels of output per employee-hour in the iron and steel industry, selected countries, 1964-74.

Source:
Bureau of Labor Statistics



PART II

A. Implications of productivity growth for costs and prices

Productivity movements are an important factor in cost and price changes. This aspect of productivity change stems from the role of output per hour as a critical link between the cost of labor and the price of goods.

In most industries, labor costs, including hourly rates of pay, overtime, and all types of fringe benefits, are the largest single cost element. Consequently, the trend of labor costs per unit of output plays a major role in determining the price of a product or service. If the effect of an increase in unit labor costs can be minimized by a greater increase in productivity, pressure to increase prices will obviously be lessened, although changes in materials cost per unit of output may offset this effect.

On the other hand, changes in unit labor costs can be a result as well as a cause of price rises. Price increases that cause employee purchasing power to fall lead to pressure for higher wages. If the wage increases exceed productivity growth, unit labor costs will increase also.

These relationships come into play at all economic levels, ranging from individual industry measures within a country to international comparisons at the total economy level. For these reasons, achieving productivity growth can be a matter of concern to workers and consumers as well as to employers and stockholders.

Productivity, unit labor costs, and compensation

Productivity change is an important determinant of cost movements. Due to the relative stability of growth in hourly compensation, changes in unit labor costs have a close inverse relation to changes in output per hour. The two top panels of the chart are almost a mirror image of each other, and show that unit labor costs tend to rise when productivity growth slows and to slow or decline when productivity growth accelerates.

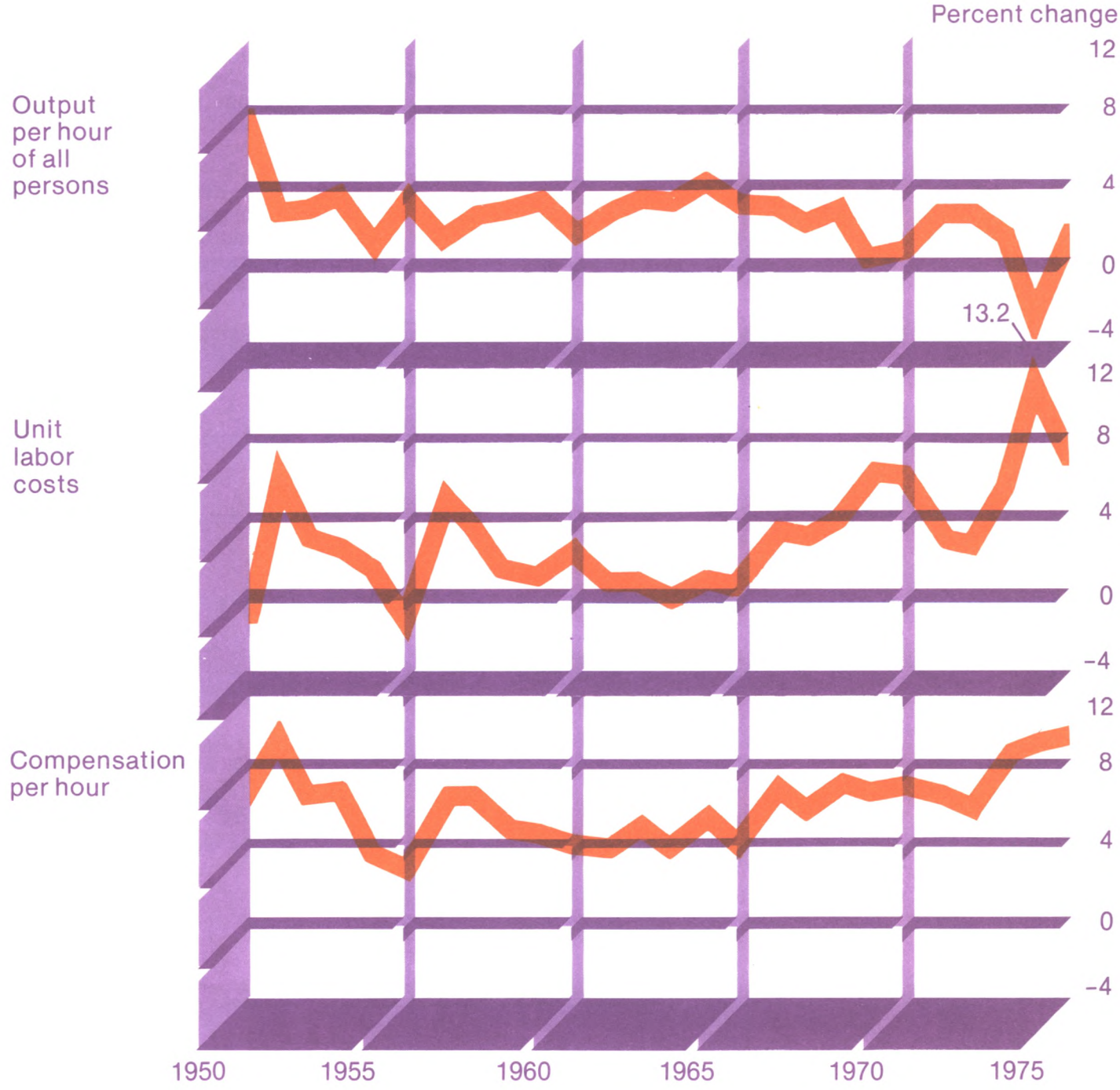
Although the rate of change in hourly compensation does vary over time, year-to-year fluctuations in this measure are not as pronounced as those that characterize productivity. Changes in compensation per hour also influence changes in unit labor costs. For instance, the large annual increase in unit labor costs between 1967 and 1975 resulted as much from the increase in the rate of growth of hourly compensation as from the decrease in the rate of productivity improvement.

Period	Average annual percent change		
	Output per hour	Unit labor costs	Compensation per hour
1950-75	2.8	2.7	5.6
1950-67	3.1	1.8	5.0
1967-75	1.4	5.9	7.4

13.

Output per hour of all persons and labor costs in the private business sector, 1950-75.

Source:
Bureau of Labor Statistics



Recent changes in productivity, unit labor costs, and compensation

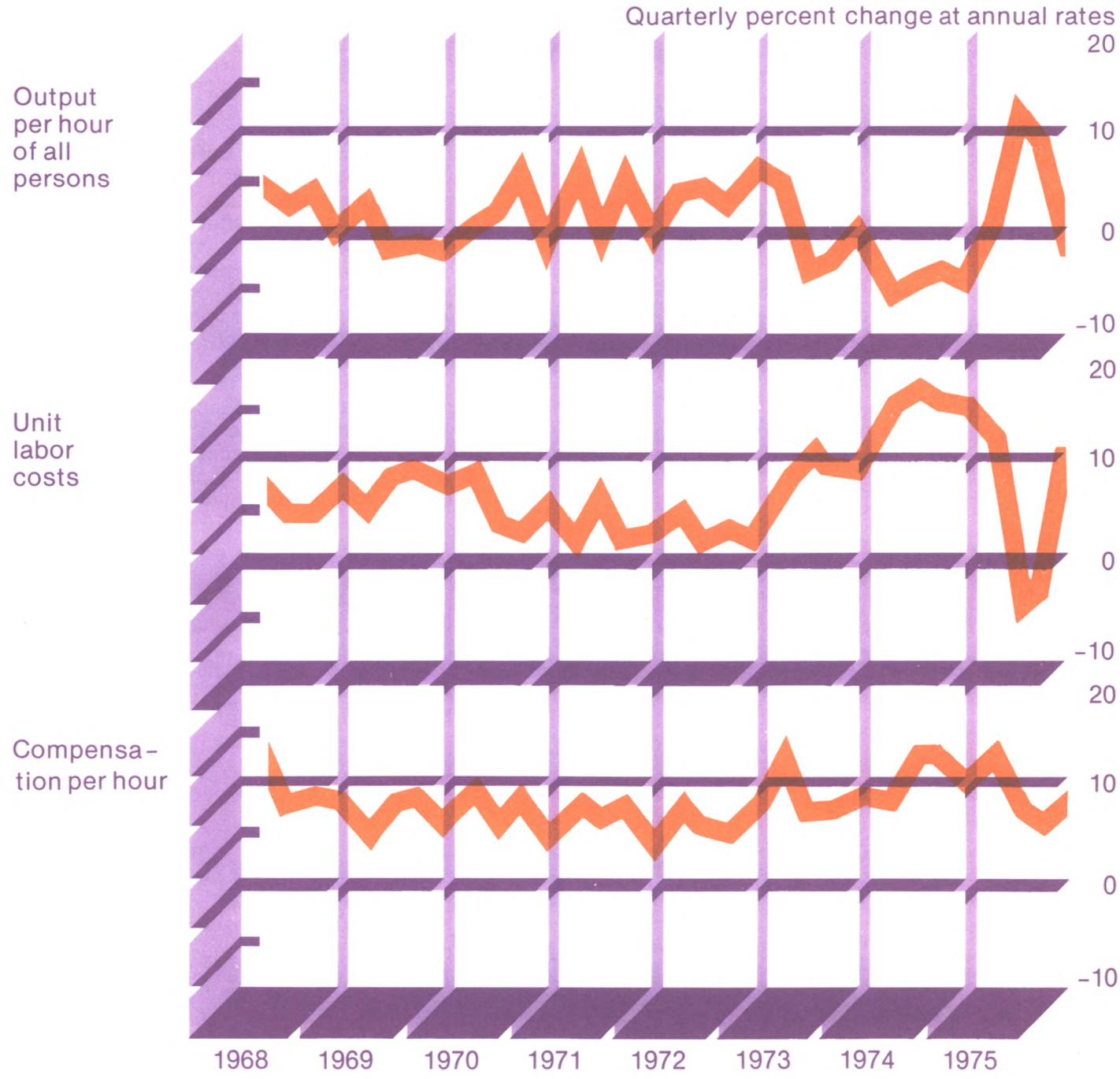
Unit labor cost movements are influenced by productivity change which, in turn, is influenced by short-run changes in output. In 1971 and 1972, the economic upswing was reflected in productivity growth which offset gains in hourly compensation. As a result, quarterly increases in unit labor costs were generally smaller in these 2 years than they had been in the preceding few years, when growth in compensation far exceeded growth in productivity.

Then, when productivity declined in 1973 and 1974, unit labor costs shot up. This increase was moderated somewhat in 1975 when productivity began to grow again. Hourly compensation continued to increase at about the same rate, but unit labor costs actually declined in the second and third quarters of 1975 under the impetus of unusually high productivity growth.

14.

Output per hour of all persons and labor costs in the private business sector, 1968-75.

Source:
Bureau of Labor Statistics



Unit labor costs during the business cycle

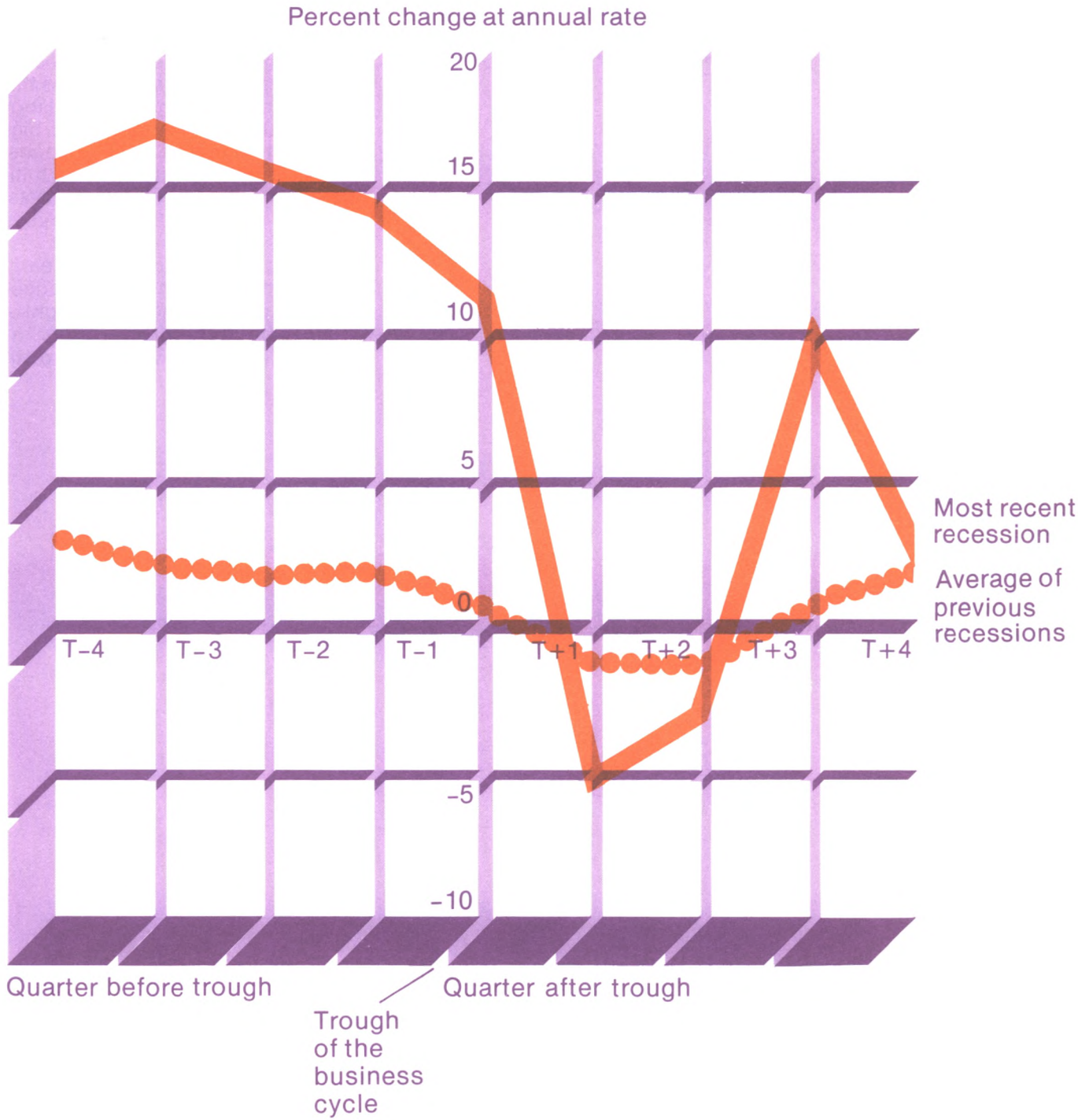
The inverse relationship between productivity and unit labor costs accounts in large part for the increased attention given to productivity measurement during periods of recession and/or inflation. Throughout a business cycle, movements in unit labor costs respond directly to productivity changes due to the small effect the cycle has on hourly labor compensation. Thus, during the expansion phase of the business cycle, productivity rises and unit labor costs either fall, or rise more slowly, depending on the rate of change in compensation per hour. As the business upswing matures, unit labor costs advance more rapidly as productivity growth slows. When the downturn begins and output falls, productivity usually falls also, resulting in more rapid increases in unit labor costs. Near the trough of the cycle, business continues to contract, the pressure of rising costs leads to a reduction in employment and hours, and unit labor costs either rise more slowly or decline as the recovery begins and productivity grows rapidly.

The chart shows this pattern clearly. Unit labor costs increased much more rapidly in the latest business contraction than in the previous ones because hourly compensation advanced at a faster pace than in earlier cycles. Thus the general pattern of rising unit labor costs in the downturn phase of the cycle and later falling, or more slowly rising, unit labor costs during the recovery phase, was particularly pronounced.

15.

Unit labor costs in the private business sector during the most recent and previous recessions.

Source:
Bureau of Labor Statistics



Productivity, unit labor costs, and prices

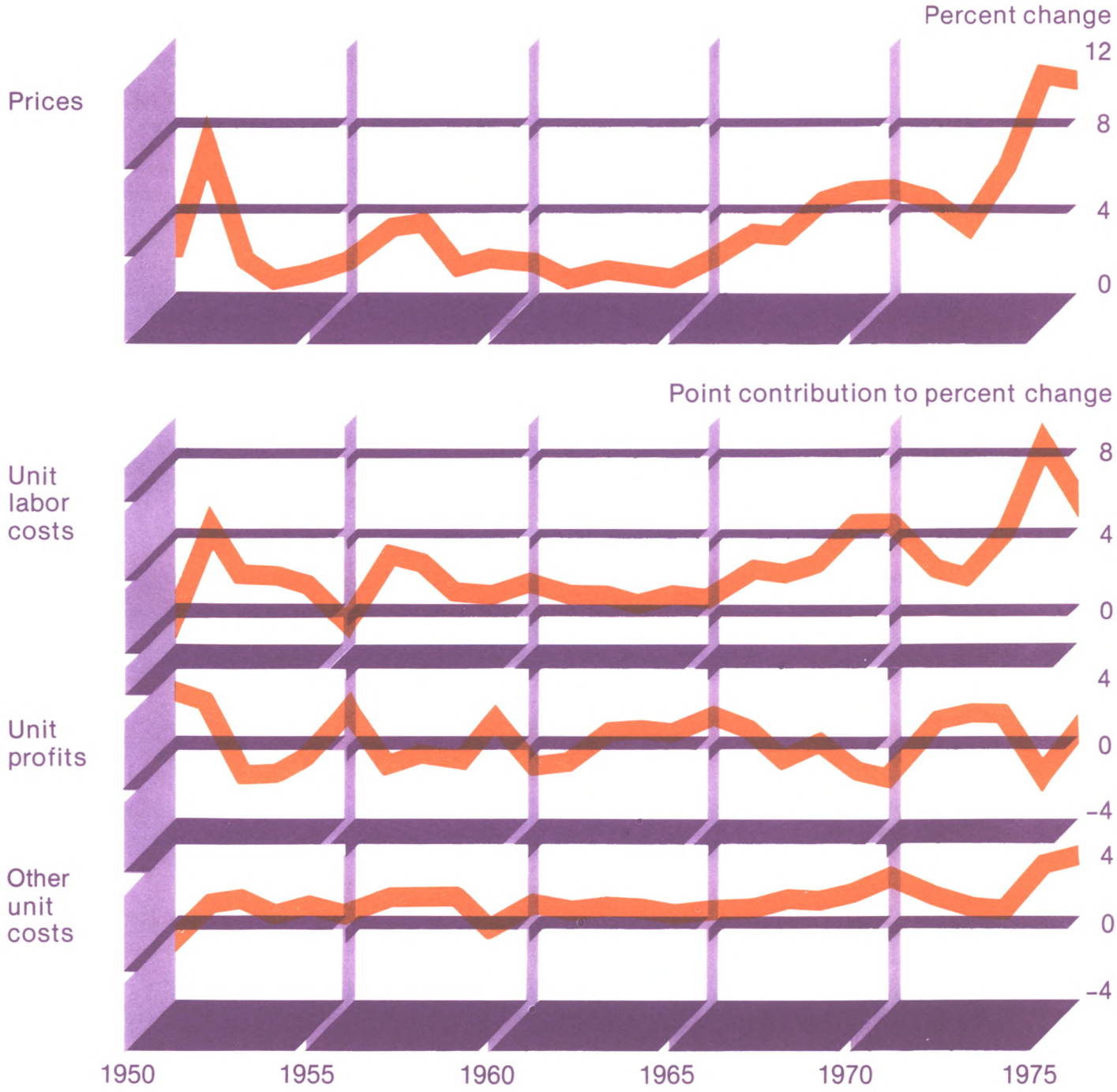
The relationship between productivity and unit labor costs is particularly important when it comes to analyzing changes in prices. As the chart shows, changes in unit labor costs generally are the single biggest component of price changes. Thus, if productivity growth mitigates increases in unit labor costs, this will in turn mitigate increases in prices.

During periods such as the early 1960's, the unit labor cost component of price change was slight—mainly because productivity increases kept pace with the growth of hourly compensation. 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 took place. However, by 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.

16.

Composition of price changes in the private business sector, 1950-75.

Source:
Bureau of Labor Statistics



Productivity and unit profits

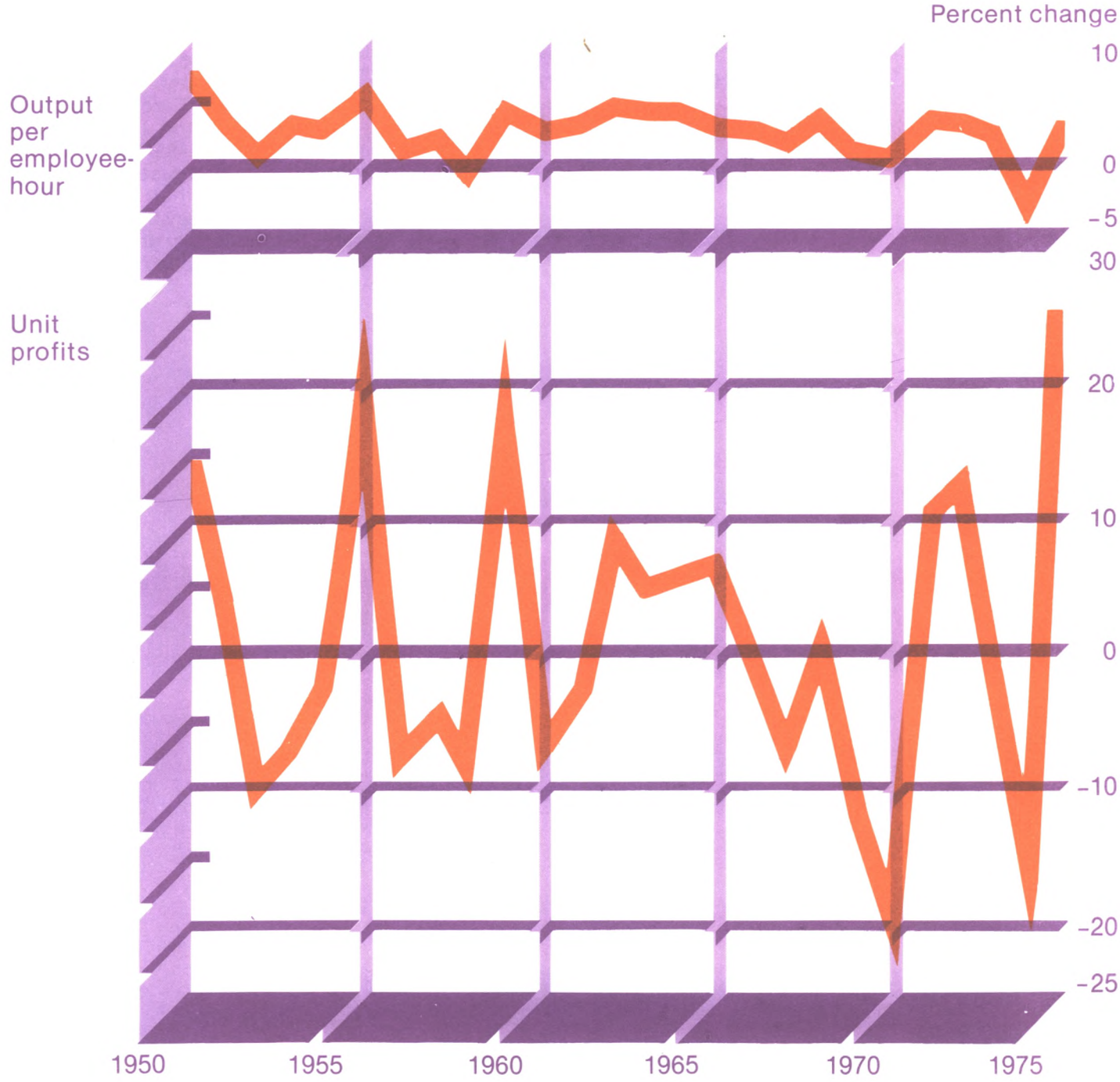
Although profits per unit are affected by many factors, they have generally increased when productivity has grown rapidly and decreased during periods of reduced productivity growth.

Because profits accrue only after all the other factors of production have been compensated, this measure varies widely from year to year. Nevertheless, the chart shows that unit profits and productivity fluctuate in the same direction, even though the magnitude of the fluctuation differs. For example, between 1962 and 1966, unit profits had their longest period of sustained growth, paralleling a period of relatively high productivity growth. When productivity growth slowed in the late 1960's, unit profits dropped, only to pick up again along with productivity in the recovery that followed in the early 1970's.

17.

Output per employee-hour and unit profits in the nonfinancial corporate sector, 1950-75.

Source:
Bureau of Labor Statistics



International comparisons: Productivity, unit labor costs, and compensation in manufacturing, 1950-67

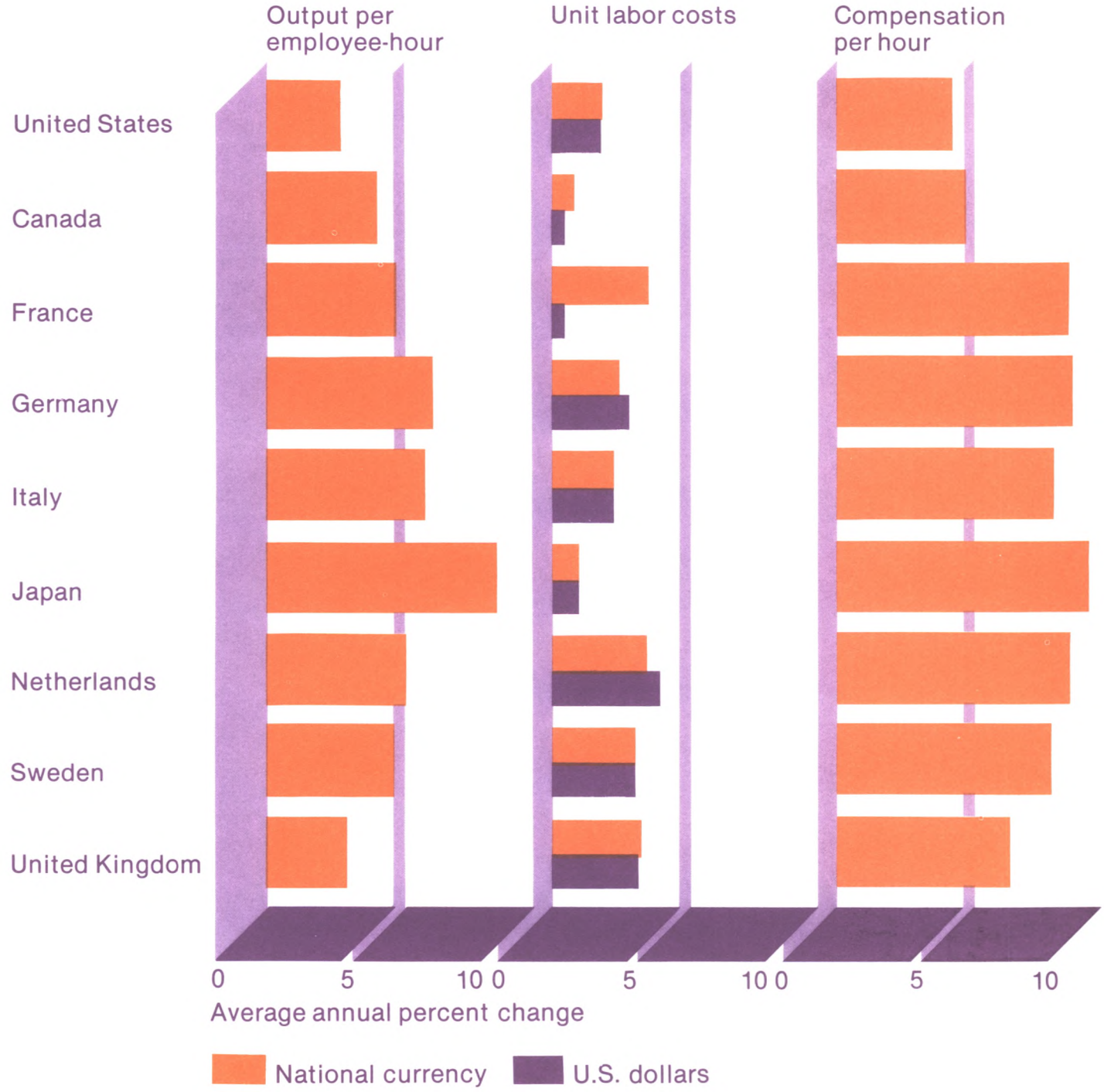
Between 1950 and 1967, unit labor costs in manufacturing, measured in terms of national currencies, rose less in the United States than in Western Europe but more than in Canada and Japan. All the foreign countries studied had larger percentage increases in hourly compensation than the United States did, but they also had faster rates of productivity growth. In both Canada and Japan, productivity growth more nearly matched compensation growth than it did in the United States, which accounts for the relatively slower rate of growth of unit labor costs in these two countries.

On a U.S. dollar basis, France also had a smaller rate of increase in unit labor costs than the United States did because the franc was devalued during the period.

18.

Output per employee-hour and labor costs in manufacturing, selected countries, 1950-67.

Source:
Bureau of Labor Statistics



International comparisons: Productivity, unit labor costs, and compensation in manufacturing, 1967-75

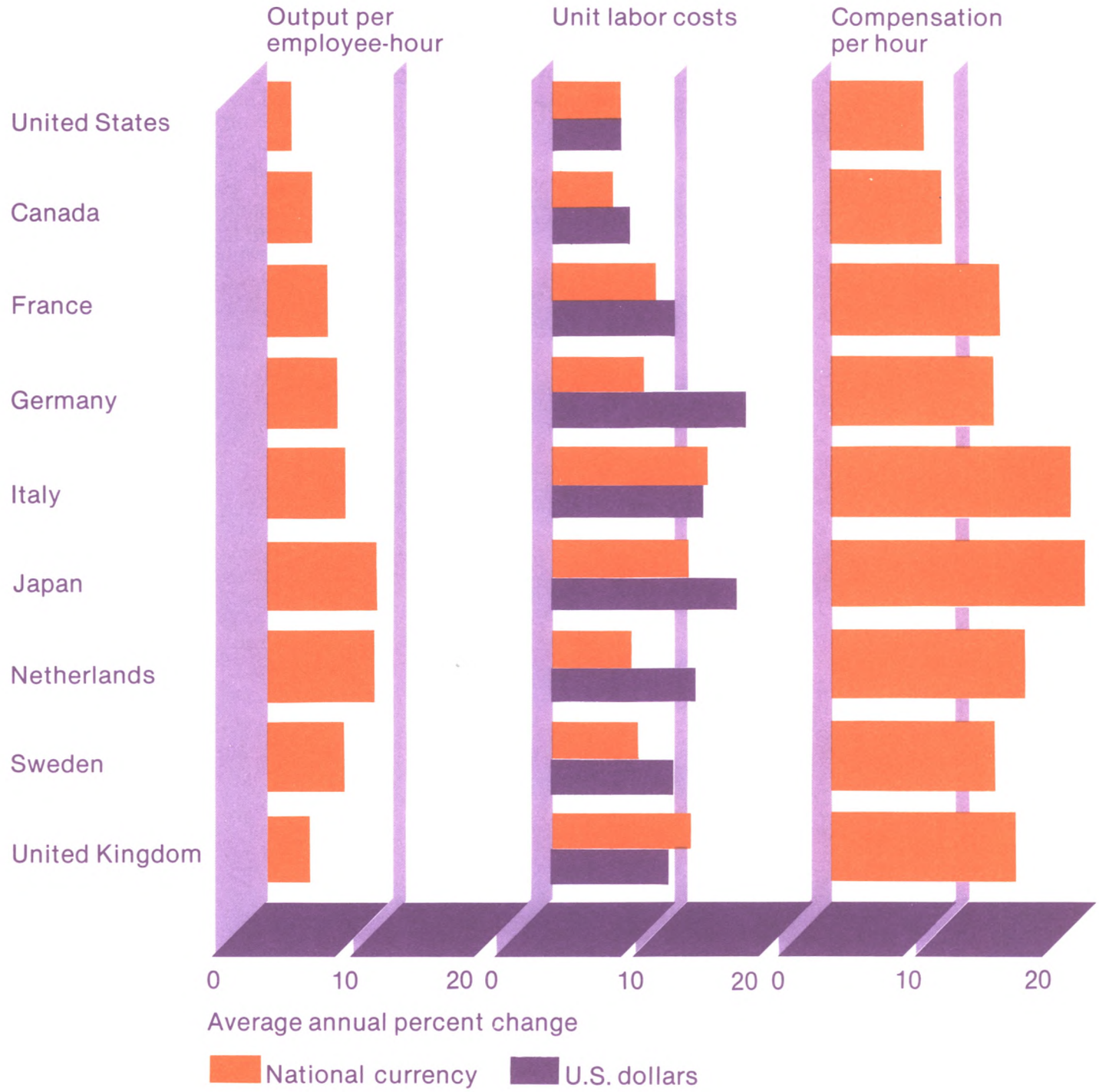
Unit labor costs reflect the interplay of wage and productivity changes. This relationship explains the sharp increase in unit labor costs in manufacturing that took place in the major industrialized countries between 1967 and 1975. Hourly compensation grew rapidly in all the countries studied, but more rapidly abroad than in the United States. Consequently, while productivity continued to grow at a faster rate abroad than in the United States, unit labor costs abroad also grew at a faster rate. Only Canada had a lower rate of growth in unit labor costs, and that only on a national currency, not a U.S. dollar, basis.

The relative cost position of the United States was further improved by the general realignment of the world's major currencies that took place in 1971 and the devaluation of the dollar in 1973. After these changes in currency values are taken into account, the average 1967-75 rates of increase in unit labor costs abroad, expressed in U.S. dollars, ranged from 6 percent in Canada to almost 15 percent in Germany, compared with only 5.3 percent in the United States.

19.

Output per employee-hour and labor costs in manufacturing, selected countries, 1967-75.

Source:
Bureau of Labor Statistics



Recent changes in productivity, unit labor costs, compensation, and prices in major sectors

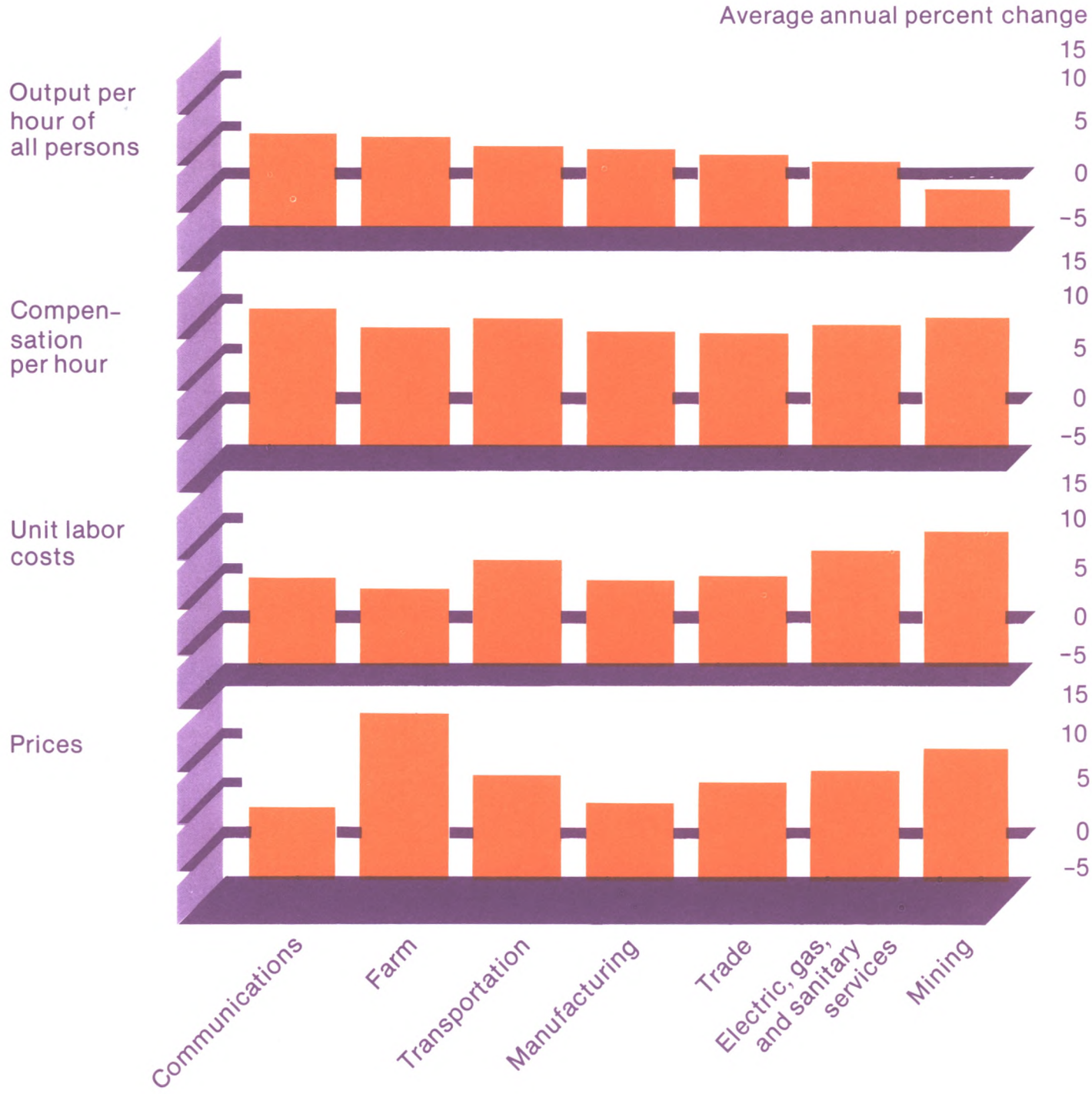
The rate of productivity growth in a sector is generally reflected in the trends of costs and prices of the sector's output. Unit labor costs and prices usually rise most in sectors where productivity is growing slowly and least in sectors where productivity is growing rapidly.

Between 1968 and 1974, with the exception of the farm sector where other factors came into play, prices rose most in mining, the only sector in which productivity declined, and least in communications, the sector where productivity grew the most. Trends in hourly compensation did not vary as widely from sector to sector as productivity, prices, and costs did, but the highest increase was in communications, and the lowest in manufacturing and trade, where productivity increases were relatively moderate.

20.

Output per hour of all persons, prices, and labor costs in major sectors, 1968-74.

Source:
Bureau of Labor Statistics



Industry productivity and prices

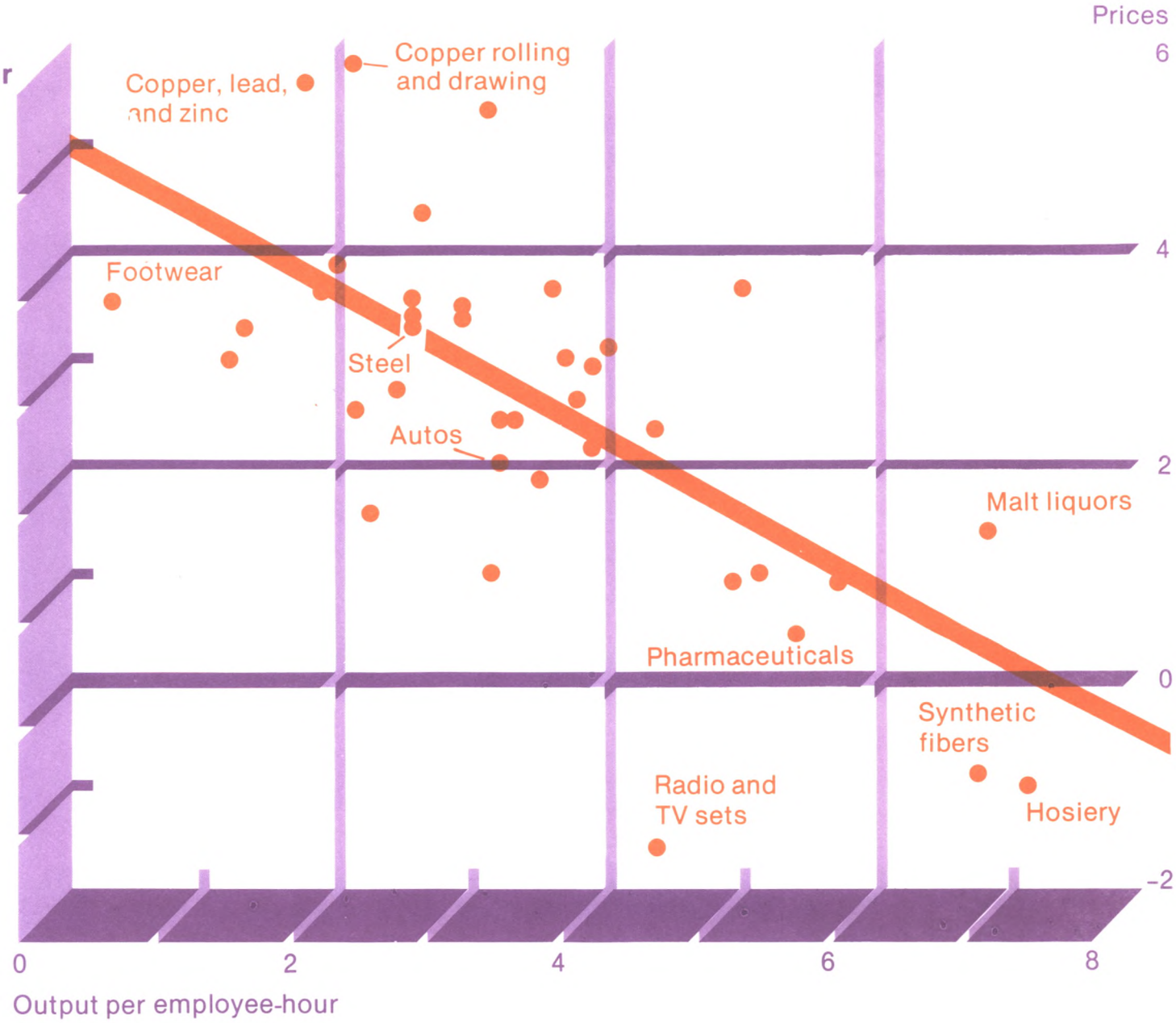
A close inverse relationship between changes in prices and changes in productivity exists at the industry level, too. Prices declined between 1960 and 1974 in industries such as hosiery, synthetic fibers, and radio and TV sets, where the rate of productivity gain was larger than average. At the same time, prices increased in industries such as footwear and copper, where productivity advances were small. Although there are some exceptions, the pattern shows that prices of products made by industries with high rates of productivity growth tend either to decline or if they increase, to do so slowly.

21.

Output per employee-hour and prices in selected industries, 1960-74.

Average annual percent change

Source:
Bureau of Labor Statistics



Industry productivity and hourly compensation

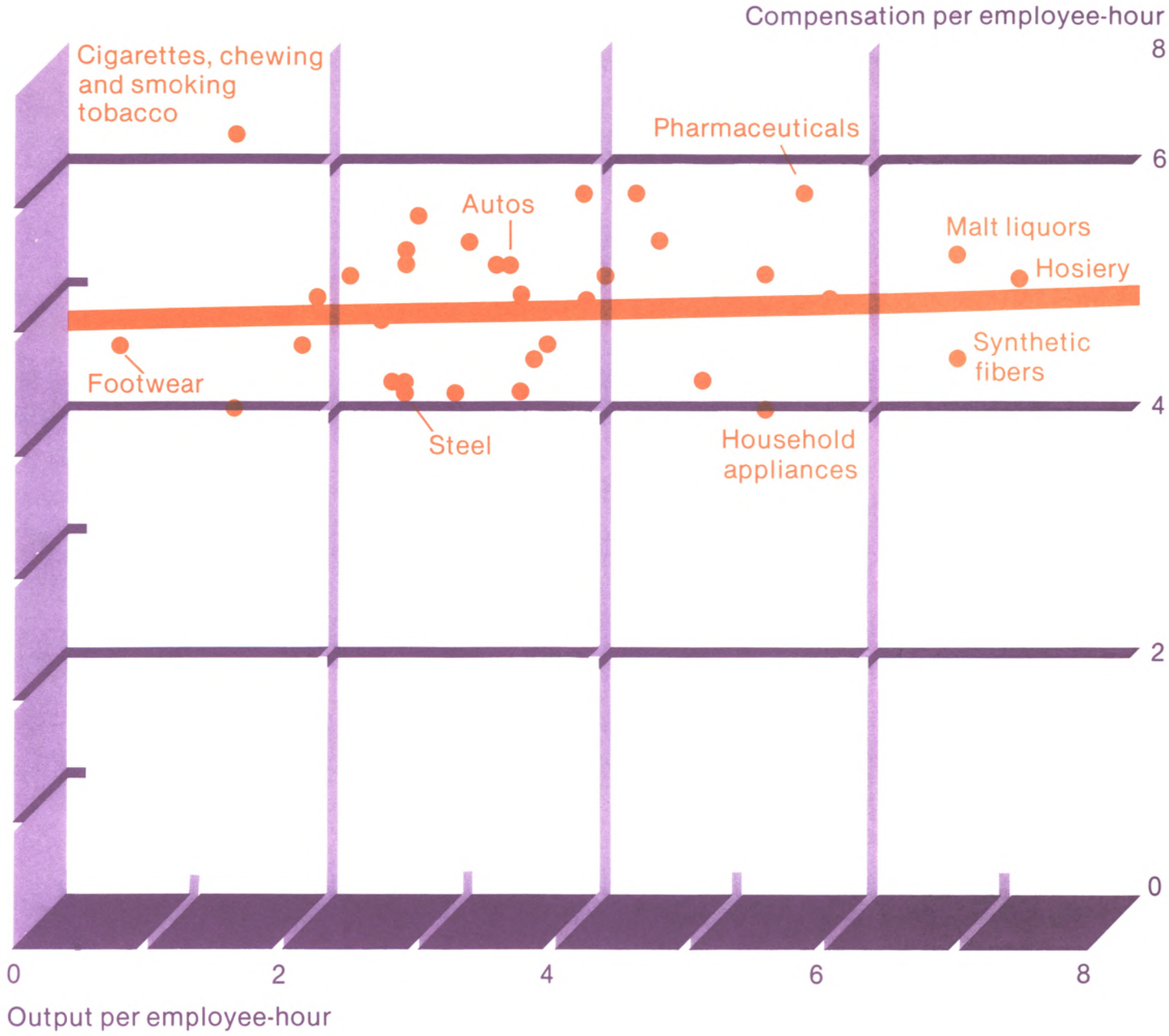
Unlike prices, the factors influencing compensation changes for individual industries seem largely independent of the factors influencing productivity change for those industries. This is shown by the relative flatness of the line on the chart. Hourly compensation increased almost as much between 1960 and 1974 in industries with a low rate of productivity growth, such as footwear and cigarettes, as in industries with a high rate of productivity growth, such as pharmaceuticals and household appliances.

22.

Output per employee-hour and compensation per employee-hour in selected industries, 1960-73.

Average annual percent change

Source:
Bureau of Labor Statistics



B. Other implications of productivity growth

One of the best known effects of productivity growth is the increase it makes possible in workers' incomes. Labor compensation expressed in terms of its buying power—real compensation—has risen at about the same rate as output per hour over the post-World War II period.

Productivity growth not only provides workers with more income, but also increases the amount of goods and services available for the population as a whole to consume. The increase in per capita product since World War II has largely been due to the increase in real product per hour, though the effect of productivity growth has been offset somewhat by the continued decline in hours.

This situation shows that two potential benefits of productivity growth are alternatives: Increases in output per hour mean either that a given amount of labor time can produce more output, or that a given amount of output can be produced with less labor time. Though these two alternatives are theoretically exclusive, in practice the benefits of productivity growth have been divided between them.

A third alternative has received a good deal of attention during periods of unemployment. Increases in output per hour can result in producing a given output with fewer workers. Though this alternative has prevailed in some industries such as railroads or coal mining, experience has shown that many industries increase employment as productivity grows because demand for their product grows even more.

Productivity and real compensation

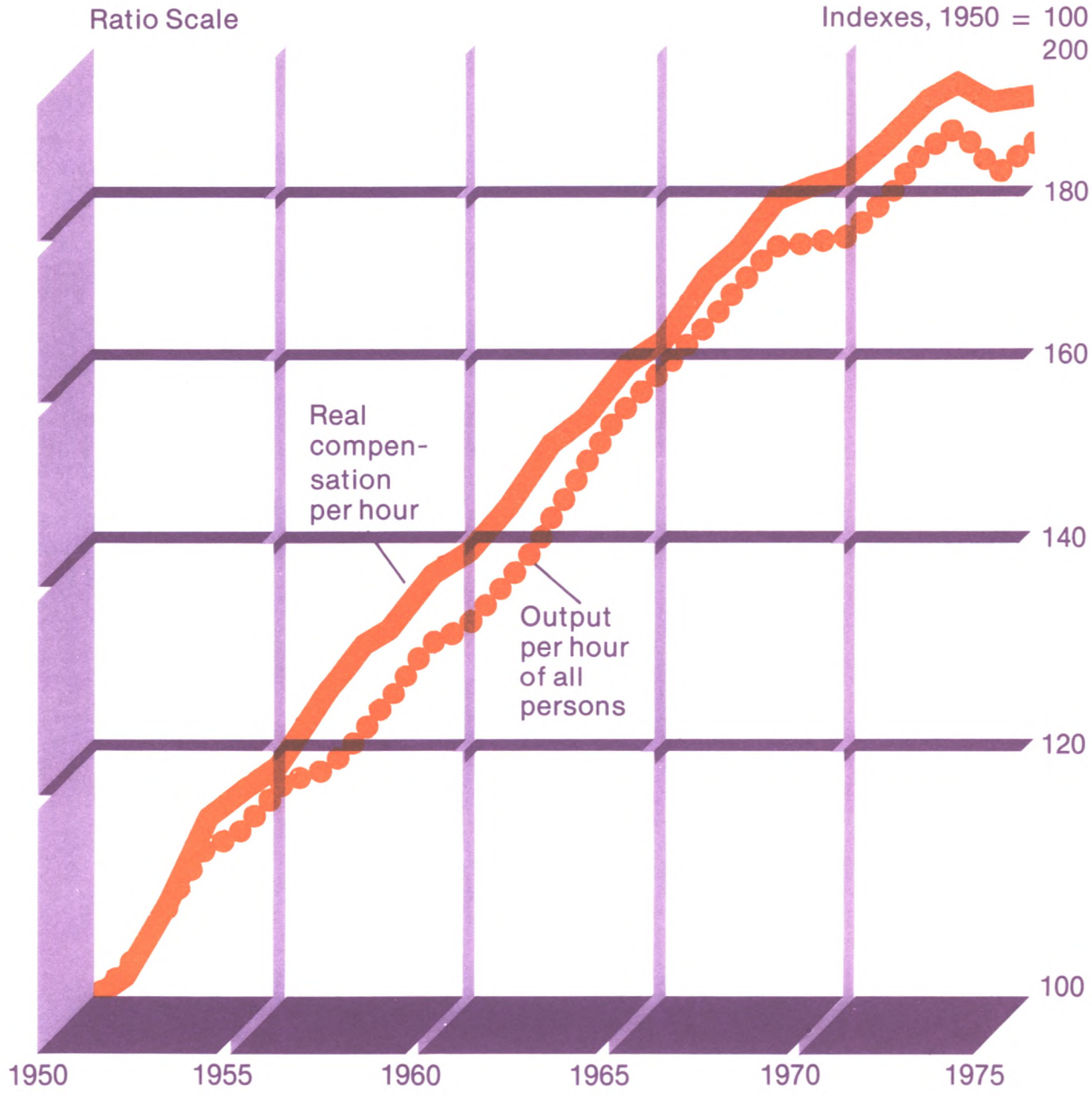
Over the long run, labor has shared in the steadily increasing productivity of the Nation's economy: Hourly compensation, adjusted to take account of changes in purchasing power (real hourly compensation), has risen at about the same rate as output per hour. In 1975, real hourly compensation was over 90 percent higher than it was in 1950.

Period	Average annual percent change	
	Output per hour of all persons	Real compensation per hour
1950-75	2.8	2.9
1950-67	3.1	3.3
1967-75	1.4	1.4

23.

Output per hour of all persons and real compensation per hour in the private business sector, 1950-75.

Source:
Bureau of Labor Statistics



Product per person and average weekly hours

One benefit of productivity improvement is an increase in the amount of goods produced and thus available for purchase by each member of the population. Gross domestic product (GDP) per person rose at an average of 1.9 percent a year between 1950 and 1975. It increased most rapidly during the 1960's, when productivity growth was particularly high.

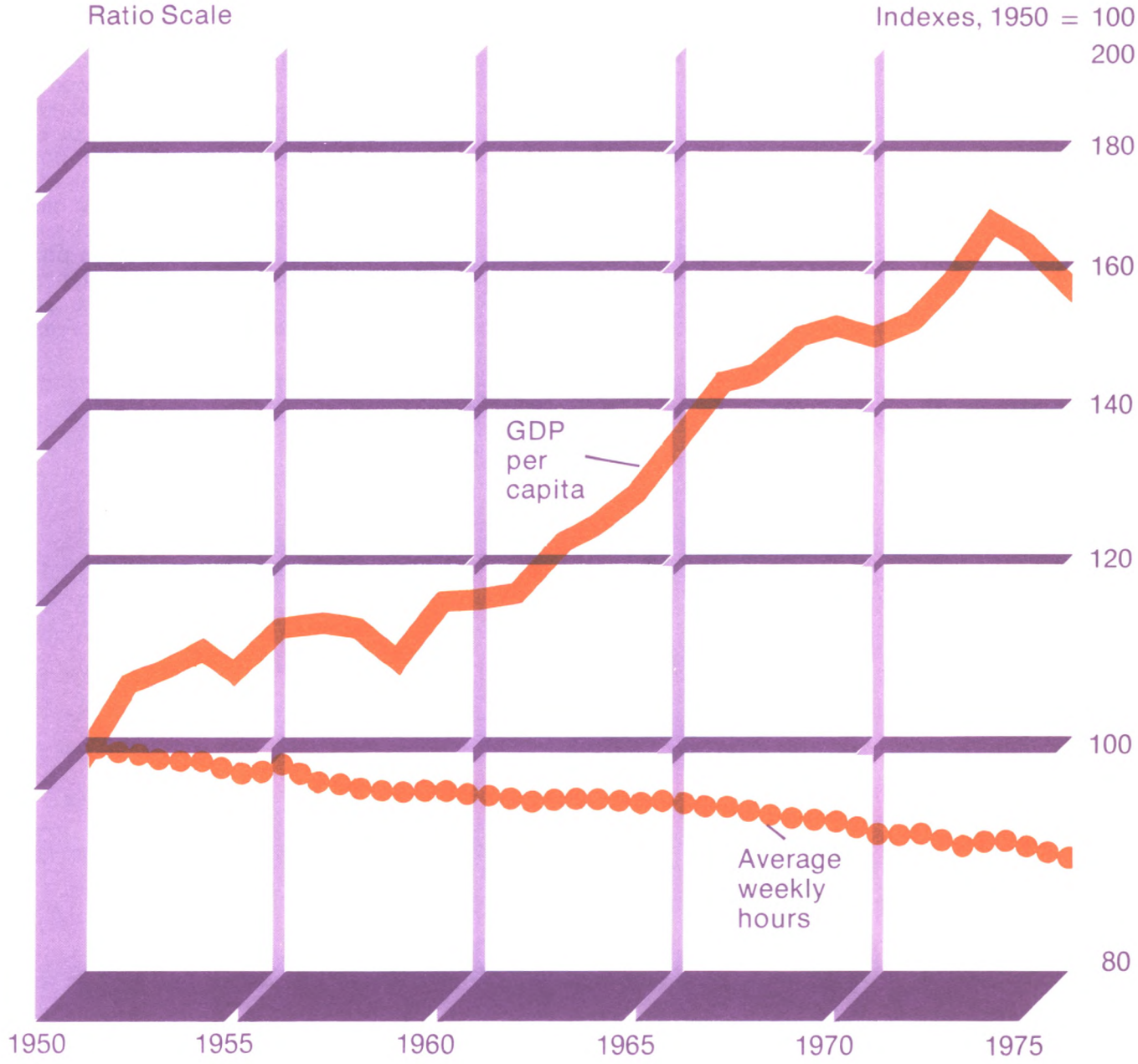
Productivity growth does not automatically produce an equivalent increase in product per capita because declines in other factors—average weekly hours, the employment rate, and the labor force participation rate—may have a dampening effect. Between 1950 and 1975, average weekly hours declined 0.5 percent a year, and the employment rate declined 0.2 percent a year. These declines were offset slightly by an increase in the rate of labor force participation.

In a broad sense, the economy has a choice of using productivity gains to increase either product per capita or leisure time—primarily through shorter workweeks but also through earlier retirement or later entry into the labor force. If the productivity gains of the last 25 years had been allocated to one of these factors rather than the other, either product per capita would have increased 2.7 percent a year or average weekly hours would have decreased 2.6 percent a year. The slight decline in average weekly hours compared with the large increase in per capita product indicates that increased income had greater appeal than increased leisure did.

24.

Gross domestic product (GDP) per capita and average weekly hours per person engaged in production in the total private economy, 1950-75.

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



Working life and life expectancy

One effect of productivity growth has been to increase leisure time by allowing people to postpone their entry into the labor force at the beginning of their working lives and to hasten their exit by early retirement. For men, this possibility, coupled with the continued lengthening of life expectancy, has meant that the number of years spent outside the labor force, in proportion to total life expectancy, has grown appreciably throughout this century. Working years have increased too, as a result of the increase in life expectancy.

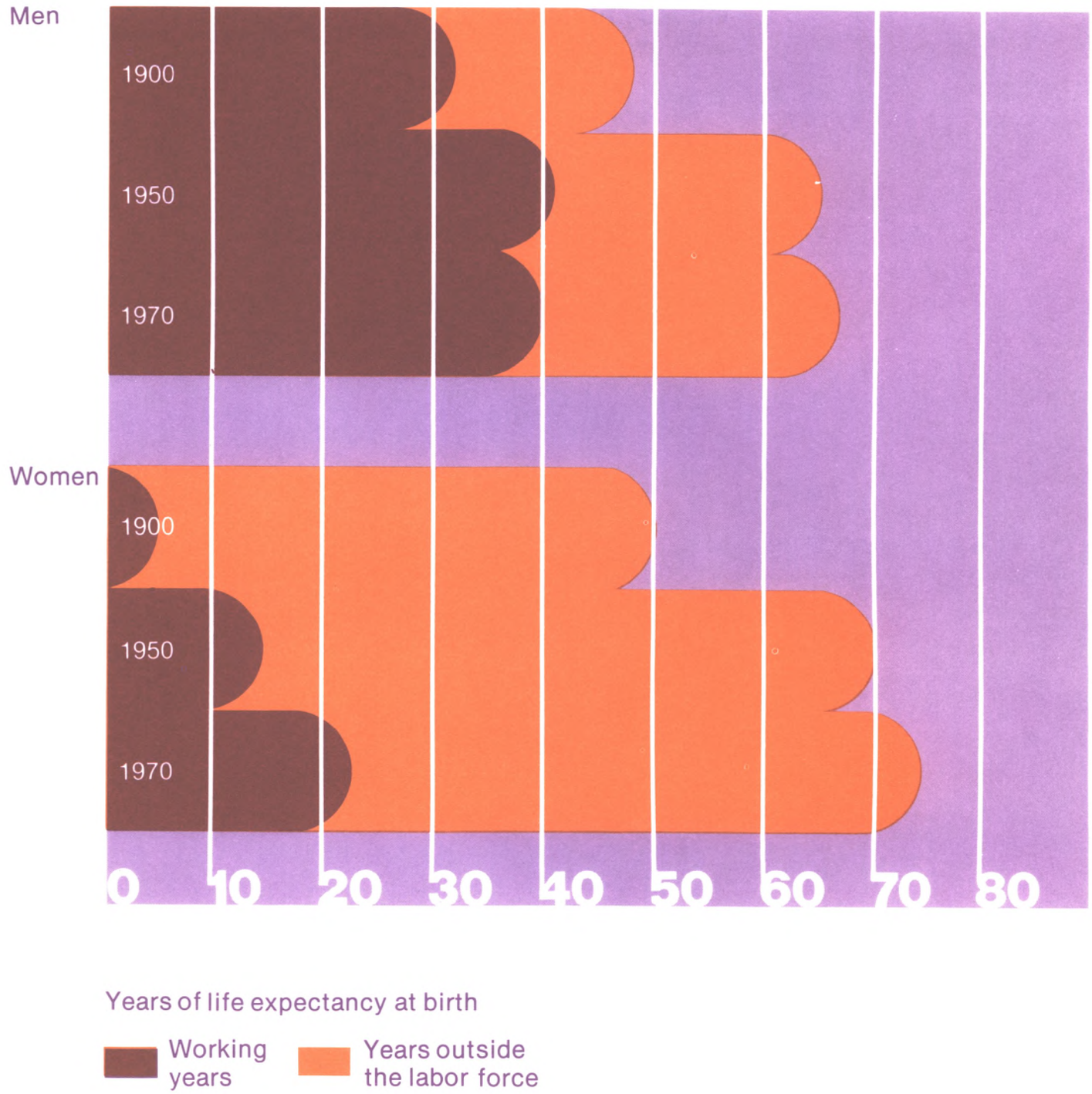
The situation for women is somewhat different, given their low labor force participation rates before World War II. Nevertheless, despite their increasing labor force participation and consequent increase in working life expectancy, their increase in life expectancy has meant that, in 1970, the number of years women could be expected to spend outside the labor force was still higher than it was in 1900.

Period	Work and nonworklife expectancy at birth (percent of total life expectancy)		
	1900	1950	1975
Men:			
Worklife	66.6	63.4	59.8
Outside labor force	33.4	36.6	40.2
Women:			
Worklife	12.4	21.3	30.6
Outside labor force	87.6	78.7	69.4

25.

Working life and life expectancy, by sex, 1900, 1950, and 1970

Source:
Bureau of Labor Statistics



Industry productivity and employment

Some people think that productivity increases cause decreases in employment, but the chart shows that this is not necessarily so. Between 1960 and 1974, for example, productivity went up in every industry series published by BLS and yet employment grew in almost two-thirds of them.

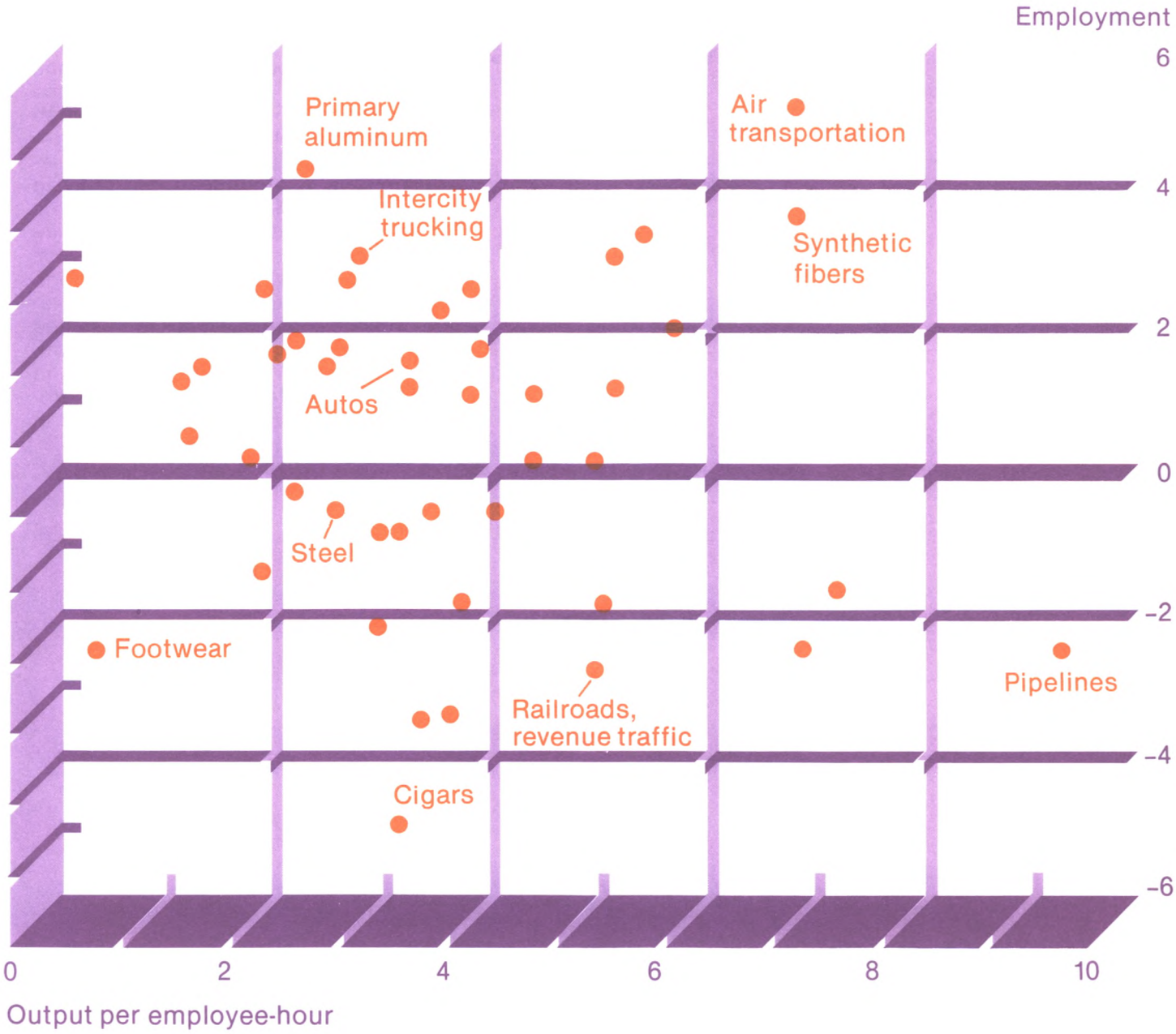
In many industries, large productivity increases are accompanied by increases in output that require more labor input. This situation occurred in the air transportation and synthetic fibers industries. In other industries, increases in productivity and output are accompanied by a reduction in employment. This was true in the highly mechanized petroleum pipeline industry, as a result of continued technological improvement. In still other industries, such as railroads, employment reductions were associated with strong productivity gains and only moderate increases in output.

26.

Output per employee-hour and employment in selected industries, 1960-75.

Average annual percent change

Source:
Bureau of Labor Statistics



Productivity, output, and employment patterns

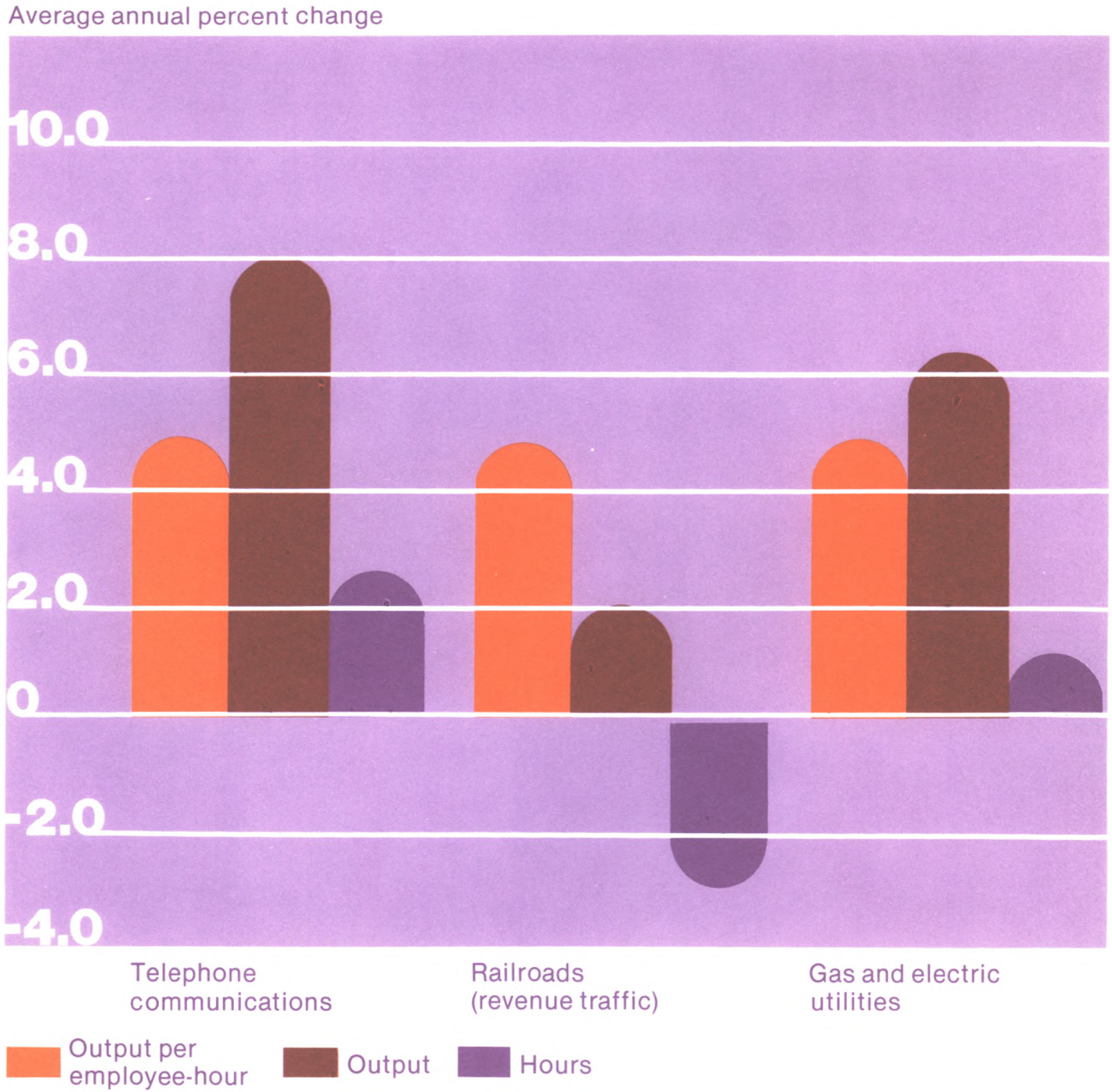
The same trend in labor productivity can reflect vastly different trends in output and employment, depending on the nature of the industry. For instance, between 1960 and 1974, productivity grew by over 5 percent a year in telephone communications, railroad transportation, and gas and electric utilities, but each one of these industries has a different productivity, output, and employment pattern. High productivity growth in telephone communications represented a large increase in output accompanied by substantial growth in hours, while a similar rate of productivity growth was achieved in railroads by a large reduction in hours coupled with a moderate increase in output. The rate of productivity increase for gas and electric utilities stayed close to the rate of output growth, as hours barely changed.

These three industries show the major types of high productivity growth situations. They indicate that the implications of productivity growth for employment are closely associated with trends in output: Industries that have large increases in output tend to increase hours too, while industries that have small output growth tend to reduce hours.

27.

Output and hours in selected industries with similar productivity growth, 1960-75.

Source:
Bureau of Labor Statistics



PART III

Factors affecting productivity growth

The factors to which changes in productivity can be attributed vary according to whether the movements are short term or long term. As many of the charts in part I show, short-term movements in productivity are directly related to the business cycle because productive capacity, including the work force, is not so flexible that producers can adjust it immediately to changes in demand.

Long-term productivity growth reflects basic changes in the factors underlying productivity improvement, such as increased availability of capital, advances in technology, and improvement in the quality of labor. Other long-term factors, which are often included under "technology", are improvements in the allocation of resources, increased economies of scale, and advances in managerial know-how. Some economists analyze the various factors and attempt to quantify their impact upon productivity. Another approach is to measure individual items that are readily quantifiable and to treat them as indicators of the sources of growth. Both approaches are discussed in this chartbook. One of the individual items—energy use—reflects both increased capital growth and technological change.

Capital makes an important contribution to productivity growth. Most researchers have concluded that output per hour has increased in large part because the amount of capital supporting each worker has increased substantially. The role of capital is outlined by measures such as the capital/labor ratio, investment as a proportion of output, and capital stock per hour.

Technological innovation is another important source of productivity growth. Much of this innovation is a result of organized research and development (R&D) programs; the amount, rate, and location of spending on R&D gives some idea of the importance placed on this activity by both government and industry. An even better approximation of the pace of technological development can be attained by tracing the rate of diffusion of important innovations that have had a clear and direct effect on productivity growth. Otherwise, measuring the effects of so generalized a process as technological change is difficult, if not impossible.

A third important contributor to productivity growth is improvement in the quality of the labor force. This improvement can be seen clearly in the statistics which compare the skills of the jobs at which Americans work now with those of an earlier period, or which trace the rise in educational attainment. And, since worker motivation plays as important a part as worker skill in improving productivity, surveys of worker attitudes are extremely illuminating, particularly when prospects for future productivity growth are being estimated.

Estimates of the sources of growth

The factors affecting productivity growth are so interrelated that determining the separate effect of each one of them is difficult. Moreover, the economists who have attempted this task have come up with different measures because of differences in definitions, concepts, and assumptions.

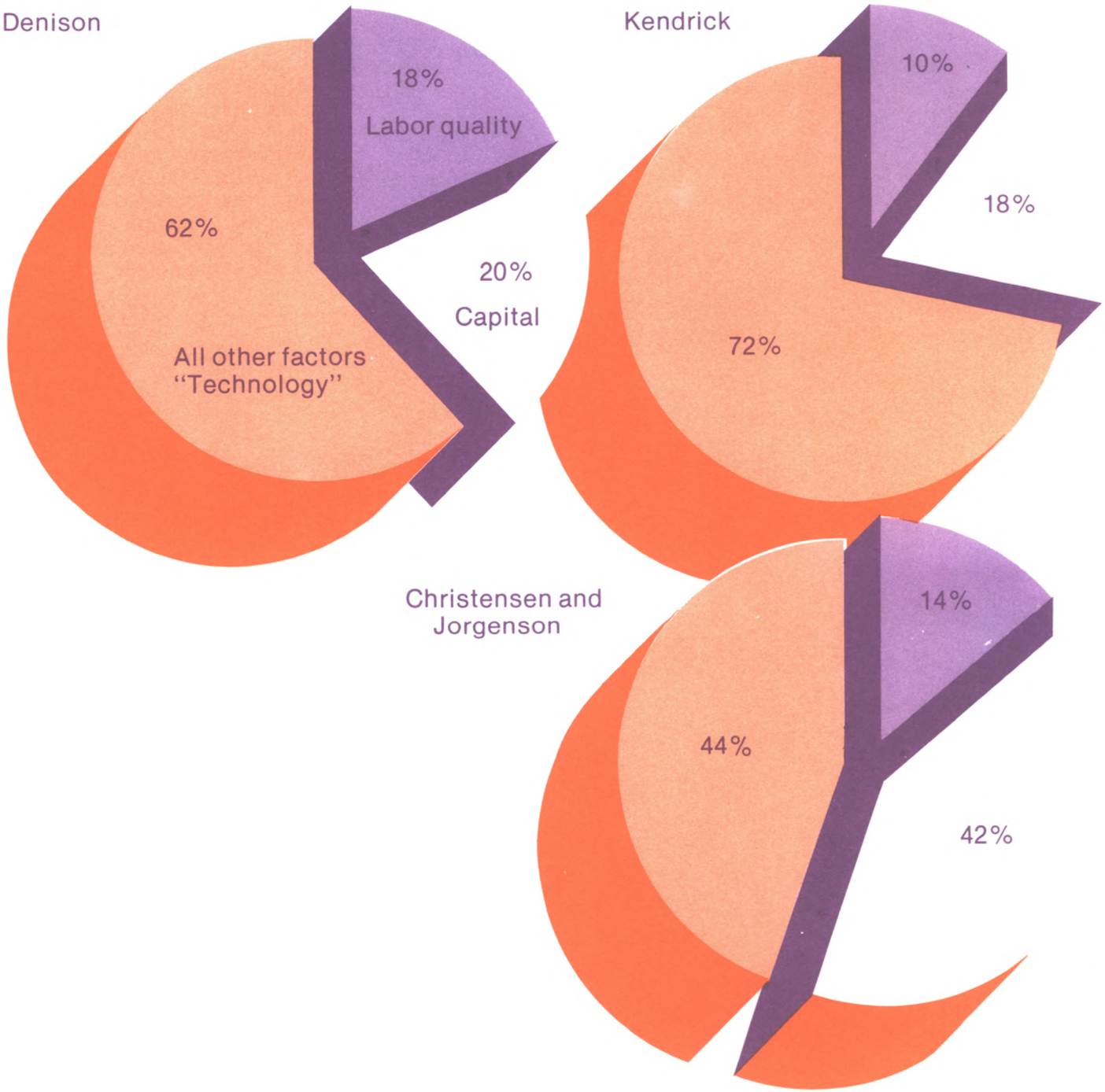
It is not possible to compare the results of all the research undertaken to date in this area, since not all researchers have focused on the same factors. However, three studies—those done by Edward Denison, John Kendrick, and Laurits Christensen and Dale Jorgenson—encompass similar factors, and thus provide a good idea of current thought in this area. Though their measures differ, they all conclude that improved "technology" and the availability of more capital per worker have been the major sources of growth.

The term "technology" is used here to represent all factors other than labor quality and capital growth. Differences in the researchers' approach to measuring those two factors thus affect their residual—or "technology"—item. Denison attributes a larger role to labor, as he provides the most elaborate analysis of the labor force. Christensen and Jorgenson use gross domestic product rather than net income as their base, which tends to raise the part of growth attributable to capital and reduce the part attributable to "technology."

28.

Three estimates of the factors affecting productivity

Source:
Calculations by the Bureau of Labor Statistics based on: Edward F. Denison, *Accounting for United States Economic Growth, 1929-1969;* John W. Kendrick, *Postwar Productivity Trends in the United States, 1948-1969;* and Laurits R. Christensen, Dianne Cummings, and Dale W. Jorgenson, *An International Comparison of Growth in Productivity, 1947-1973.*



Capital:
Capital stock per hour

Growth in capital stock per hour of labor input has been an important factor in improving labor productivity, since more and better equipment allows workers to perform their jobs more effectively. Capital stock per hour rose by 2.9 percent a year between 1950 and 1974, as capital increased four times as fast as hours of labor input did.

The capital/labor ratio grew steadily throughout the period. Although growth in capital stock accelerated after 1967, hours also increased at a faster pace.

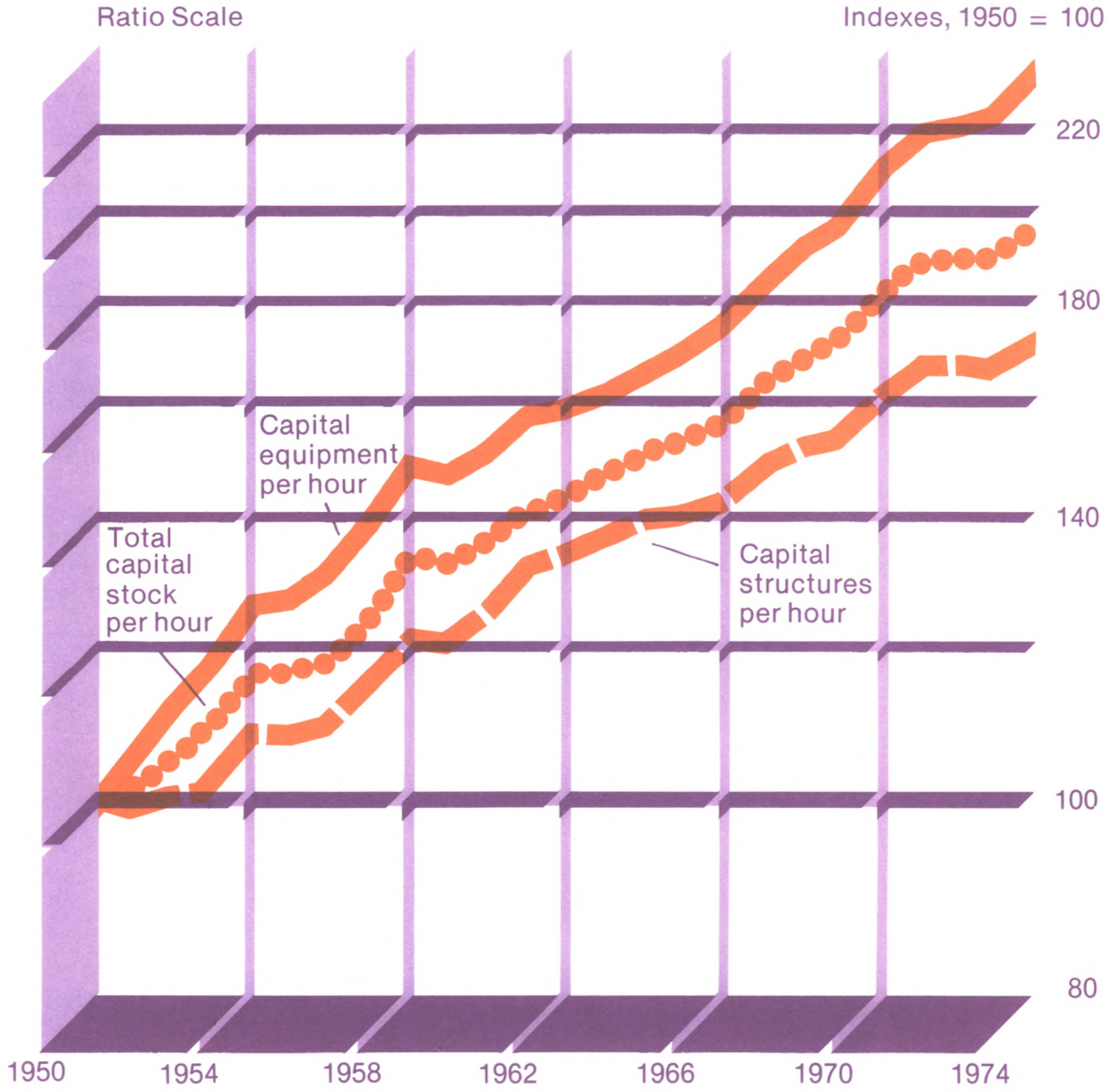
The total stock of fixed capital (defined here as gross fixed nonresidential stock) can be broken down into its two components of structures (plant) and equipment. The chart shows that the growth in structures per hour of labor input has been slower than the growth in equipment per hour.

Period	Average annual percent change				
	Capital stock per hour			Capital	Hours
	Total	Equipment	Structures (plant)		
1950-74	2.9	3.4	2.5	3.6	0.7
1950-67	3.0	3.5	2.6	3.3	.3
1967-74	2.7	3.5	2.0	4.1	1.4

29.

Total capital stock, capital equipment, and capital structures per hour of all persons in the private business sector, 1950-74.

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



The capital/labor ratio

The capital/labor ratio measures the intensity with which the capital stock and labor are used in production. This ratio has grown steadily since 1950 and is a primary factor in explaining the rise in labor productivity.

Labor productivity is also a function of capital productivity, which fluctuates more than labor productivity does. Although the long-term effect of the change in the output/capital ratio on labor productivity was small, the relatively sharp decline in this ratio since 1966 is associated with lowering the average annual rate of productivity growth to 1.6 percent. Several reasons have been adduced for the decline in capital productivity: lower utilization of the existing capital stock in recent years during recessions, a possible shift of capital investment to sectors where capital productivity is low, and an increase in the proportion of capital investment allocated to meet environmental and safety needs.

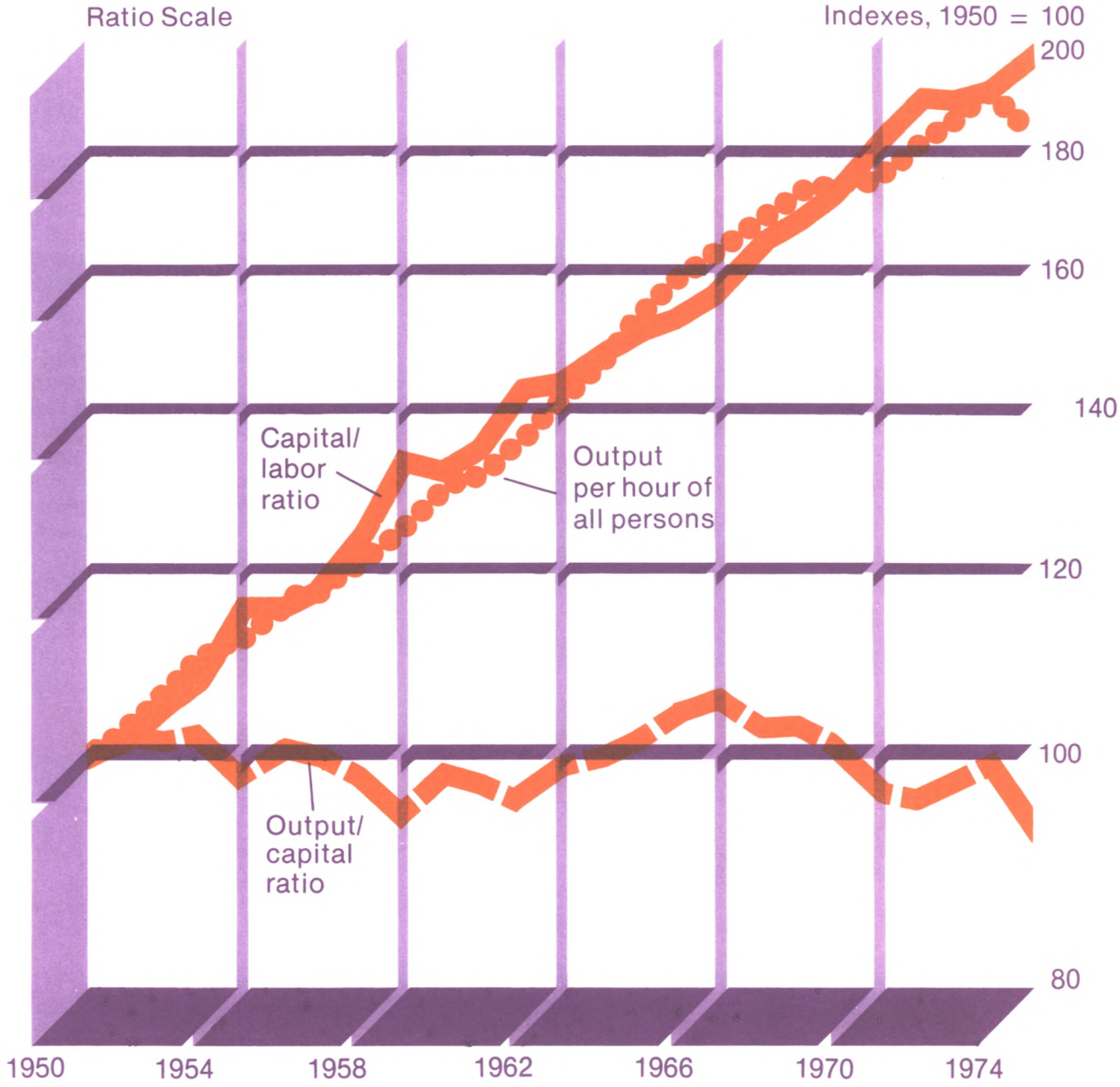
It would not be correct to interpret the trends shown in the chart as reflecting solely the substitution of capital for labor, or to consider such substitution as the only source of productivity change where capital is concerned. In a broader sense, labor and capital cooperate in the production of goods and services.

Period	Change in labor productivity	Attributable to—		
		Change in the capital/labor ratio	Change in the output/capital ratio	Interaction
1950-74	2.6	2.8	—0.2	0
1950-66	3.1	2.7	.4	0
1966-74	1.6	3.0	—1.3	—0.1

30.

Output per hour of all persons and the output/capital and capital/labor ratios in the private business sector, 1950-74.

Source:
Bureau of Labor Statistics



International comparisons: Investment/output ratios

Since growth in output per hour of labor input is closely related to the amount of capital supporting each worker, the ratio of investment to output is an indicator of potential growth in labor productivity. Productivity is more likely to increase rapidly in countries where this ratio is high than in countries where it is low since it indicates that a higher percentage of output in current values is being set aside to increase capital stock.

Between 1960 and 1973, the United States, Canada, and the United Kingdom had the lowest average capital investment ratios in manufacturing as well as the lowest average increases in manufacturing productivity. At the other extreme, Japan had the highest investment ratio and the highest rate of productivity gain.

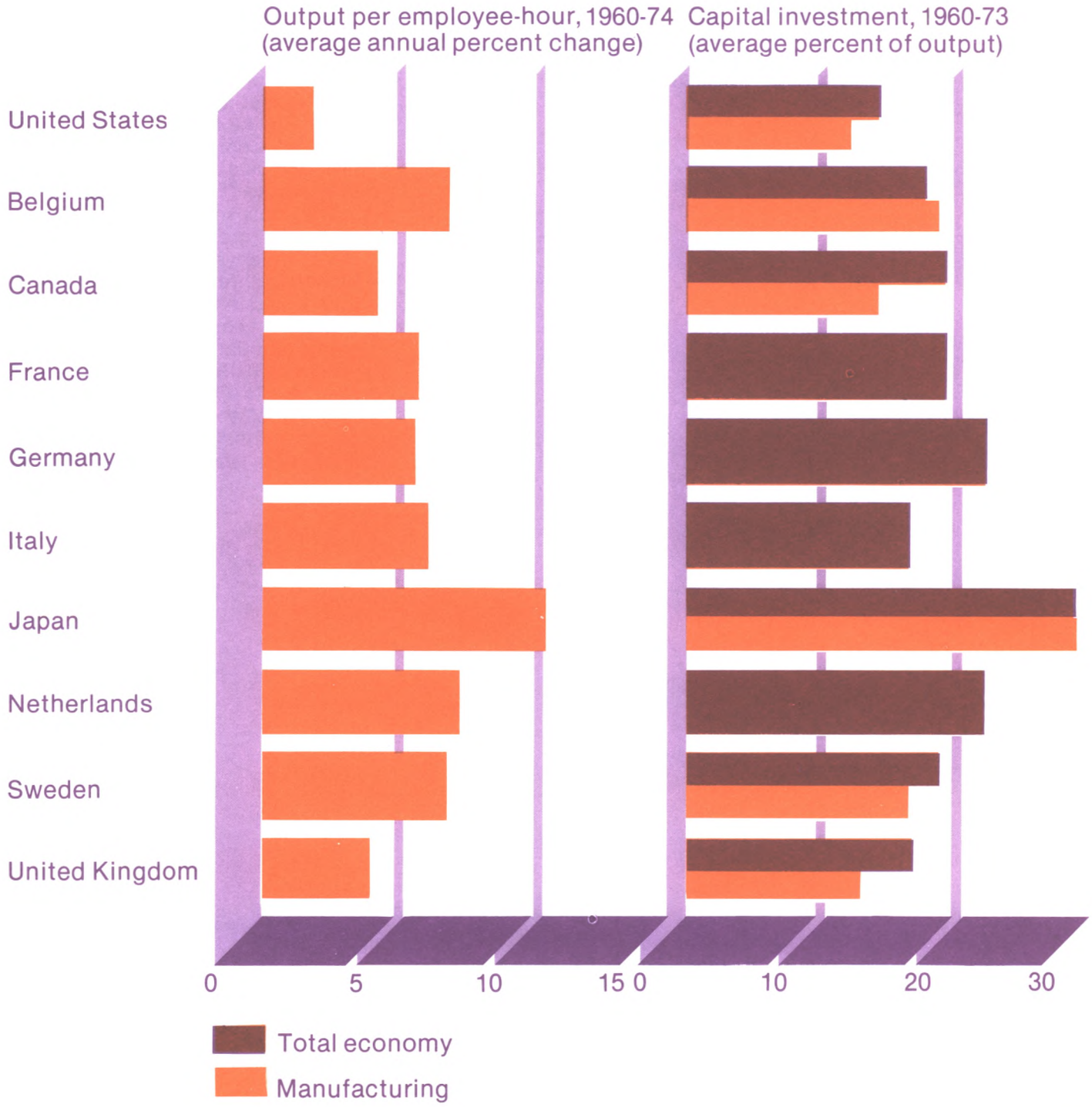
Data on capital investment in manufacturing are not available for all the European Economic Community (EEC) countries. Consequently, investment ratios for the total economy have been substituted in the chart even though they can be imprecise indicators of capital investment in manufacturing. For instance, Canada had a relatively high investment ratio for the total economy, but a relatively low ratio for manufacturing.

National ratios of investment to output should be compared with caution, since such comparisons may mislead if the relative prices of capital goods and consumer goods vary widely between countries. If this is the case, a country which spends a higher proportion of its output on investment goods may actually be devoting a smaller amount of new real resources to future production. The chart on the next page shows real resources invested in capital, but for a single year only.

31.

Output per employee-hour in manufacturing, 1960-74, and capital investment, 1960-73, selected countries.

Source:
Bureau of Labor Statistics



International comparisons: Real investment per capita

The best measure of the amount of resources a country is devoting to increasing its capital stock, and thus to improving labor productivity, is one that is expressed in real terms, unlike the ratio used in the previous chart. This is a difficult task, and data are limited in scope—in this case to a single year.

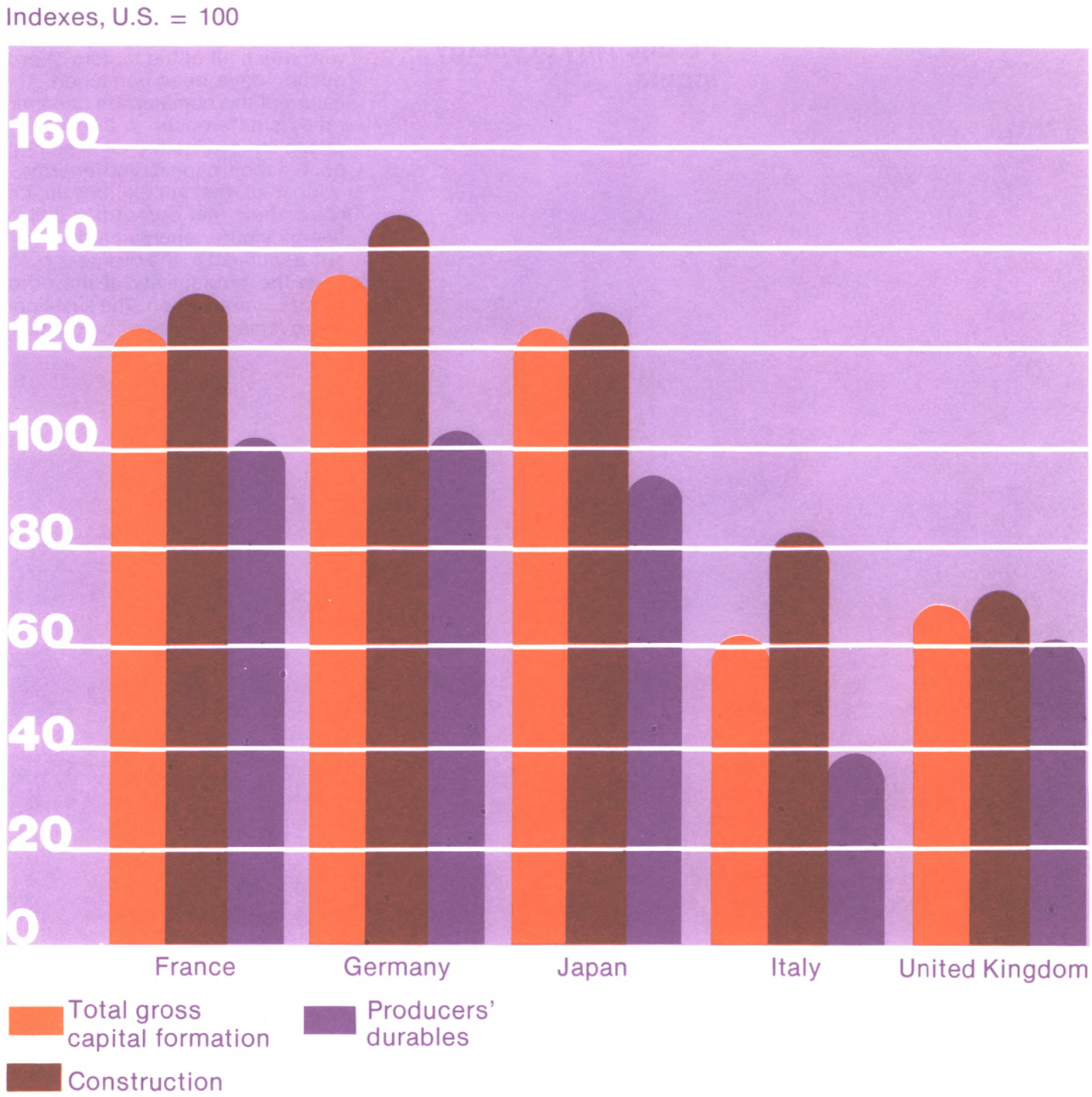
The chart shows that real capital formation (gross addition to capital stock in a year) per capita was higher in three countries in 1970 than it was in the United States; in these three countries—France, Germany, and Japan—gross domestic product (GDP) per capita has been nearing the U.S. level rapidly throughout the post-World War II period. In the other two countries compared—Italy and the United Kingdom—gross capital formation per capita was far below the U.S. level. Although the rate of productivity growth has exceeded that of the United States in both of these countries during the past 25 years, it has not been sufficient to move them to within range of the U.S. productivity level.

Clearly, a measure of capital formation covering several years would be more informative than one limited to a single year, but such a measure is not available on a constant-dollar basis—that is, one that is adjusted for price changes that could distort the underlying trend. The measure depicted in the chart is taken from a United Nations study that was done for a single year.

32.

Gross capital formation per capita in selected countries, 1970

Source:
Irving Kravis et al, *A System of International Comparisons of Gross Product and Purchasing Power*



Energy: Productivity of energy inputs

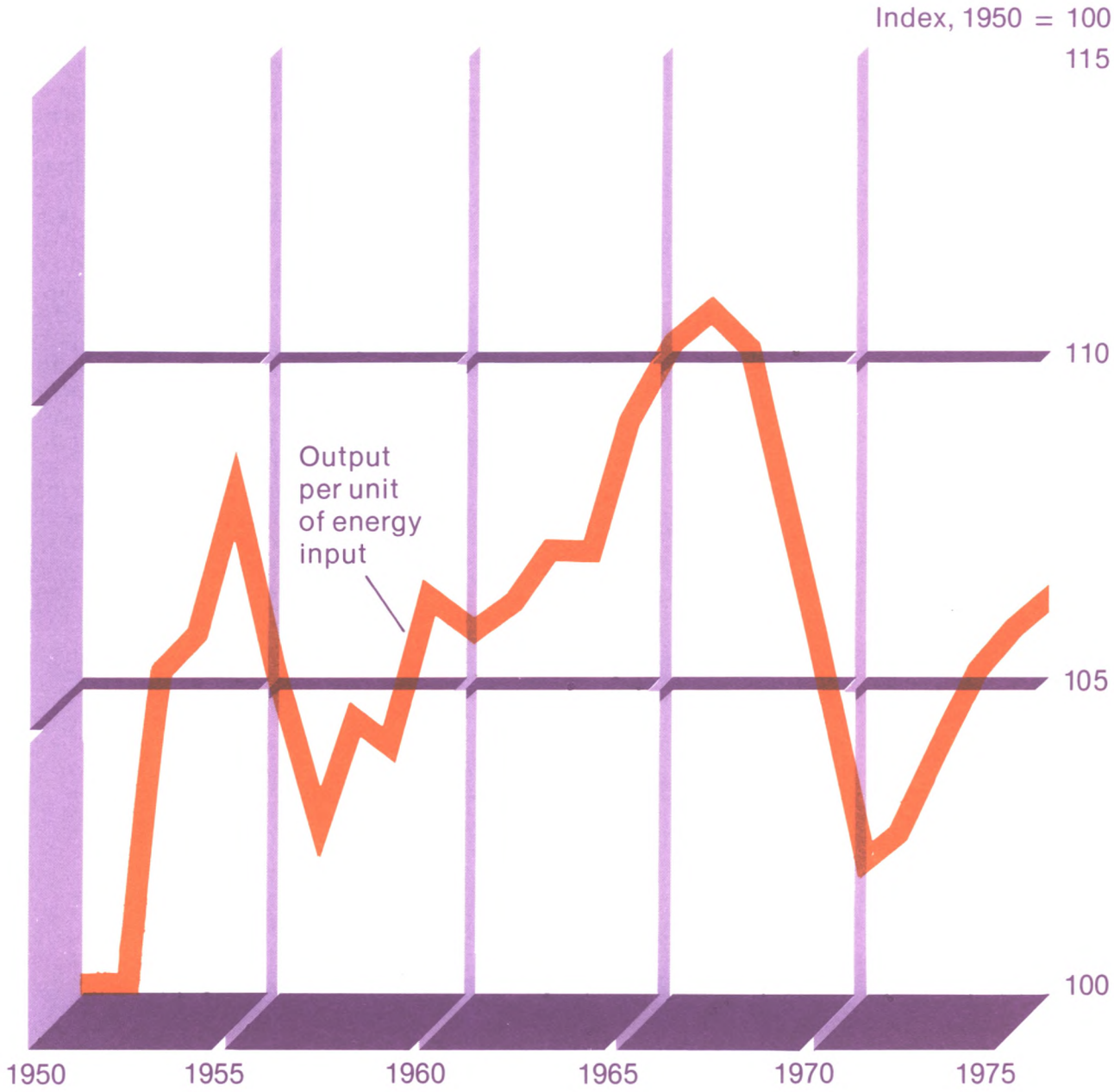
The total productivity of an economy is a measure of the efficiency with which all of the factors of production have been combined. The nature of this combination generally reflects differences in the relative prices or availability of major inputs—labor, capital, and energy.

Most of the fluctuations in the chart show that output per unit of energy input—"energy productivity"—is as subject to the business cycle as is the productivity of the other factors of production. The sustained improvement in energy productivity between 1960 and 1966 parallels a similar improvement in both labor and capital productivity, as technological improvements contributed to a general upswing in productivity. The drop in energy productivity between 1966 and 1970 represents a substitution of then-cheap energy for relatively more scarce and expensive labor and capital resources. In the same way, the increase in energy productivity between 1970 and 1975 represents a response to the increasing cost of, first, electricity and then petroleum.

33.

Output per unit of energy input, 1950-75

Source:
U.S. Department of the Interior, Bureau of Mines; U.S. Department of Commerce, Bureau of Economic Analysis



Technological change: Diffusion of technological innovations

Productivity growth is directly affected by the rate of acceptance of new technology. Researchers generally concur that the rate of diffusion of any major new technology varies considerably within industries and between them, but disagree as to the specific factors causing this variation and their relative importance. Factors which are reported to affect the diffusion rate include the cost and profitability of adopting the innovation, the size of the firm, and the level of output of the firm.

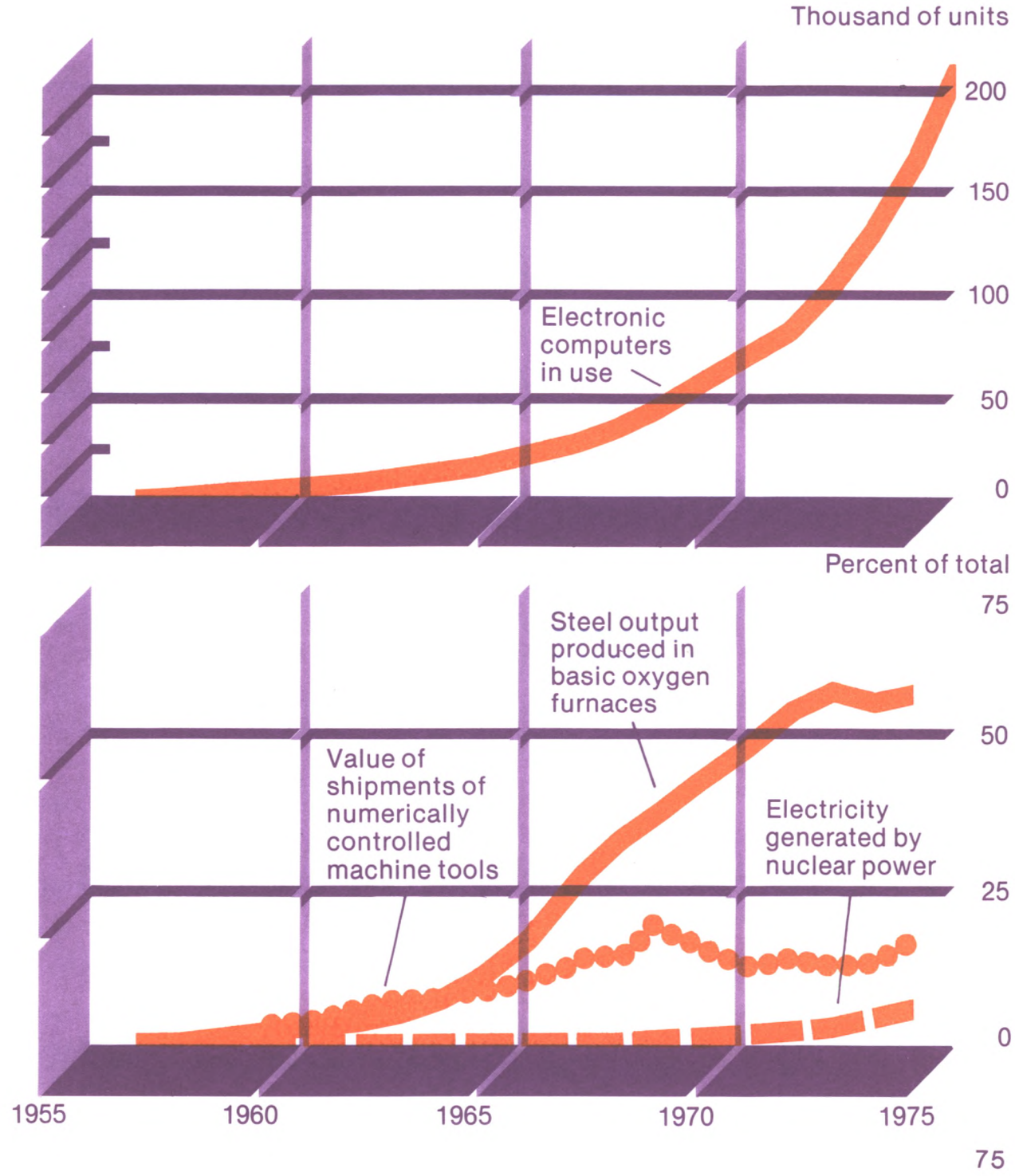
The chart shows trends in the diffusion of four major technological innovations of the post-World War II period: The electronic computer, which has resulted in significant productivity gains in industry, business, and government; the basic oxygen furnace, a steelmaking process which lowers production and capital costs and increases output; numerical control, a system for the automatic operation of machine tools which has increased productivity in the metalworking industries; and the production of electricity by nuclear energy.

Each of the innovations shown has developed a different pattern of diffusion. The number of computers in use is growing at an increasing rate, while the proportion of steel produced by basic oxygen furnaces apparently has failed to grow past a certain level, partly because some firms cannot afford to install the new system, and partly because another technology, the electric-arc furnace, is being adopted. The proportion of electricity generated by nuclear power is increasing but is still relatively small, partly due to the environmental impact of possible accidents, while the proportion of machine tools that are numerically controlled seems to have stabilized.

34.

Use of some key technological innovations, 1956-75

Source:
Bureau of the Census; American Iron and Steel Institute; International Data Corporation; and Federal Power Commission.



International comparisons: Diffusion of technological innovations

Productivity improvement that results from technological change is an important element in international competition. Information available for two of the innovations examined in the preceding section shows that the United States continues to lead other major industrial countries in computer installations, but that it trails Japan, Germany, and France in the proportion of steel produced in basic oxygen furnaces.

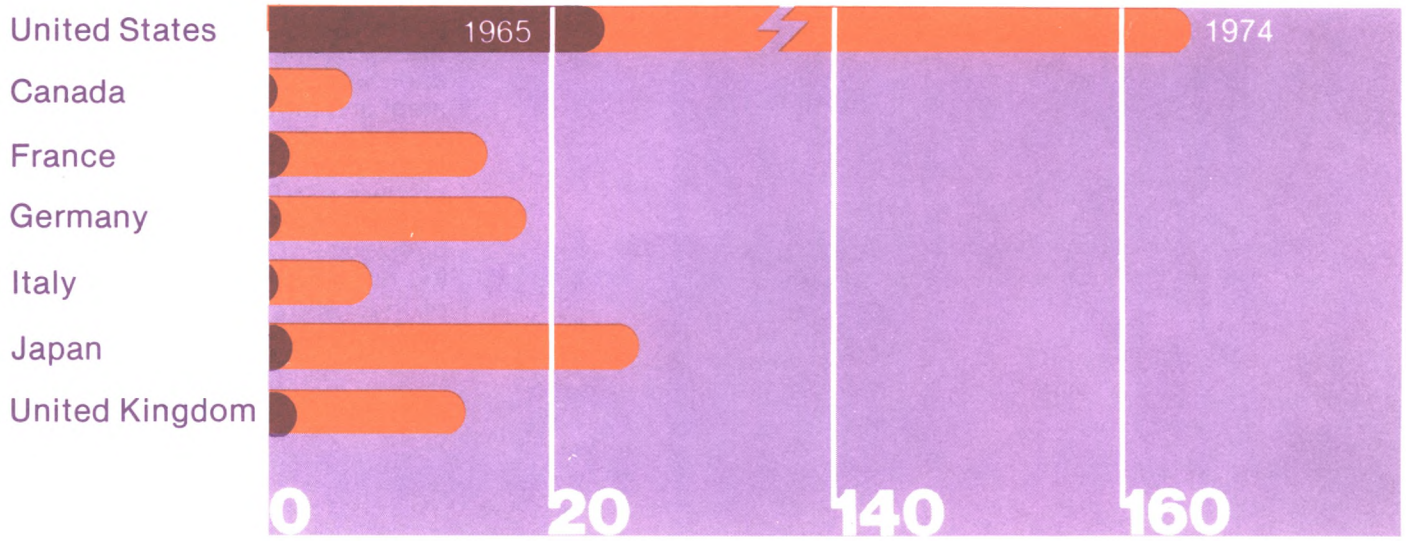
A possible reason for the decline in the relative productivity level of the U.S. steel industry is the lag in substituting the basic oxygen furnace for the open-hearth method. The chart shows that in 1960 only 3 percent of U.S. steel and about 12 percent of Japanese steel was produced by the basic oxygen process. By 1965, this process accounted for over half of Japanese steel production, but only 17 percent of U.S. production, a gap that has persisted to the present.

35.

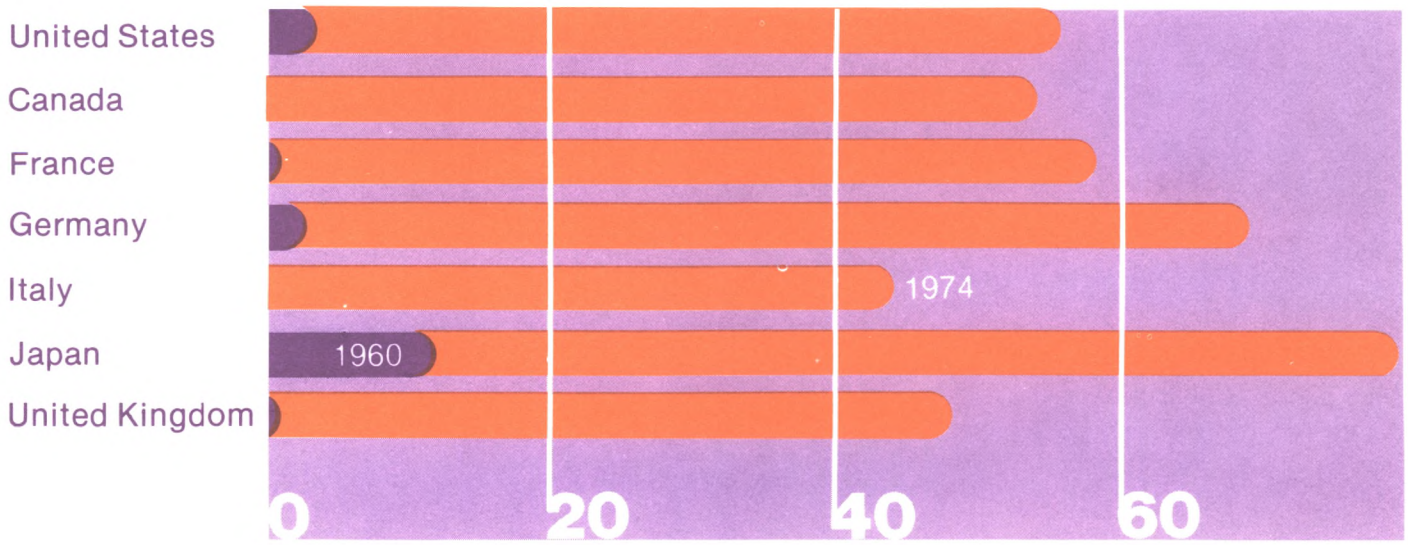
Use of two key technological innovations in selected countries.

Source:
International Data Corporation and National Bureau of Standards.

Electronic digital computers in use, 1965 and 1974



Steel output produced in basic oxygen furnaces, 1960 and 1974



Research and development expenditures

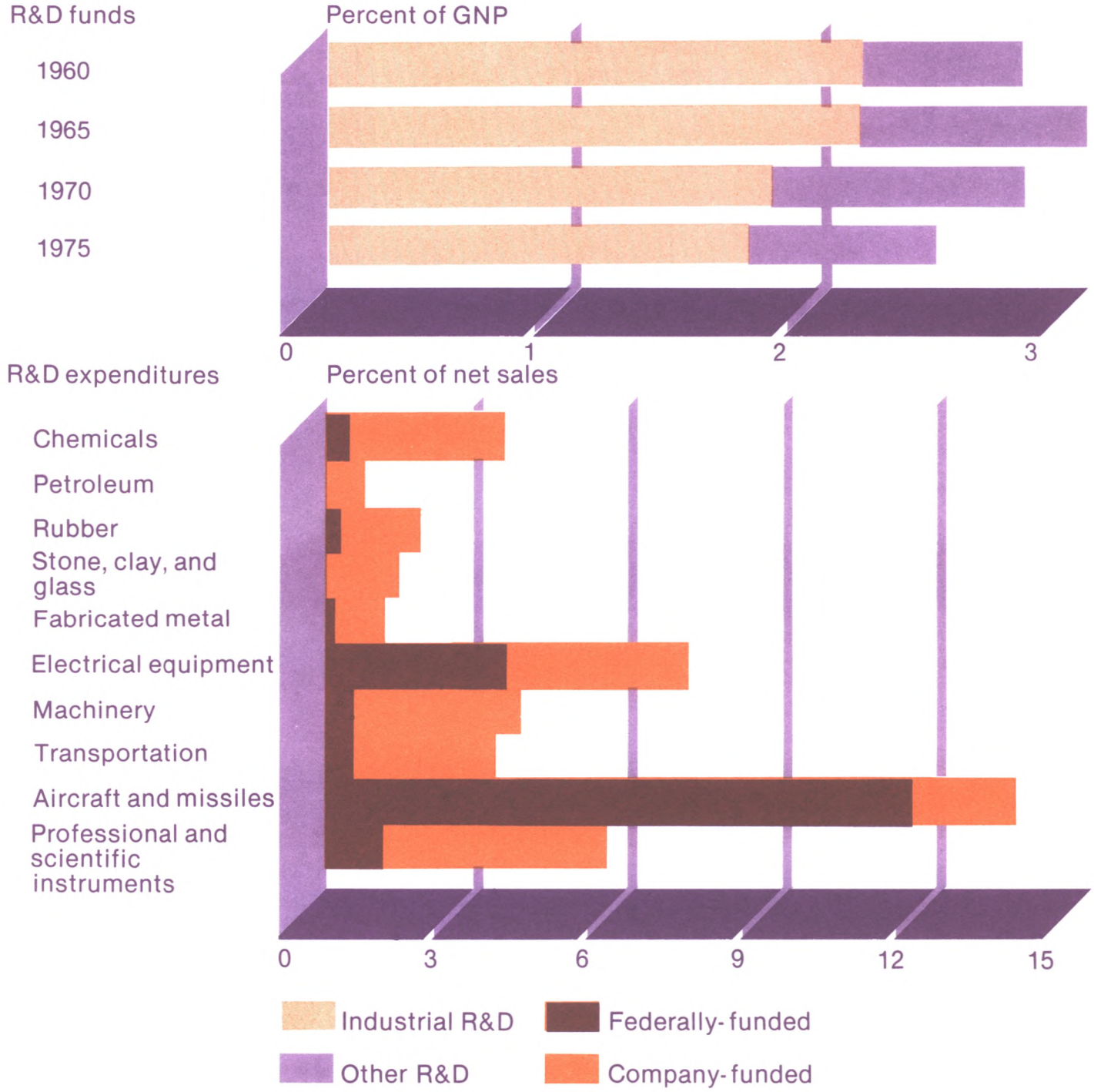
Expenditures for research and development (R&D) can generate increases in productivity through the development and subsequent application of more efficient equipment and processes. One indicator of the relative importance of R&D is the proportion of gross national product (GNP) devoted to it. This proportion was relatively stable for both total R&D spending and spending on industrial R&D during most of the 1960's, but it declined between 1968 and 1974.

The amount and rate of spending for R&D varied between major industries. For instance, two industries heavily involved in Federal contract work for defense and space programs—the aircraft and missiles industry and the electrical equipment and communication industry—spent proportionately more on R&D in 1973 than other industries did. Federal funding was a much less significant element in other industries where R&D expenditures were proportionately large.

36.

Funds for research and development (R&D) as a percent of GNP, selected years, R&D expenditures in selected industries, 1973.

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



International comparisons: Research and development

Statistics on R&D activity are not as readily available for other countries as they are for the United States. Nevertheless, sufficient information exists to make some comparison possible between activity in the United States and its major trading partners.

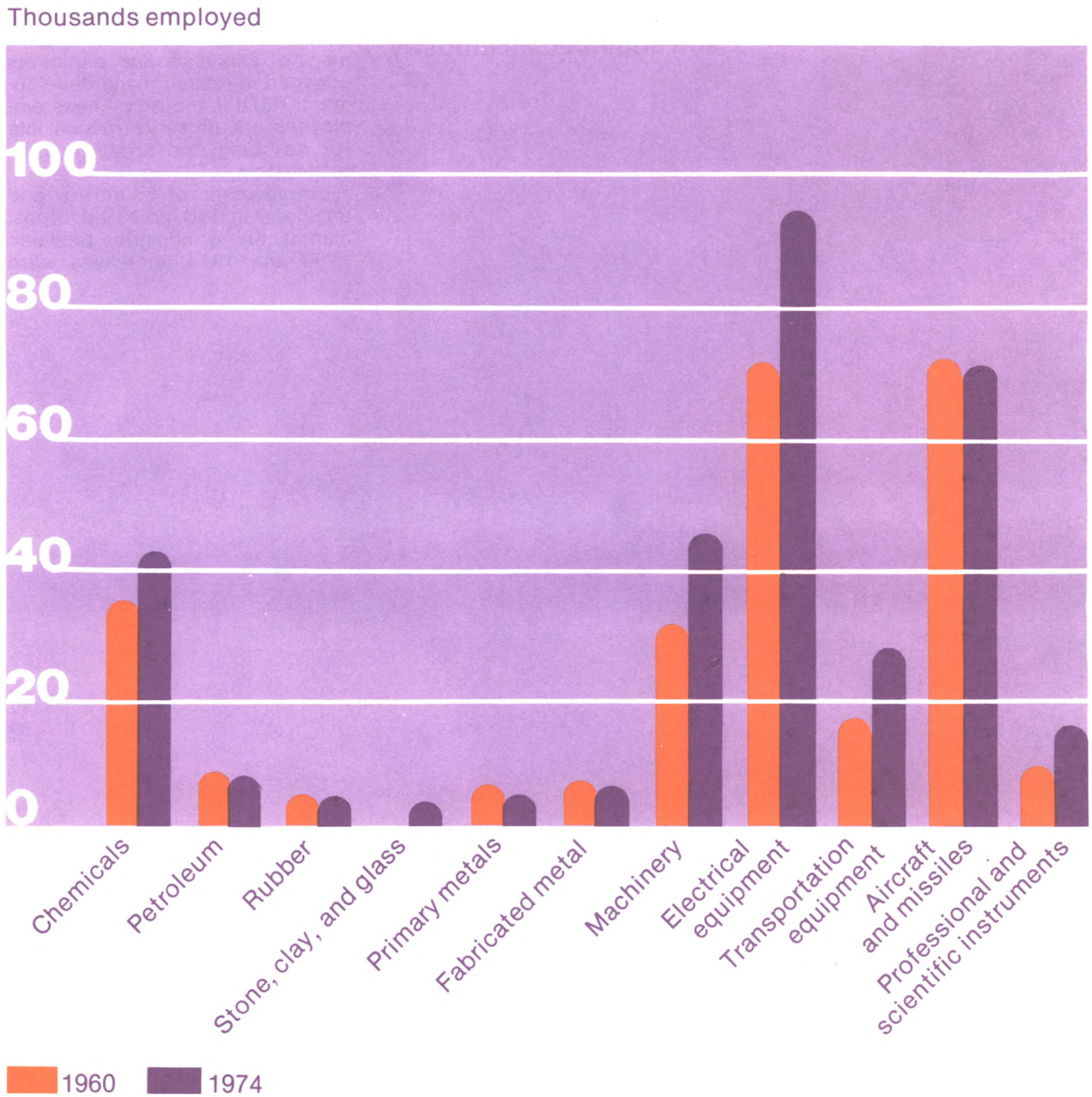
R&D expenditures as a proportion of GNP were higher in the United States than in other industrial countries until 1974, when the German rate of expenditure exceeded the American one. The latest available data indicate that the proportion of GNP devoted to R&D was very similar in all of the countries compared —ranging between 1.7 percent and 2.4 percent. The principal objectives of U.S. expenditures for R&D were national defense and space efforts, while the principal objectives of R&D in the other countries were economic development and the advancement of science.

There was greater variation in the proportion of scientists and engineers engaged in R&D. This variation was substantially smaller in 1973, however, than it had been 10 years earlier. While the number of scientists and engineers engaged in R&D per 10,000 members of the population remained about the same in the United States, it almost doubled in France, tripled in Germany, and increased by more than half in Japan.

37.

Scientists and engineers engaged in R&D in selected industries, 1960 and 1974.

Source:
National Science Foundation



Employment of scientists and engineers in industry

Another precursor of productivity growth is the increase in employment of scientists and engineers engaged in research and development (R&D) in industry. These employees are primarily responsible for devising and applying new technology.

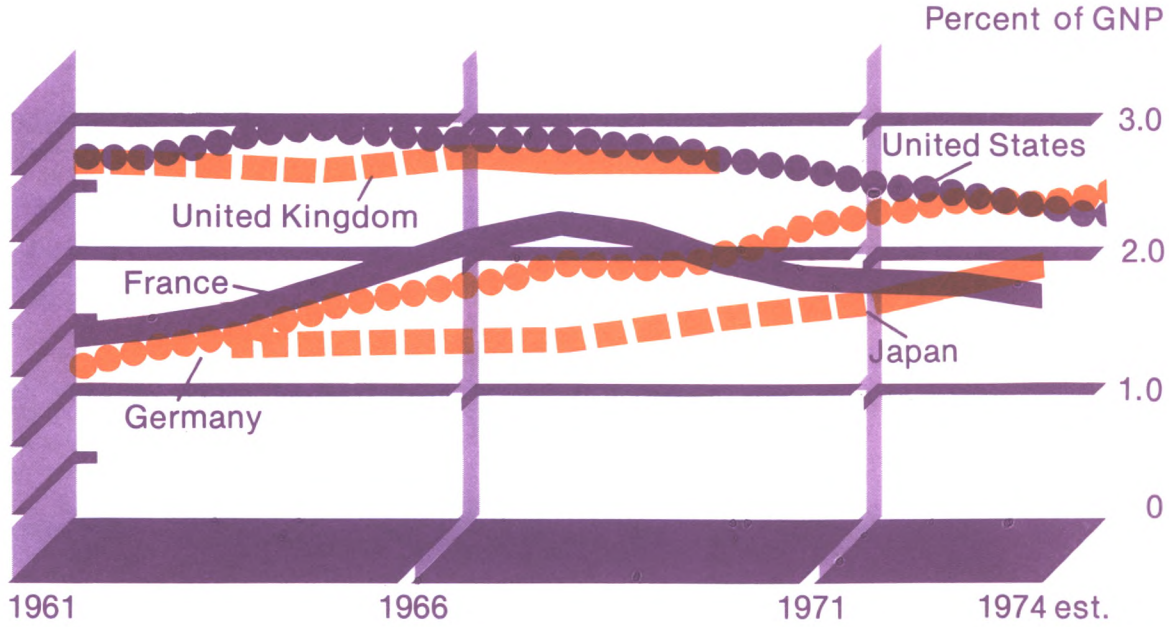
Employment of scientists and engineers in R&D increased in most manufacturing industries between 1960 and 1974. Increases were particularly pronounced in industries such as machinery, electrical equipment, and chemicals, which already had large numbers of employees in this category. The aircraft industry was a special case—the loss of Federal contracts due to the winding down of the space program and the completion of certain military projects led to a decline in the employment of scientists and engineers in R&D in this industry.

38.

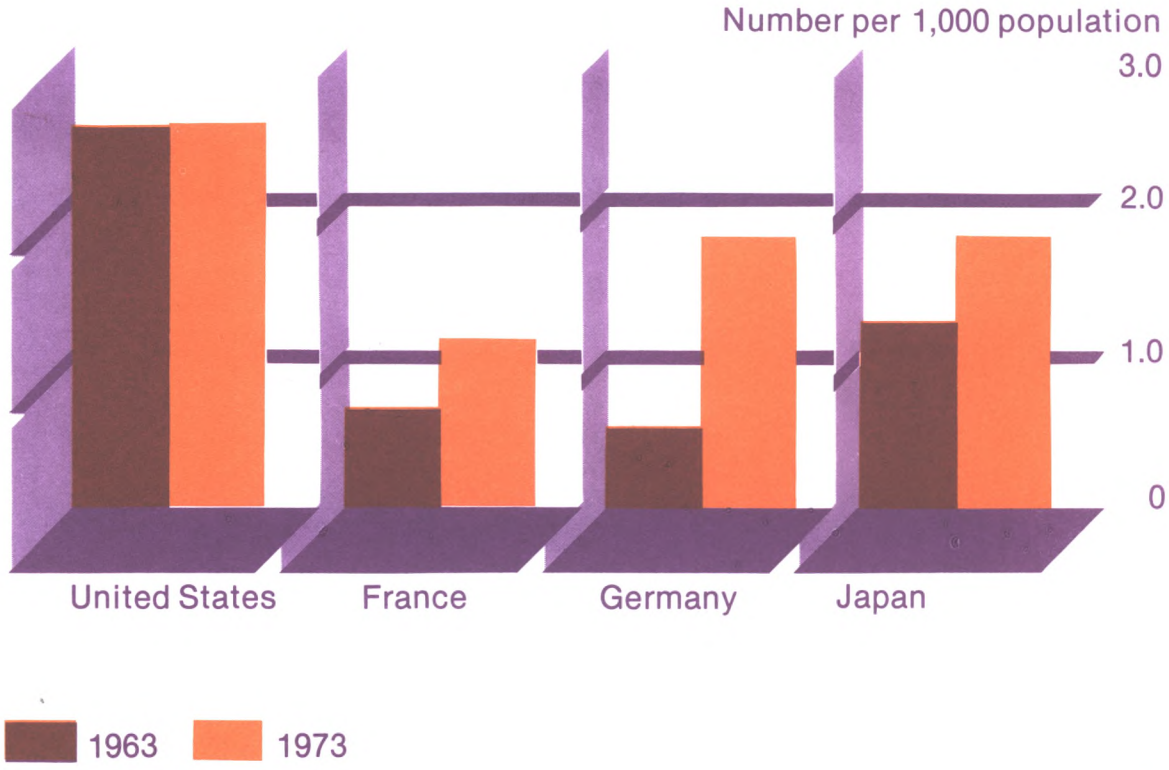
Research and development in selected countries.

Source:
National Science Foundation

R&D expenditures, 1961-74



Scientists and engineers engaged in R&D, 1963 and 1973



Labor quality: Educational attainment

The general upgrading of the work force over time is considered an important factor in productivity growth. This upgrading occurs primarily in two often interrelated ways: Increases in the proportion of the work force employed in higher skilled occupations and improvements in the level of education of the working population.

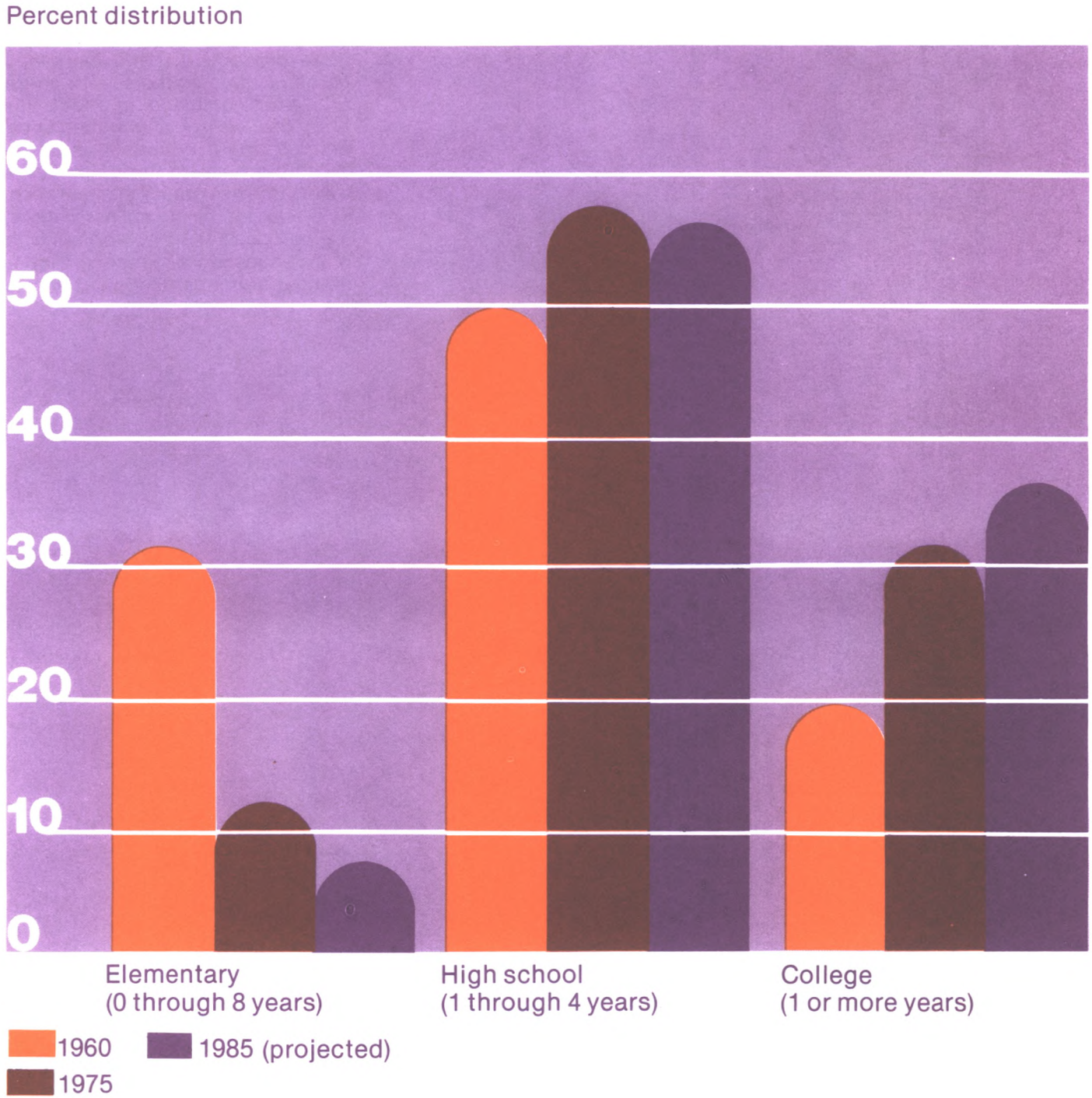
The educational level of the American work force has risen steadily and it is expected to rise even more, largely because young people have been spending more time in school. The proportion of the working population that has not completed high school has been dropping; by 1985 it is expected that over three-fourths of the work force will have a high school diploma.

Highest level of schooling completed	Proportion of the labor force		
	March 1960	March 1975	Projected 1985
Elementary:			
Less than 8 years	30.8	5.7	3.3
8 years		6.0	4.2
High school:			
1-3 years	22.2	17.4	15.5
4 years	27.6	39.7	40.7
College:			
1-3 years	10.1	15.4	17.1
4 years or more	9.2	15.7	19.2

39.

Educational attainment of the civilian labor force, 1960, 1975, and projected 1985.

Source:
Bureau of Labor Statistics



Education and lifetime earnings

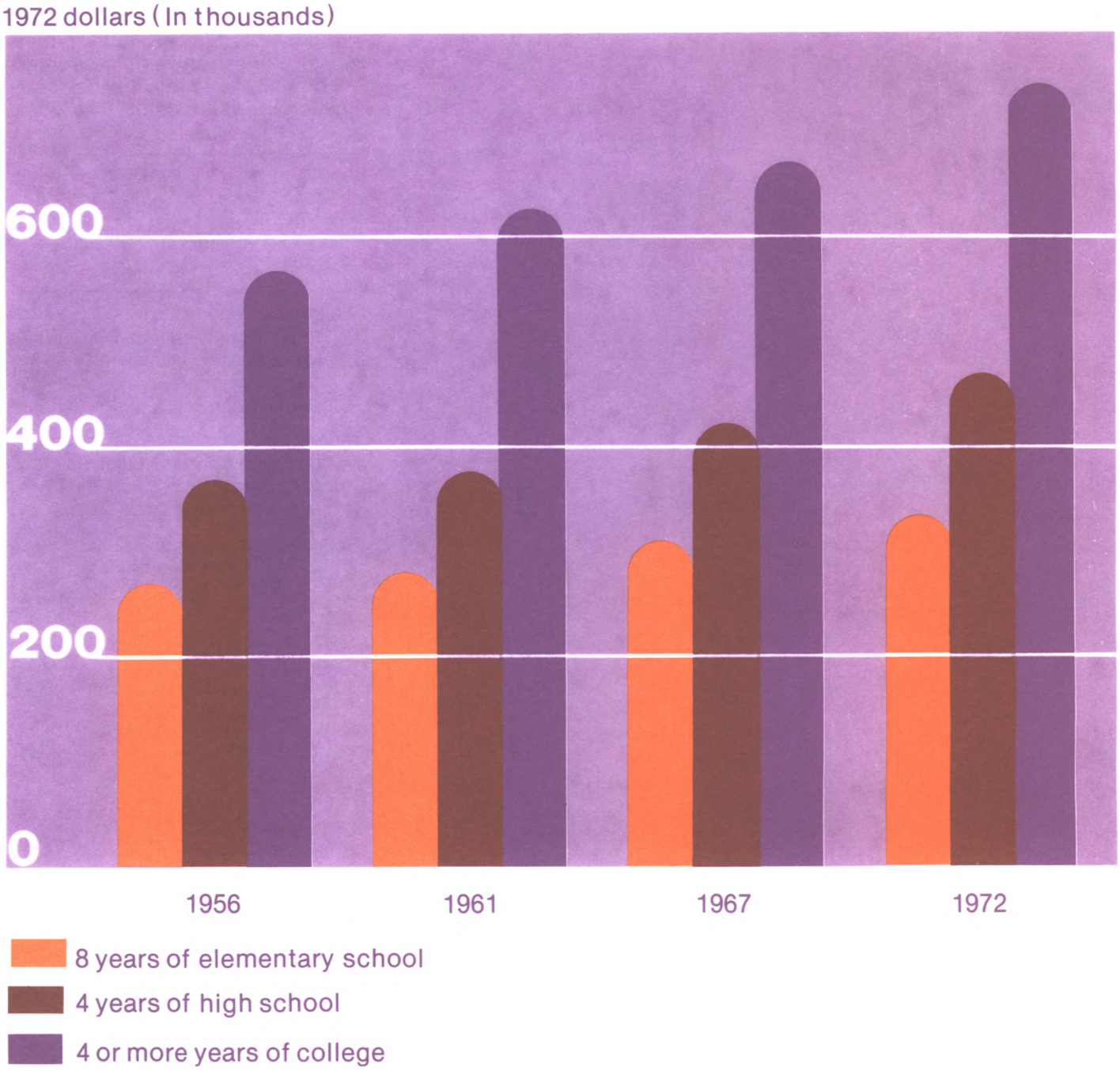
One indication that increased education does in fact make a worker more productive is the increased earnings that workers with more education command. In effect, this is another way of saying that workers with more education must be worth more, since the employer is willing to pay more for their services.

In addition to higher earnings at a given point in time, workers with more education also receive higher lifetime earnings. The chart shows that estimated lifetime earnings expressed in constant dollars have gone up for male workers since 1956 at all levels of educational attainment. Nevertheless, even in 1975 workers with 8 years of elementary education could expect to earn less than half the lifetime income of workers with 4 or more years of college, while workers with 4 years of high school education could expect less than two-thirds the income of college graduates.

40.

Estimated lifetime income for men by educational attainment, selected years.

Source:
Bureau of the Census



Occupational composition

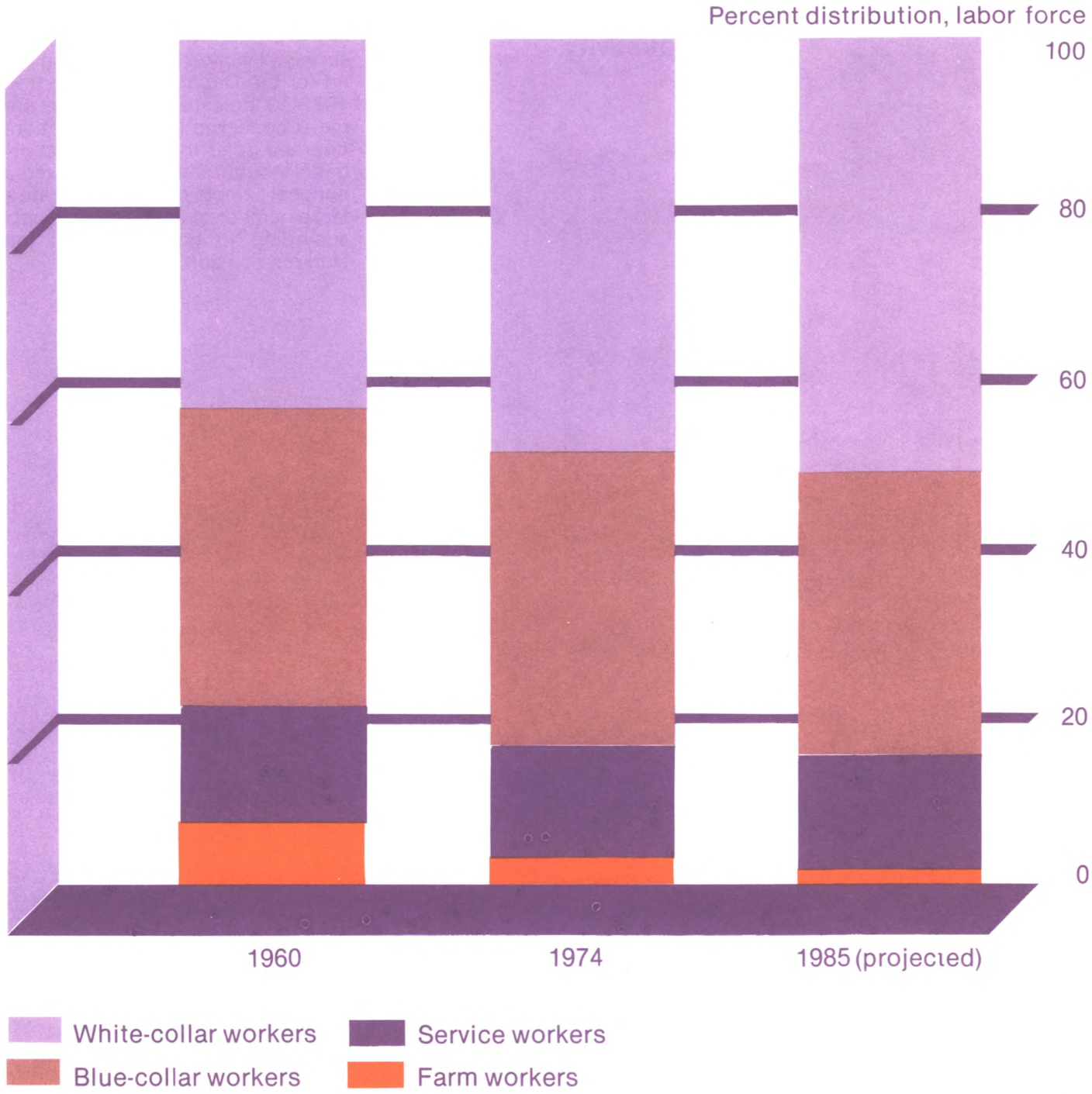
The occupational groups which are growing in importance—professional, clerical, and service workers—generally have relatively high educational requirements. The occupational groups which account for a decreasing proportion of the work force—operatives, laborers, and farm workers—require relatively little education.

Occupational group	Occupational distribution of the labor force (percent)		
	1960	1974	1985 (projected)
White-collar workers	43.1	48.6	51.5
Professional and technical workers	11.0	14.4	15.5
Managers and administrators	11.2	10.4	10.5
Sales workers	6.4	6.3	6.1
Clerical workers	14.5	17.5	19.4
Blue-collar workers	36.3	34.6	32.6
Craft and kindred workers	13.3	13.3	13.3
Operatives	17.3	16.2	14.7
Nonfarm laborers	5.7	5.1	4.6
Service workers	12.7	13.2	14.1
Farm workers	7.9	3.5	1.8

41.

Occupational composition of employment, 1960, 1974, and projected 1985.

Source:
Bureau of Labor Statistics



Worker attitudes and productivity

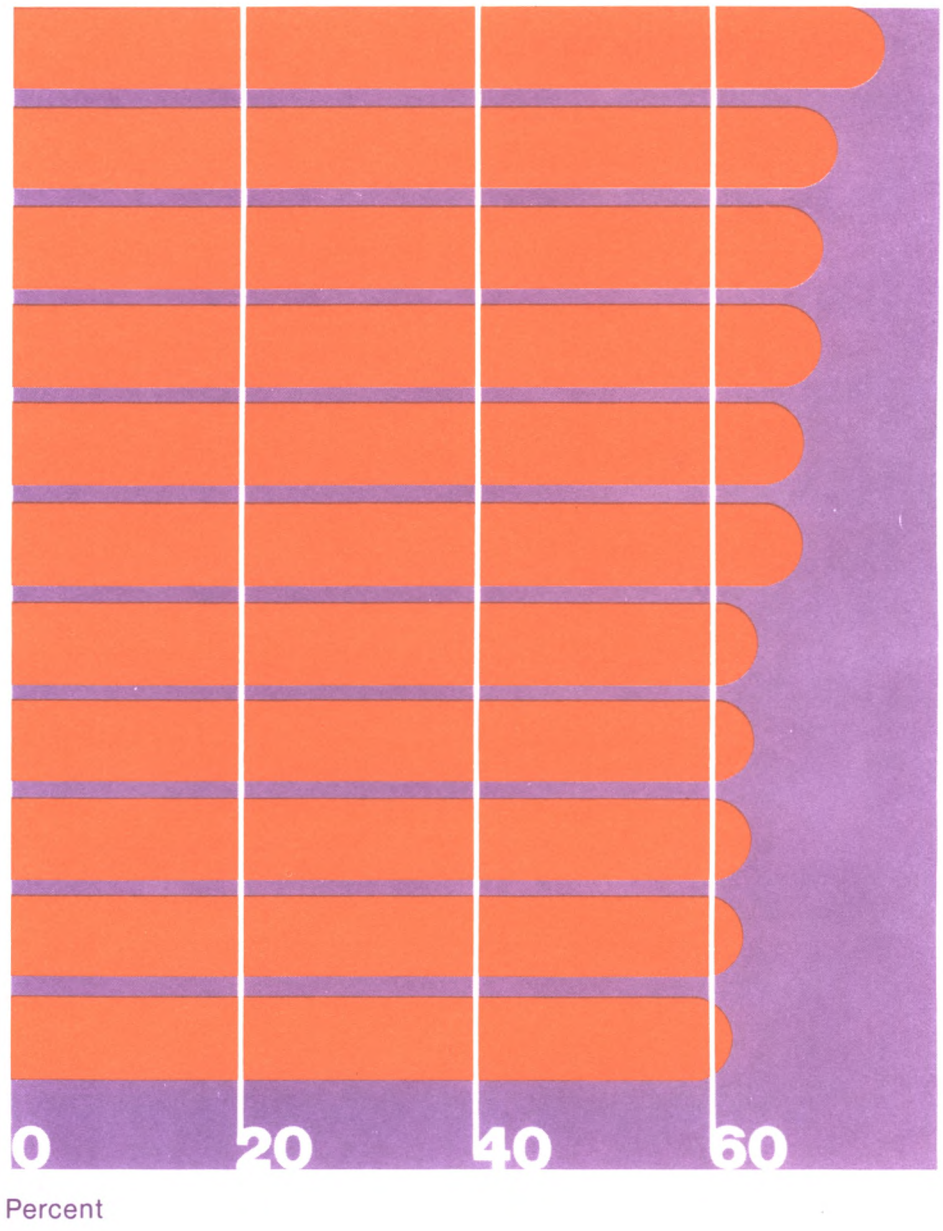
Worker attitudes are an important key to productivity improvement. A survey of worker attitudes conducted for the Department of Labor in 1972-73 indicated that workers are more concerned with production-oriented goals than had previously been thought. This survey asked a national sample of workers to rate a large number of different job facets according to how important the workers considered them.

The chart shows the job facets most frequently rated as "very important" by the workers. Only two—pay and job security—are economic aspects of work. The other nine reflect workers' concerns with having adequate resources to do their work as well as having an interesting and challenging job.

42.

Proportion of workers rating selected job facets as "very important," 1972-73

Source: Survey Research Center, University of Michigan



APPENDIX

Supporting data for charts

Table 1. Output per hour of all persons in the total private economy and the nonfarm sector, 1909-75

(Index, 1909 = 100)

Year	Total private economy	Nonfarm sector	Year	Total private economy	Nonfarm sector
1909	100.0	100.0	1942	178.6	168.6
			1943	182.9	172.2
1910	105.5	99.4	1944	195.0	184.7
1911	100.7	100.8	1945	203.2	192.5
1912	103.4	101.6	1946	196.4	183.5
1913	103.4	102.6	1947	197.0	182.6
1914	100.0	99.2	1948	205.1	188.3
1915	99.8	97.5	1949	211.4	195.1
1916	100.9	98.3			
1917	97.8	94.4	1950	228.0	207.0
1918	103.5	101.9	1951	235.5	211.9
1919	107.6	106.5	1952	242.7	216.6
			1953	251.2	221.1
1920	104.0	102.9	1954	256.1	225.1
1921	104.6	104.3	1955	265.0	232.7
1922	114.4	113.7	1956	266.0	231.9
1923	119.9	117.3	1957	274.1	237.3
1924	122.0	121.3	1958	284.4	244.7
1925	128.1	127.0	1959	293.3	252.6
1926	131.5	130.1			
1927	131.9	128.5	1960	297.2	254.4
1928	131.3	128.7	1961	308.4	263.1
1929	137.8	134.4	1962	321.8	274.0
			1963	332.9	282.4
1930	131.6	130.0	1964	345.9	292.5
1931	131.0	131.1	1965	356.2	300.1
1932	124.1	125.8	1966	368.7	309.0
1933	121.9	124.1	1967	376.4	314.4
1934	134.9	137.1	1968	386.6	322.6
1935	141.1	142.3	1969	386.7	321.3
1936	149.5	148.9			
1937	149.8	148.3	1970	391.0	323.4
1938	153.4	151.9	1971	405.4	334.5
1939	159.8	156.9	1972	418.4	345.8
			1973	427.8	352.8
1940	166.3	163.1	1974	417.1	344.3
1941	176.9	168.6	1975	422.5	347.3

Table 2. Output per hour of all persons in the private and nonfarm business sectors, 1950-75

(Index, 1950 = 100)

Year	Private business sector	Nonfarm business sector
1950	100.0	100.0
1951	102.6	101.5
1952	105.7	104.1
1953	109.7	106.0
1954	111.6	107.6
1955	116.1	111.9
1956	117.5	112.4
1957	120.7	114.6
1958	124.6	117.6
1959	129.3	122.0
1960	131.3	123.2
1961	135.6	126.7
1962	141.0	131.4
1963	146.4	135.9
1964	153.0	141.4
1965	158.1	145.6
1966	163.3	149.4
1967	167.4	152.6
1968	172.7	157.3
1969	173.1	156.8
1970	174.4	157.1
1971	180.1	161.8
1972	185.6	167.0
1973	189.2	169.9
1974	182.8	163.9
1975	186.5	166.9

Table 3. Output per hour of all persons in the private business sector, adjusted for shifts in employment from the farm to the nonfarm business sector, 1950-75

(Index, 1950 = 100)

Year	Output per hour	Shift-adjusted output per hour
1950	100.0	100.0
1951	102.6	101.5
1952	105.7	103.8
1953	109.7	106.8
1954	111.6	108.6
1955	116.1	112.8
1956	117.5	113.5
1957	120.7	115.9
1958	124.6	119.4
1959	129.3	123.5
1960	131.3	125.1
1961	135.6	128.8
1962	141.0	133.6
1963	146.4	138.3
1964	153.0	143.9
1965	158.1	148.3
1966	163.3	152.3
1967	167.4	155.8
1968	172.7	160.5
1969	173.1	160.4
1970	174.4	161.4
1971	180.1	166.6
1972	185.6	171.6
1973	189.2	174.5
1974	182.8	168.6
1975	186.5	172.1

Table 4. Output per hour of all persons and output in the private business sector, 1968-75

(Percent change at annual rate)

Year and quarter	Output per hour of all persons	Output
1968:		
I	4.8	5.5
II	2.9	5.6
III	3.7	6.5
IV	−0.4	2.4
1969:		
I	0.3	3.7
II	−1.3	2.3
III	−0.9	0.3
IV	−1.3	−1.8
1970:		
I	0.8	−2.8
II	2.2	−0.2
III	7.1	3.0
IV	−1.9	−4.9
1971:		
I	7.6	9.1
II	−0.9	1.9
III	6.7	4.4
IV	−0.3	4.7
1972:		
I	3.3	10.5
II	4.8	7.6
III	1.6	4.5
IV	7.0	10.1
1973:		
I	4.4	11.3
II	−3.9	0.2
III	−1.9	0.7
IV	0.3	1.9
1974:		
I	−6.6	−6.4
II	−3.8	−3.8
III	−2.6	−3.9
IV	−4.0	−9.4
1975:		
I	1.6	−11.2
II	12.7	8.9
III	8.5	12.3
IV	−1.6	3.6

Table 5. Output per hour of all persons in the private business sector during the most recent and previous recessions

(Percent change at annual rate)

Quarter before (−) or after (+) trough	Most recent recession	Average of previous recessions[1]
Trough − 4	−6.6	4.1
Trough − 3	−3.8	−1.6
Trough − 2	−2.6	−0.2
Trough − 1	−4.0	4.6
Trough	(1975 I) 1.6	3.0
Trough + 1	12.7	10.0
Trough + 2	8.5	3.9
Trough + 3	−1.6	6.3
Trough + 4	7.5	0.6

[1] The previous recessions and their respective troughs included in the calculations were designated by the National Bureau of Economic Research as follows: For the 1969-70 period, 4th quarter of 1970; for 1960-61, 1st quarter of 1961; for 1958, 2nd quarter; for 1954, 3rd quarter; and for 1948-49, 4th quarter of 1949.

Table 6. Output per hour of all persons by major sector, 1950-74

(Index, 1950 = 100)

Year	Farm	Mining	Manufacturing	Trade	Transportation	Communications	Gas, electric, and sanitary services
1950	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1951	101.3	104.9	103.3	98.9	105.4	105.7	113.3
1952	108.5	106.7	104.9	101.4	103.7	108.5	120.5
1953	123.1	112.3	107.0	103.5	104.3	114.0	126.9
1954	129.9	118.5	108.7	103.5	107.7	116.8	138.5
1955	131.8	125.3	114.2	109.4	113.7	124.6	145.5
1956	136.5	127.4	113.3	109.8	118.7	124.7	153.2
1957	144.8	128.4	115.8	112.2	119.0	132.4	161.1
1958	162.8	134.0	115.1	113.1	121.2	145.6	168.5
1959	156.6	138.2	120.5	118.1	124.7	158.1	183.2
1960	169.8	144.0	121.8	118.0	128.1	165.5	195.6
1961	180.0	153.0	124.7	121.0	131.0	176.2	207.1
1962	185.1	161.0	130.3	128.3	136.1	187.9	217.2
1963	196.4	169.4	139.3	133.3	143.8	201.2	227.6
1964	202.2	172.7	146.6	138.0	156.4	207.3	240.7
1965	214.0	177.4	151.6	142.4	165.7	215.1	247.6
1966	223.6	186.2	154.0	148.6	165.7	223.6	260.2
1967	240.9	194.5	154.6	151.7	164.8	236.4	269.8
1968	244.5	203.7	160.1	157.9	173.8	247.7	287.3
1969	261.3	203.4	162.2	157.0	174.5	256.1	296.0
1970	291.8	208.4	161.5	159.5	175.3	263.0	296.6
1971	317.0	208.2	170.4	164.0	177.1	282.3	310.4
1972	305.8	207.1	178.9	171.5	187.1	295.1	311.1
1973	324.4	203.4	182.1	176.5	199.8	306.0	321.0
1974	307.3	191.1	174.9	170.7	199.2	323.1	285.2

Table 7. Onsite labor requirements for various types of new construction, selected periods

(Average annual percent change)

Type of construction	Period	Percent change[1]
Federally aided highways[2]	1958-73	−2.5
	1958-64	−3.8
	1964-73	−1.8
Federal office buildings[2]	1959-72/73	−2.0
Sewer works[2]	1963-71	−2.2
Private single-family housing[2]	1962-69	−1.9
Public housing[2]	1960-68	−2.2
General hospitals[3]	1960-66	−1.0
Elementary and secondary schools[3]	1959-65	−2.7

[1] Compound interest method.
[2] Constant dollars.
[3] Square feet.

Table 8. Output per employee-year, output, and employee years in the Federal Government, measured sample, fiscal years 1967-75

(Index, 1967 = 100)

Fiscal year	Output per employee-year	Output	Employee years
1967	100.0	100.0	100.0
1968	101.1	103.7	102.6
1969	103.5	107.1	103.5
1970	104.0	107.4	103.3
1971	105.6	108.8	103.0
1972	106.3	109.0	102.6
1973	109.2	110.5	101.2
1974	108.7	110.7	101.9
1975	110.7	112.8	101.8

Table 9. Output per employee-hour in selected industries, 1960-75

Industry	Average annual percent change
Pipelines[1]	9.2
Hosiery[1]	7.1
Malt liquors[1]	6.8
Air transportation	6.7
Synthetic fibers[1]	6.7
Aluminum rolling and drawing[1]	5.7
Pharmaceuticals[2]	5.4
Gas and electric utilities	5.1
Telephone communications	5.1
Petroleum refining[1]	5.0
Railroads, revenue traffic	4.9
Major household appliances[1]	4.9
Radio and TV sets[1]	4.3
Paper, paperboard, and pulp mills[1]	4.3
Candy and other confectionery[1]	4.0
Concrete products[3]	3.9
Gas stations	3.8
Corrugated and solid fiber boxes[1]	3.8
Hydraulic cement[1]	3.7
Flour and other grain mill products[1]	3.6
Nonmetallic minerals	3.4
Tires and inner tubes[1]	3.5
Clay construction products[1]	3.3
Canning and preserving[3]	3.2
Motor vehicles and equipment	3.2
Sugar[1]	3.1
Cigars[1]	3.1
Bakery products[1]	2.9
Clay refractories[1]	2.9
Intercity trucking	2.7
Hotels and motels[1]	2.6
Glass containers[1]	2.5
Gray iron foundries[1]	2.5
Paints and allied products[1]	2.4
Steel	2.2
Primary aluminum	2.2
Copper rolling and drawing[1]	2.1
Ready-mixed concrete[1]	2.1
Soft drinks[1]	2.0
Metal cans[1]	1.9
Iron mining, usable ore	1.9
Primary copper, lead, and zinc[1]	1.8
Steel foundries[1]	1.3
Cigarettes, chewing and smoking tobacco[1]	1.2
Bituminous coal and lignite mining	1.1
Footwear[1]	0.3
Copper mining, recoverable metal	0.1

[1] 1960-74.
[2] 1963-74.
[3] 1960-73.

Table 10. Real gross domestic product (GDP) per employed civilian in selected countries, 1950-75

(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	116.3	119.8	122.1	138.0	136.7	111.5
1960	123.6	131.0	156.7	179.4	186.0	125.5
1965	143.5	150.2	200.5	224.6	281.5	140.8
1967	149.3	154.8	218.9	237.6	334.5	148.8
1970	150.8	165.3	253.2	286.0	447.9	160.4
1971	154.2	170.7	264.6	293.4	478.1	167.4
1972	157.9	175.2	276.9	304.4	520.4	170.4
1973	161.0	178.2	288.8	318.9	557.9	176.2
1974	155.3	175.6	297.2	326.9	556.0	176.6
1975	154.2	172.6	295.3	324.9	570.2	173.9

Table 11. Output per employee-hour in manufacturing in selected countries, 1950-75

(Index, 1950 = 100)

Year	United States[1]	Canada[1]	Japan	France	Germany	United Kingdom
1950	100.0	100.0	100.0	100.0	100.0	100.0
1951	103.2	105.2	125.2	105.2	103.0	101.0
1952	105.1	106.9	131.8	108.7	112.6	96.8
1953	106.9	110.6	149.5	114.4	120.8	101.3
1954	108.6	115.2	160.3	117.5	125.7	104.7
1955	114.0	122.9	168.2	123.5	133.6	108.1
1956	113.3	128.1	179.4	131.4	137.2	108.1
1957	115.6	128.9	195.8	133.5	149.2	110.7
1958	115.0	133.3	183.2	138.7	156.8	112.6
1959	120.3	140.7	213.1	148.8	169.4	117.1
1960	121.4	145.5	245.8	156.5	181.4	124.1
1961	124.4	153.4	277.1	163.8	191.3	125.0
1962	130.2	161.7	289.3	171.3	203.3	128.1
1963	139.3	167.8	313.6	181.6	214.2	135.1
1964	146.7	175.1	354.7	190.7	230.9	144.9
1965	151.3	181.9	369.6	201.6	247.0	149.3
1966	153.6	187.3	407.0	215.7	256.8	154.6
1967	154.1	192.7	467.3	227.8	273.2	161.6
1968	159.6	206.7	526.2	253.8	294.0	172.7
1969	161.6	218.3	607.5	262.9	310.9	175.1
1970	161.0	222.0	684.6	276.1	318.6	176.3
1971	170.0	217.5	708.9	290.4	334.7	184.7
1972	178.7	244.5	765.9	309.6	356.0	195.8
1973	181.8	252.6	861.2	323.9	378.7	206.6
1974	174.6	252.4	876.2	332.8	397.8	205.3
1975 p	173.3	256.3	850.0	318.2	410.9	202.6

p = preliminary.
[1] Output per hour of all persons.

Table 12. Levels[1] of output per employee-hour in the iron and steel industry, selected countries, 1964-74

(Index, United States = 100)

Year	Japan	France	Germany	United Kingdom
1964	43-54	48-51	54-63	46-50
1965	43-54	48-52	52-61	47-51
1966	51-63	50-54	53-61	45-48
1967	63-79	55-59	59-69	46-50
1968	68-85	59-63	65-76	48-52
1969	83-104	65-70	71-83	50-54
1970	97-121	68-73	72-84	51-56
1971	94-117	65-70	69-81	48-52
1972	103-128	67-72	72-85	49-54
1973	122-151	64-68	72-84	47-51
1974p	126-156	66-70	77-90	43-47

p = preliminary.
[1] Range of estimates.

Table 13. Output per hour of all persons and labor costs in the private business sector, 1950-75

(Percent change)

Year	Output per hour of all persons	Unit labor costs	Compensation per hour
1950	8.1	−0.9	7.1
1951	2.6	7.0	9.8
1952	3.0	3.3	6.4
1953	3.8	2.7	6.6
1954	1.7	1.6	3.4
1955	4.0	−1.4	2.6
1956	1.2	5.4	6.7
1957	2.7	3.9	6.7
1958	3.3	1.3	4.7
1959	3.7	0.9	4.6
1960	1.5	2.6	4.2
1961	3.3	0.7	4.0
1962	4.0	0.7	4.7
1963	3.8	0.0	3.9
1964	4.5	0.9	5.4
1965	3.4	0.5	3.9
1966	3.3	3.7	7.0
1967	2.5	3.1	5.6
1968	3.2	4.3	7.6
1969	0.2	6.7	7.0
1970	0.8	6.4	7.2
1971	3.3	3.2	6.6
1972	3.1	2.5	5.7
1973	1.9	6.2	8.2
1974	−3.4	13.2	9.3
1975	2.1	7.5	9.7

Table 14. Output per hour of all persons and labor costs in the private business sector, 1968-75

(Percent change at annual rate)

Year and quarter	Output per hour of all persons	Unit labor costs	Compensation per hour
1968			
I	4.8	7.0	12.1
II	2.9	4.3	7.3
III	3.7	4.3	8.1
IV	−0.4	8.1	7.7
1969			
I	0.3	4.5	4.8
II	−1.3	8.6	7.1
III	−0.9	9.6	8.6
IV	−1.3	7.0	5.6
1970			
I	0.8	9.1	9.9
II	2.2	2.9	5.2
III	7.1	1.7	9.0
IV	−1.9	5.8	3.8
1971			
I	7.6	0.5	8.1
II	−0.9	6.7	5.8
III	6.7	1.1	7.9
IV	−0.3	2.4	2.1
1972			
I	3.3	4.8	8.3
II	4.8	0.4	5.3
III	1.6	2.4	4.1
IV	7.0	0.8	7.9
1973			
I	4.4	8.5	13.2
II	−3.9	10.4	6.1
III	−1.9	8.9	6.8
IV	0.3	8.1	8.4
1974			
I	−6.6	15.6	8.0
II	−3.8	17.1	12.7
III	−2.6	15.5	12.6
IV	−4.0	14.5	9.9
1975			
I	1.6	11.3	13.1
II	12.7	−5.1	6.9
III	8.5	−3.0	5.2
IV	−1.6	10.1	8.3

Table 15. Unit labor costs in the private business sector during the most recent and previous recessions

(Percent change at annual rate)

Quarter before (−) or after (+) trough	Most recent recession	Average of previous recessions[1]
Trough − 4	15.6	3.2
Trough − 3	17.1	2.2
Trough − 2	15.5	1.7
Trough − 1	14.5	2.0
Trough	(1975 I) 11.3	0.6
Trough + 1	−5.1	−1.0
Trough + 2	−3.0	−1.1
Trough + 3	10.1	0.5
Trough + 4	3.2	2.1

[1] The previous recessions and their respective troughs included in the calculations were designated by the National Bureau of Economic Research as follows: For the 1969-70 period, 4th quarter of 1970; for 1960-61, 1st quarter of 1961; for 1958, 2nd quarter; for 1954, 3rd quarter; and for 1948-49, 4th quarter of 1949.

Table 16. Composition of price changes in the private business sector, 1950-75

(Percent change)

Year	Implicit price deflator	Point contribution to percent change		
		Unit labor costs	Unit nonlabor payments	
			Profits[1]	Other[2]
1950	1.4	−0.7	2.7	−0.6
1951	7.5	4.5	2.2	0.8
1952	1.5	2.1	−1.7	1.0
1953	0.5	1.8	−1.6	0.3
1954	1.0	1.1	−0.8	0.6
1955	1.6	−0.8	2.2	0.2
1956	3.3	3.4	−1.1	1.0
1957	3.5	2.7	−0.4	1.1
1958	1.3	0.9	−0.7	1.1
1959	1.7	0.6	1.3	−0.1
1960	1.6	1.7	−1.1	1.0
1961	0.6	0.6	−0.5	0.5
1962	1.4	0.4	0.4	0.6
1963	1.1	0.0	0.5	0.6
1964	0.9	0.7	0.2	0.1
1965	2.0	0.3	1.4	0.3
1966	3.1	2.4	0.3	0.5
1967	2.8	2.0	−0.4	1.1
1968	4.1	2.8	0.1	1.1
1969	4.7	4.4	−1.2	1.6
1970	4.8	4.3	−2.0	2.4
1971	4.3	2.2	1.0	1.2
1972	3.4	1.8	1.4	0.3
1973	5.8	4.1	1.6	0.1
1974	10.3	8.8	−1.6	3.1
1975	10.0	5.6	0.7	3.7

[1] Unit profits include corporate profits, estimated profits of unincorporated enterprises, and net rental earnings of owner-occupied dwellings.

[2] Other unit nonlabor costs include depreciation, interest, and indirect taxes.

Table 17. Output per employee-hour and unit profits in the nonfinancial corporate sector, 1950-75

(Percent change)

Year	Output per employee-hour	Unit profits
1950	7.4	14.2
1951	2.7	3.4
1952	0.5	−10.8
1953	3.2	−7.2
1954	2.7	−1.4
1955	6.0	20.2
1956	0.6	−8.1
1957	2.4	−4.5
1958	−0.1	−9.9
1959	4.4	19.0
1960	2.3	−8.6
1961	3.3	−2.1
1962	4.9	9.9
1963	4.3	4.8
1964	4.2	5.9
1965	3.1	7.3
1966	2.3	−0.1
1967	1.4	−7.8
1968	3.9	0.6
1969	1.0	−11.8
1970	0.4	−21.4
1971	4.0	10.3
1972	3.5	13.1
1973	2.4	−1.7
1974	−3.0	−19.1
1975	2.9	25.7

Table 18. Output per employee-hour and labor costs in manufacturing, selected countries, 1950-67

(Average annual percent change)

Country	Output per employee-hour	Unit labor costs		Compensation per hour
		National currency	U.S. dollars	
United States[1]	2.7	1.8	1.8	4.5
Canada[1]	4.1	0.8	0.4	4.9
France	4.9	3.6	0.8	8.7
Germany	6.2	2.5	3.0	8.9
Italy	5.9	2.3	2.3	8.3
Japan	8.6	1.0	1.0	9.6
Netherlands	5.0	3.6	4.1	8.8
Sweden	4.9	3.2	3.2	8.2
United Kingdom	3.0	3.4	3.3	6.5

[1] Output per hour of all persons.

Table 19. Output per employee-hour and labor costs in manufacturing, selected countries, 1967-75[1]

(Average annual percent change)

Country	Output per employee-hour	Unit labor costs		Compensation per hour
		National currency	U.S. dollars	
United States[2]	1.8	5.3	5.3	7.2
Canada[2]	3.6	4.7	6.0	8.5
France	4.6	8.0	9.9	12.9
Germany	5.2	7.0	14.7	12.6
Italy[3]	5.8	11.9	11.7	18.3
Japan	8.2	10.2	14.2	19.2
Netherlands[3]	8.1	6.1	11.0	14.7
Sweden	5.7	6.3	9.5	12.4
United Kingdom	3.2	10.5	9.0	14.0

[1] 1975 estimates based on part-year data except for the United States and Canada.
[2] Output per hour of all persons.
[3] 1970-74.

Table 20. Output per hour of all persons, prices, and labor costs in major sectors, 1968-74

(Average annual percent change)

Sector	Output per hour of all persons	Compensation per hour	Unit labor costs	Prices
Communications	4.6	9.6	4.7	2.7
Farm	4.2	7.2	2.9	13.1
Transportation	2.7	8.5	5.7	5.6
Manufacturing	2.4	6.9	4.4	3.4
Trade	1.9	6.8	4.8	5.3
Electric, gas, and sanitary services	0.7	7.6	6.9	6.2
Mining	−0.7	8.2	9.0	8.9

Table 21. Output per employee-hour and prices in selected industries, 1960-74

(Average annual percent change)

Industry	Output per employee-hour	Prices
Canning and preserving[1]	3.2	2.4
Flour and other grain mill products	3.6	3.7
Bakery products	2.9	3.5
Sugar	3.1	5.3
Candy and other confectionery	4.0	3.1
Malt liquors	6.8	1.4
Soft drinks	2.0	3.9
Cigarettes, chewing and smoking tobacco	1.2	3.0
Cigars	3.1	1.0
Hosiery	7.1	−1.0
Paper, paperboard, and pulp mills	4.3	2.3
Corrugated and solid fiber boxes	3.8	2.6
Synthetic fibers	6.7	−0.9
Pharmaceuticals[2]	5.4	0.4
Paints and allied products	2.4	2.7
Petroleum refining	5.0	3.7
Tires and inner tubes	3.5	1.9
Footwear	0.3	3.6
Glass containers	2.5	3.4
Hydraulic cement	3.7	3.0
Clay construction products	3.3	2.4
Clay refractories	2.9	3.4
Concrete products[1]	3.9	2.1
Ready-mixed concrete[1]	2.1	2.5
Steel	2.5	3.3
Gray iron foundries	2.5	3.6
Steel foundries	1.3	3.3
Primary copper, lead, and zinc	1.8	5.6
Primary aluminum	2.2	1.6
Copper rolling and drawing	2.1	5.8
Aluminum rolling and drawing	5.7	0.9
Metal cans	1.9	3.7
Major household appliances	4.9	0.9
Radio and TV sets	4.3	−1.6
Motor vehicles and equipment	3.2	2.0
Telephone communications	5.1	1.0
Gas stations	3.9	2.9
Hotels and motels	2.6	4.3

[1] 1960-73.
[2] 1963-74.

Table 22. Output per employee-hour and compensation per hour in selected industries, 1960-73

(Average annual percent change)

Industry	Output per employee-hour	Compensation per hour
Canning and preserving	3.2	5.2
Flour and other grain mill products	4.0	5.1
Bakery products	3.0	5.4
Sugar	3.4	4.9
Candy and other confectionery	4.0	5.1
Malt liquors	6.6	5.3
Soft drinks	1.9	5.6
Cigarettes, chewing and smoking tobacco	1.3	6.2
Cigars	3.4	4.1
Hosiery	7.1	5.1
Paper, paperboard, and pulp mills	4.4	5.4
Corrugated and solid fiber boxes	3.9	4.9
Synthetic fibers	6.6	4.4
Pharmaceuticals[1]	5.5	5.8
Paints and allied products	2.4	4.2
Petroleum refining	5.2	5.1
Tires and inner tubes	3.6	4.5
Footwear	0.4	4.5
Glass containers	2.5	5.2
Hydraulic cement	4.2	5.8
Clay construction products	3.5	4.4
Clay refractories	2.9	4.1
Concrete products	3.9	5.8
Ready-mixed concrete	2.1	5.1
Steel	2.5	4.1
Gray iron foundries	2.5	5.3
Steel foundries	1.3	4.0
Primary copper, lead, and zinc	1.9	4.9
Primary aluminum	2.3	4.7
Copper rolling and drawing	2.5	4.2
Aluminum rolling and drawing	5.7	4.9
Metal cans	1.8	4.5
Major household appliances	5.2	4.0
Radio and TV sets	4.7	4.2
Motor vehicles and equipment	3.3	5.2

[1] 1963-73.

Table 23. Output per hour of all persons and real compensation per hour in the private business sector, 1950-75

(Index, 1950 = 100)

Year	Output per hour of all persons	Real compensation per hour
1950	100.0	100.0
1951	102.6	101.7
1952	105.7	105.9
1953	109.7	112.0
1954	111.6	115.3
1955	116.1	118.7
1956	117.5	124.8
1957	120.7	128.7
1958	124.6	131.1
1959	129.3	136.1
1960	131.3	139.6
1961	135.6	143.6
1962	141.0	148.7
1963	146.4	152.6
1964	153.0	158.7
1965	158.1	162.3
1966	163.3	168.8
1967	167.4	173.4
1968	172.7	179.0
1969	173.1	181.7
1970	174.4	183.8
1971	180.1	187.9
1972	185.6	192.2
1973	189.2	195.7
1974	182.8	192.8
1975	186.5	193.8

Table 24. Gross domestic product (GDP) per capita and average weekly hours per person engaged in production in the private economy, 1950-75

(Index, 1950 = 100)

Year	GDP per capita	Average weekly hours
1950	100.0	100.0
1951	106.3	99.9
1952	108.5	99.5
1953	110.8	99.0
1954	107.4	98.0
1955	112.6	98.4
1956	113.0	97.6
1957	112.9	96.3
1958	108.3	95.4
1959	115.5	96.0
1960	116.3	95.6
1961	117.1	94.8
1962	122.0	95.0
1963	125.0	94.9
1964	129.7	94.4
1965	135.6	94.7
1966	142.2	94.0
1967	144.4	93.0
1968	149.2	92.7
1969	151.7	92.3
1970	149.6	91.1
1971	152.2	90.7
1972	159.7	90.0
1973	166.9	90.7
1974	162.7	89.7
1975	158.4	88.8

Table 25. Working life and life expectancy, by sex, 1900, 1950, and 1970

Year	Years of life expectancy at birth	Working years	Years outside the labor force
Men:			
1900	48.2	32.1	16.1
1950	65.5	41.5	24.0
1970	67.1	40.1	27.0
Women:			
1900	50.7	6.3	44.4
1950	71.0	15.1	55.9
1970	74.8	22.9	51.9

Table 26. Output per employee-hour and employment in selected countries, 1960-75

(Average annual percent change)

Industry	Output per employee-hour	Employment
Air transportation	6.7	5.1
Aluminum rolling and drawing[1]	5.7	2.0
Bakery products[1]	2.9	−2.1
Bituminous coal and lignite mining	1.1	1.3
Candy and other confectionery[1]	4.0	−0.5
Canning and preserving[2]	3.2	1.2
Cigarettes, chewing and smoking tobacco[1]	1.2	0.5
Cigars[1]	3.1	−4.9
Clay construction products[1]	3.3	−3.5
Clay refractories[1]	2.9	−0.8
Concrete products[2]	3.9	1.8
Copper mining, recoverable metal	0.1	2.7
Copper rolling and drawing[1]	2.1	−0.2
Corrugated and solid fiber boxes[1]	3.8	2.5
Flour and other grain mill products[1]	3.6	−3.4
Footwear[1]	0.3	−2.4
Gas and electric utilities	5.1	1.2
Gas stations	3.8	1.2
Glass containers[1]	2.5	1.8
Gray iron foundries[1]	2.5	1.8
Hosiery[1]	7.1	−1.7
Hotels and motels[1]	2.6	2.7
Hydraulic cement[1]	3.7	−1.9
Intercity trucking	2.7	3.0
Iron mining, usable ore	1.9	−1.4
Major household appliances[1]	4.9	0.1
Malt liquors[1]	6.8	−2.4
Metal cans[1]	1.9	2.5
Motor vehicles and equipment	3.2	1.6
Nonmetallic minerals	3.4	−0.5
Paints and allied products[1]	2.4	1.5
Paper, paperboard, and pulp mills[1]	4.3	0.1
Petroleum refining[3]	5.0	−1.9
Pharmaceuticals[1]	5.4	3.3
Pipelines	9.2	−2.4
Primary aluminum[1]	2.2	4.2
Primary copper, lead, and zinc[1]	1.8	0.2
Radio and TV sets[1]	4.3	1.1
Railroads, revenue traffic	4.9	−2.7
Ready-mixed concrete[2]	2.1	1.9
Soft drinks[1]	2.0	1.7
Steel	2.2	−0.5
Steel foundries[1]	1.3	1.5
Sugar[1]	3.1	−0.8
Synthetic fibers[1]	6.7	3.6
Telephone communications	5.1	3.0
Tires and inner tubes[1]	3.5	2.2

[1] 1960-74.
[2] 1960-73.
[3] 1963-74.

Table 27. Output and hours in selected industries with similar productivity growth, 1960-75

(Average annual percent change)

Industry	Output per employee-hour	Output	Hours
Telephone communications	5.1	8.2	2.8
Railroads (revenue traffic)	4.9	2.1	−2.7
Gas and electric utilities	5.1	6.4	1.3

Table 28. Three estimates of the factors affecting productivity

(Percent distribution)

Economist	Labor quality	Capital	All other factors—"technology"
Denison	18	20	62
Kendrick	10	18	72
Christensen and Jorgenson	14	42	44

Table 29. Total capital stock, capital equipment, and capital structures per hour of all persons in the private business sector,[1] 1950-74

(Index, 1950 = 100)

Year	Capital stock[2] per hour		
	Total	Capital equipment	Capital structures
1950	100.0	100.0	100.0
1951	101.1	104.4	99.0
1952	104.7	110.8	100.6
1953	107.6	116.6	101.8
1954	115.2	126.3	107.8
1955	115.2	127.6	107.1
1956	117.8	131.4	108.9
1957	123.9	139.1	114.1
1958	133.2	149.1	122.8
1959	131.9	147.8	121.6
1960	135.5	151.6	125.0
1961	141.5	157.5	131.0
1962	143.5	159.1	133.3
1963	147.2	163.1	136.8
1964	150.2	166.9	139.2
1965	152.3	170.0	140.7
1966	156.5	176.2	143.6
1967	164.0	185.8	149.8
1968	168.6	192.6	152.9
1969	172.0	198.4	154.8
1970	181.9	211.0	162.9
1971	189.2	220.4	168.8
1972	189.6	222.3	168.2
1973	190.4	225.9	167.3
1974	197.2	236.0	171.9

[1] Net of government enterprises.
[2] Gross fixed nonresidential capital stock.

Table 30. Output per hour of all persons in the private business sector, and the capital/labor and output/capital ratios, 1950-74

(Index, 1950 = 100)

Year	Output per hour	Capital/labor ratio	Output/capital ratio
1950	100.0	100.0	100.0
1951	102.6	101.1	101.5
1952	105.7	104.7	101.0
1953	109.7	107.6	101.9
1954	111.6	115.2	96.9
1955	116.1	115.2	100.8
1956	117.5	117.8	99.8
1957	120.7	123.9	97.4
1958	124.6	133.2	93.6
1959	129.3	131.9	98.0
1960	131.3	135.5	96.9
1961	135.6	141.5	95.8
1962	141.0	143.5	98.3
1963	146.4	147.2	99.5
1964	153.0	150.2	101.9
1965	158.1	152.3	103.9
1966	163.3	156.5	104.4
1967	167.4	164.0	102.1
1968	172.7	168.6	102.4
1969	173.1	172.0	100.6
1970	174.4	181.9	95.8
1971	180.1	189.2	95.2
1972	185.6	189.6	97.9
1973	189.2	190.4	99.3
1974	182.8	197.2	92.7

[1] Net of government enterprises.

Table 31. Output per employee-hour in manufacturing, 1960-74, and capital investment, 1960-73, selected countries

Country	Output per employee-hour, 1960-74 (average annual percent change)	Capital investment 1960-73 (average percent of output)[1]	
		Total economy	Manufacturing
United States[2]	2.8	14.8	[3]12.4
Belgium	7.0	17.8	19.1
Canada[2]	4.2	19.7	14.6
France	5.9	19.7	n.a.
Germany	5.8	22.2	n.a.
Italy	6.3	16.3	n.a.
Japan	10.2	28.9	29.1
Netherlands	7.3	21.9	n.a.
Sweden	6.9	19.1	16.5
United Kingdom	4.0	16.7	13.1

[1] Capital investment, excluding residential dwellings, as percent of gross domestic product at factor cost, in current prices.
[2] Output per hour of all persons.
[3] Based on investment figures issued prior to the January 1976 revision of the national income accounts.
n.a. = not available.

Table 32. Gross capital formation per capita in selected countries, 1970

(Index, U.S. = 100)

Country	Total gross capital formation	Construction	Producers' durables
France	123.5	130.9	100.0
Germany	134.8	144.5	102.1
Japan	123.6	126.3	95.7
Italy	60.5	81.8	39.8
United Kingdom	68.1	71.6	60.0

Table 33. Output per unit of energy input, 1950-75

(Index, 1950 = 100)

Year	Output per unit of energy input
1950	100.0
1951	100.0
1952	105.1
1953	105.8
1954	108.3
1955	105.1
1956	102.6
1957	104.5
1958	103.9
1959	106.4
1960	105.8
1961	106.4
1962	107.1
1963	107.1
1964	109.0
1965	110.3
1966	110.9
1967	110.3
1968	108.3
1969	105.8
1970	101.9
1971	102.6
1972	103.9
1973	105.1
1974	105.8
1975	106.4

Table 34. Use of some key technological innovations, 1956-75

Year	Electronic computers in use (in thousands)	Steel output produced in basic oxygen furnaces (percent of total)	Value of shipments of numerically controlled machine tools (percent of total)	Electricity generated by nuclear power (percent of total)
1956	0.7	0.4	n.a.	n.a.
1957	1.5	0.5	n.a.	[1]
1958	2.6	1.6	n.a.	[1]
1959	3.8	2.0	2.5	[1]
1960	5.4	3.4	4.5	[1]
1961	7.6	4.0	6.3	0.2
1962	9.9	5.6	7.4	.3
1963	12.9	7.8	8.6	.3
1964	18.2	12.2	8.7	.3
1965	23.2	17.4	10.9	.4
1966	31.1	25.3	14.5	.5
1967	37.0	32.6	15.2	.6
1968	46.5	37.1	20.1	.9
1969	56.8	42.6	17.1	1.0
1970	68.3	48.2	13.2	1.4
1971	83.2	53.1	14.5	2.3
1972	104.0	56.0	14.2	3.1
1973	133.3	55.2	14.6	4.5
1974	165.0	56.0	17.7	6.1
1975	[2]210.0	n.a.	n.a.	n.a.

[1] Less than 0.1 percent.
[2] Estimated.
n.a. = not available.

Table 35. Use of two key technological innovations in selected countries

Country	Electronic digital computers in use		Steel output produced in basic oxygen furnaces (percent of total)	
	1965	1974	1960	1974
United States	23,200	165,040	3.4	56.1
Canada	750	6,158	n.a.	54.0
France	1,500	16,107	.7	58.4
Germany	[1]996	18,843	2.5	68.8
Italy	[1]500	7,675	0	43.8
Japan	1,445	26,069	11.9	80.0
United Kingdom	1,850	14,424	.5	48.1

[1] 1963.
n.a. = not available.

Table 36. Funds for research and development (R&D) as a percent of GNP, selected years, and R&D expenditures in selected industries, 1973

R&D funds
(Percent of GNP)

Year	Total	Industrial
1960	2.72	2.08
1965	2.98	2.07
1970	2.72	1.85
1975 estimate	2.38	1.66

R&D expenditures
(Percent of net sales)

Industry	Total	Company-funded	Federally funded
Chemicals and allied products	3.5	3.1	0.4
Petroleum refining and extracting	.7	.7	—
Rubber	1.8	1.6	.2
Stone, clay, and glass	1.5	1.5	—
Fabricated metal products	1.2	1.1	.1
Electrical equipment and communications	7.1	3.6	3.5
Machinery	3.8	3.2	.6
Motor vehicles and other transportation equipment	3.3	2.7	.6
Aircraft and missiles	13.5	2.9	10.6
Professional and scientific instruments	5.6	4.4	1.2

Table 37. Scientists and engineers engaged in research and development in selected industries, 1960 and 1974

(Thousands employed)

Industry	1960	1974
Chemicals and allied products	36.1	42.1
Petroleum refining and extracting	9.2	8.3
Rubber	5.3	5.7
Stone, clay, and glass	n.a.	4.2
Primary metals	6.9	5.7
Fabricated metal products	7.4	6.9
Electrical equipment and communications	72.1	94.7
Machinery	32.1	45.8
Motor vehicles and other transportation equipment	17.8	28.4
Aircraft and missiles	72.4	69.7
Professional and scientific instruments	10.0	16.7

n.a. = not available

Table 38. Research and development in selected countries

R&D expenditures as a percent of GNP

Year	United States	France	Germany	Japan	United Kingdom
1961	2.75	1.38	1.08	n.a.	2.69
1962	2.75	1.43	1.23	n.a.	n.a.
1963	2.90	1.53	1.38	1.25	n.a.
1964	2.99	1.78	1.54	n.a.	2.62
1965	2.93	1.99	1.70	n.a.	n.a.
1966	2.92	2.07	1.78	n.a.	2.79
1967	2.92	2.16	1.94	1.34	2.75
1968	2.86	2.11	1.93	n.a.	2.70
1969	2.76	1.96	1.99	1.50	2.73
1970	2.66	1.88	2.12	n.a.	n.a.
1971	2.53	1.87	2.29	1.65	n.a.
1972	2.45	1.82	2.37	1.89	n.a.
1973	2.35	1.73	2.36	1.92	n.a.
1974	2.29	n.a	2.41	n.a.	n.a.

n.a. = not available

Scientists and engineers engaged in R&D per 10,000 population

Country	1963	1973
United States	[1]24.7	24.9
France	6.7	[2]11.1
Germany	[1]5.7	17.8
Japan	12.0	[2]18.9

[1] 1964.
[2] 1971.

Table 39. Educational attainment of the civilian labor force, 1960, 1975, and projected 1985

(Percent distribution)

Highest level of schooling completed	1960	1975	1985 (projected)
Elementary: 0 through 8 years	30.8	11.7	7.5
High school: 1 through 4 years	49.8	57.2	56.2
College: 1 year or more	19.3	31.1	36.3

Table 40. Estimated lifetime income for men by educational attainment, selected years

(1972 dollars)

Year	8 years of elementary school	4 years of high school	4 years of college or more
1956	$274,998	$375,628	$573,298
1961	287,045	382,677	635,989
1967	313,347	427,331	677,838
1972	343,730	478,873	757,923

Table 41. Occupational composition of employment, 1960, 1974, and projected 1985

(Percent distribution)

Occupational group	1960	1974	1985 (projected)
Farm workers	7.9	3.5	1.8
Service workers	12.7	13.2	14.1
Blue-collar workers	36.3	34.6	32.6
White-collar workers	43.1	48.6	51.5

Table 42. Proportion of workers rating selected job facets as "very important", 1972-73

Job facet	Percent
The work is interesting	75.7
I have enough information to get the job done	71.7
The people I work with are friendly and helpful	69.5
I receive enough help and equipment to get the job done	69.4
I have an opportunity to develop my own special abilities	68.7
I have enough authority to do my job	67.9
The pay is good	64.1
My supervisor is competent in doing (his/her) job	63.9
I can see the results of my work	63.6
My responsibilities are clearly defined	63.4
The job security is good	61.8

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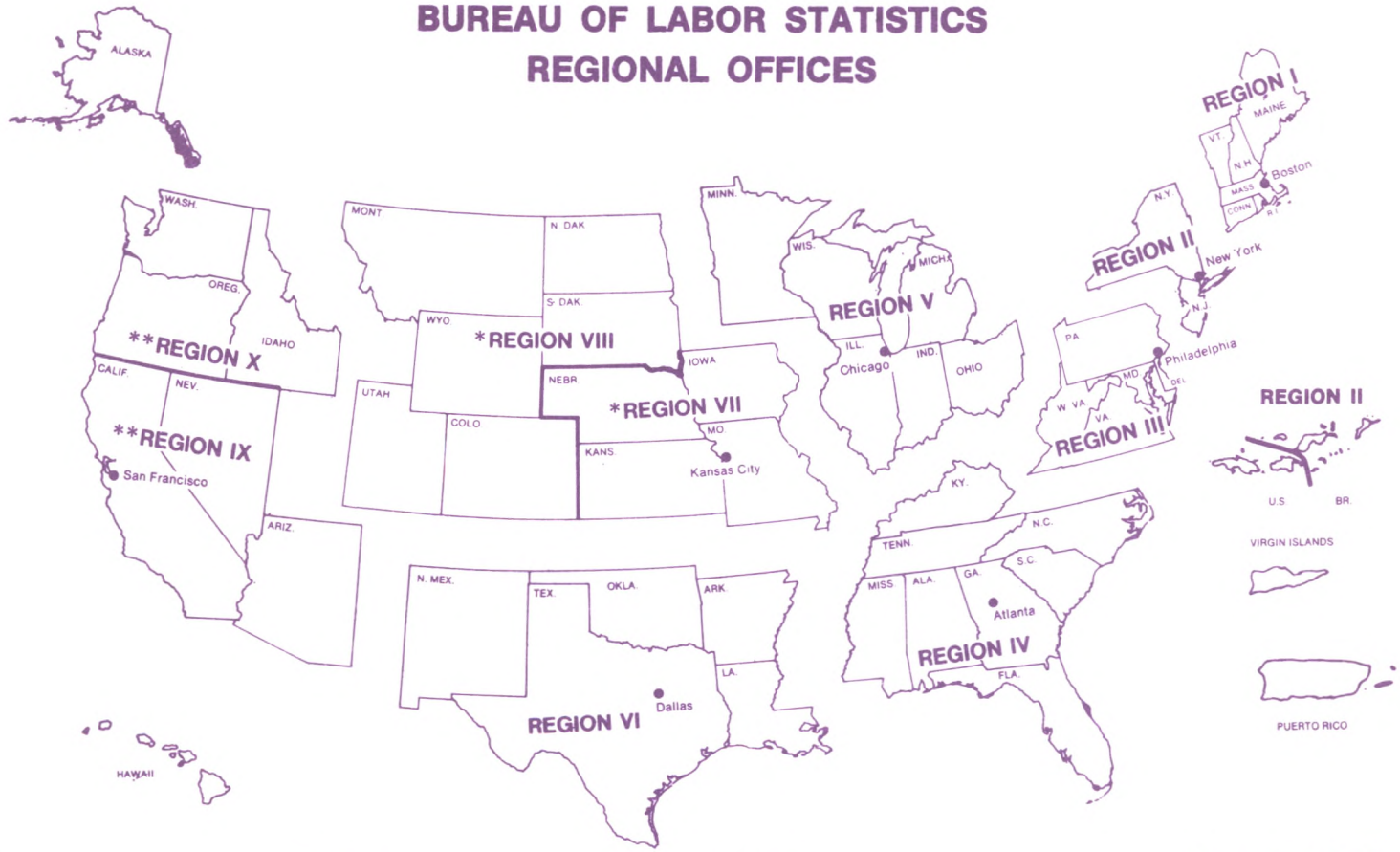

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