Productivity: An International Perspective

U.S. DEPARTMENT OF LABOR
Bureau of Labor Statistics

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Prepared by the
Bureau of Labor Statistics
for the National Commission
on Productivity

U.S. DEPARTMENT OF LABOR
Peter J. Brennan, Secretary

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Users of this chartbook interested in keeping abreast of current information on U.S. and foreign productivity can find up-to-date statistics on productivity and related subjects in publications of the Bureau of Labor Statistics. Data for the U.S. economy can be found in the *Quarterly Review of Productivity and Costs*, as well as in the monthly *Chartbook on Prices, Wages, and Productivity*. Data for foreign countries are contained in the *Handbook of Labor Statistics* and in occasional reports and releases by the Bureau. These reports are free and are available on request from the Bureau of Labor Statistics. Many of the U.S. and foreign series are published and analyzed from time to time in the *Monthly Labor Review*, which is available by subscription from the Superintendent of Documents or from any of the BLS regional offices, listed on the inside back cover.

Preface

Productivity is a key element influencing many economic variables and the attempt to increase productivity is a major objective of most governments. The differential rates of productivity growth experienced by the developed countries in the last two decades have led to major shifts in relative economic strength and have affected living standards, costs, prices, industrial structures, trading patterns, and international monetary arrangements. Information on productivity in the international area and the factors influencing its growth is, therefore, essential for appropriate policy formulation.

This chartbook is designed to provide reasonably consistent data that will permit international comparisons of productivity trends and levels along with related factors for selected countries. The first part covers the basic information on productivity trends and levels; the second and third show how differences in productivity affect costs and living standards; the fourth traces trends in various sources of productivity growth. In general, the countries examined are the major developed countries–those with which the United States has the greater part of its trade relationships–though a few less developed countries are sometimes included.

International comparisons often lack the precision usually associated with comparable U.S. measures. Small differences, therefore, may not be significant; however, broad movements should provide reasonably valid indications. A brief explanation of some of the recurring statistical problems is included in Appendix A. Supplementary information on specific problems has also been included in both the textual material and notes to selected tables.

This chartbook was prepared for the National Commission on Productivity. The Commission was established by the President in 1970, and was given a statutory basis by Congress in 1971. Composed of business, labor, government, and public leaders, the Commission develops and promotes programs and policies designed to improve U.S. productivity. One such program is the dissemination of information about productivity and its implications.

The chartbook was prepared in the Office of Productivity and Technology of the Bureau of Labor Statistics under the general direction of Jerome A. Mark, Assistant Commissioner. It was designed and written by Martha Farnsworth Riche under the direction of Chester Myslicki. Arthur Neef and staff, under the direction of John H. Chandler, Chief, Division of Foreign Labor Statistics, provided basic data and contributed to the analysis. Edgar Weinberg, Assistant to the Executive Director, planned the report on behalf of the National Commission on Productivity.

Contents

PART I. Productivity Measures

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. Basically, productivity can be measured in two ways. One way relates output to a single input such as labor or capital, while the other relates output to a composite of inputs, combined to reflect their relative importance. The latter type of measure is more comprehensive, but it is almost impossible to obtain, in view of the problem of identifying and measuring all inputs. For this and other reasons, the most commonly used measure of productivity relates output to a single input–labor.

One reason for choosing a labor productivity measure is that labor input is more readily measurable than other inputs. In addition, labor is the largest cost factor in the economy. Nevertheless, measures of output per man-hour or output per employee in no way imply that labor effort is solely or primarily responsible for productivity growth. In a technologically advanced society, productivity growth also reflects technological innovation, changes in capital stock and capacity utilization, scale of production, materials flow, management skills, the state of labor relations, competitive pressure, and many other factors whose contribution often cannot be measured separately.

The output side of the output per man-hour or output per employee ratio refers to the final products and services of an entire national economy (including government) or the amount of value added by an enterprise, industry, or sector. Since few of these entities produce a single homogeneous commodity that can be measured by simply counting the number of units produced, the various units of output must be combined on some common basis–either their unit labor requirements in a base period or their unit value. When the number of units produced is not known, as is often the case, output must be expressed in terms of the appropriate national currency, adjusted for price changes whenever necessary. Official U.S. data on productivity exclude general government. For this report, government has been included in both the output and input side for consistency with the other country measures.

Productivity comparisons can be made along two dimensions: the *level* of productivity in different countries at a given time, or the *trend* in productivity in different countries over a period of time. Both dimensions provide useful information and illuminate each other when studied simultaneously. For instance, as the charts in this book show, productivity has been growing at a relatively slow rate in the United States in recent years, but the overall level of U.S. productivity still surpasses the level attained in other developed countries.

Trends in Real GNP per Employed Civilian

At the national level, productivity measures are derived from the gross national product (GNP)–expressed in real terms by removing the effect of price changes–and the corresponding civilian employment. Although man-hours are a more meaningful measure of labor input than employment, man-hour indexes are not available for most of the countries compared. Consequently, consistent productivity comparisons can only be made on the basis of GNP per employee.[1]

The rate of change in real GNP per employee between 1950 and 1972 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.

Growth rates varied within this period. The highest rates for the United States spanned the recession-free years of 1960 through 1965. Japan's rate of productivity growth accelerated over the period.

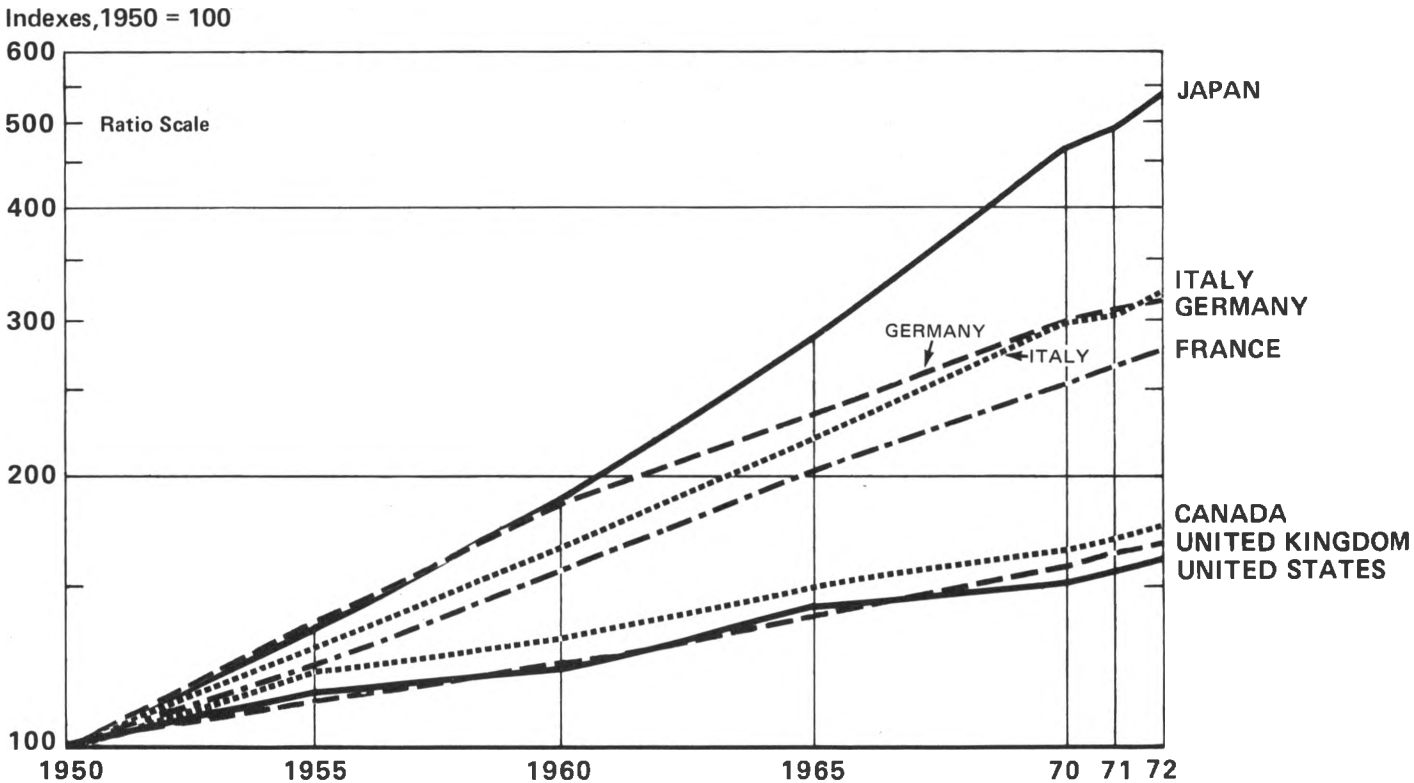
These rates of change are based on each country's own combination of its products by its own set of prices. If the other countries had used U.S. prices to calculate their national output, their rates of growth of real GNP per employee would probably have been slightly lower.

Country	Average annual percent change in real GNP per employed civilian			
	1950-72	1950-60	1960-65	1965-72
United States	2.2	2.1	3.2	1.5
Canada	2.6	2.8	2.7	2.2
France	4.8	4.6	5.2	4.7
Germany	5.4	6.8	4.3	4.4
Italy	5.4	5.2	5.9	5.4
Japan	8.0	6.6	8.7	9.4
United Kingdom	2.4	2.1	2.4	2.8

[1]Output per man-hour changes for the U.S. private economy averaged out at 2.9 percent for the 1950-72 period. The comparable measure for output per employed civilian for the private economy was 2.5 percent.

Chart 1.

Real GNP per Employed Civilian, 1950-72



Source: Bureau of Labor Statistics

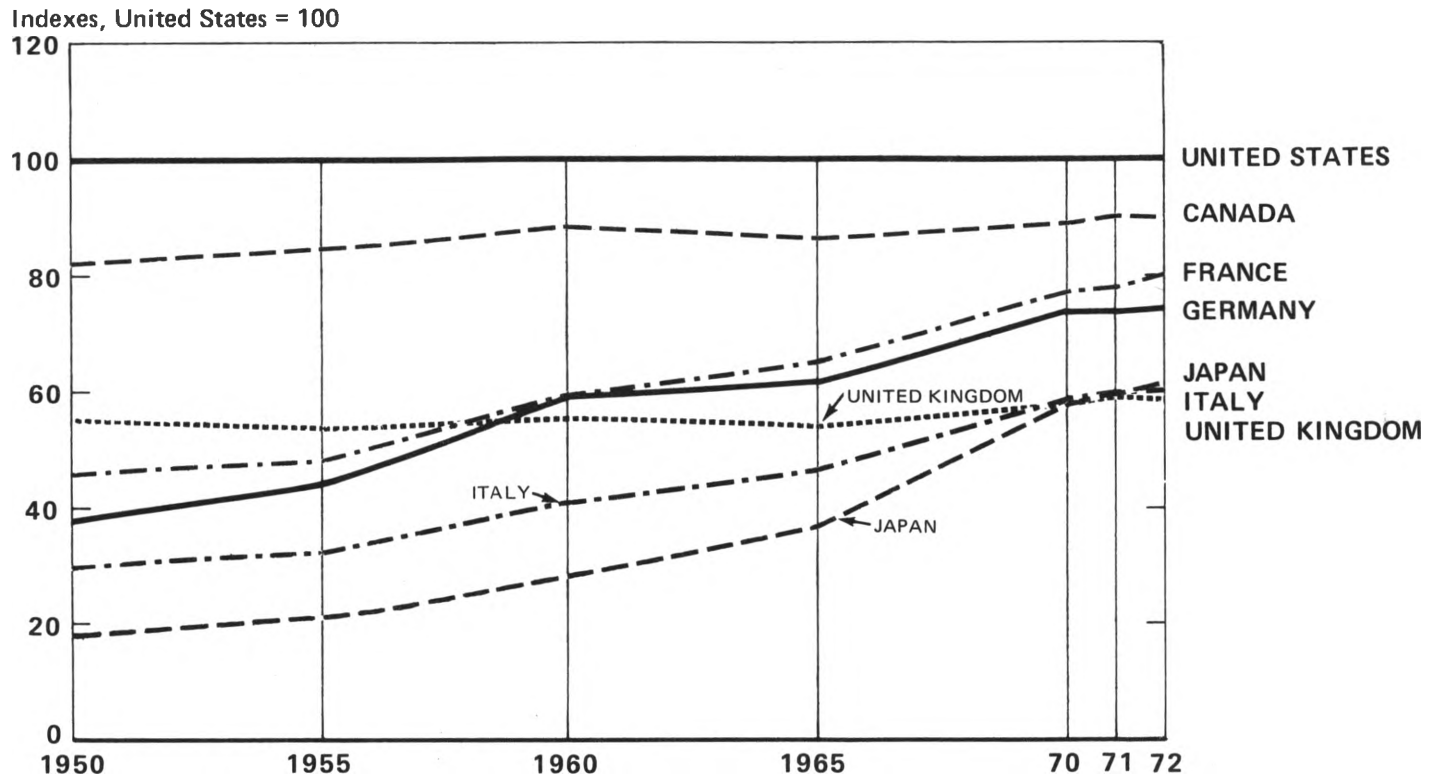
Comparative Levels of Real GNP per Employed Civilian

Higher rates of change in productivity over a limited time span may not signify higher productivity levels in one country compared to others if the more rapidly advancing country starts off at a relatively low level. Productivity levels are difficult to ascertain and ideally require periodic wide-scale investigations of a complex nature. The best available evidence suggests that the United States still has the highest level of productivity, even though the gap between the United States and many of the countries compared narrowed significantly between 1950 and 1972. Japan gained the most over the period, yet its estimated level of productivity in 1972 was among the lowest of the countries compared. Alternative estimates for the United Kingdom suggest that its productivity level may be understated.

As indicated in Appendix A, no use was made of official exchange rates to convert GNP expressed in foreign currencies into U.S. dollars. Such a procedure is inappropriate and would lead to extremely erratic movements from year to year.

Chart 2.

Real GNP per Employed Civilian, 1950-72



Source: Bureau of Labor Statistics

Trends in Output per Employed Civilian by Sector

In all the countries analyzed, productivity has grown faster in agriculture than in industry (mining, manufacturing, and construction) and faster in industry than in services during the past two decades.

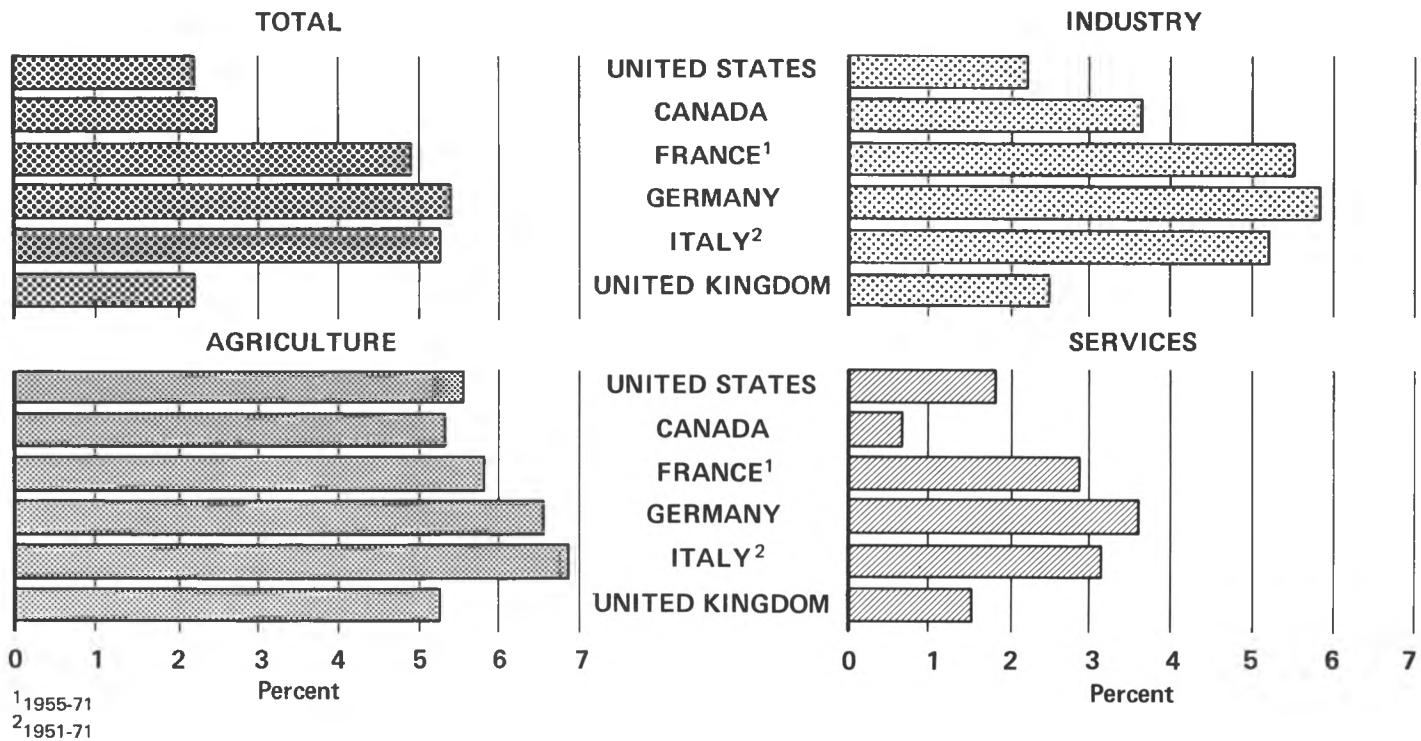
The rate of productivity growth for the economy as a whole reflects not only productivity changes in the component sectors, but also shifts of employment between sectors with different levels of productivity. In this sense, the shift of employment into industry from agriculture, where productivity levels are relatively low, has contributed to the rise in the overall rate, and shifts into services have tended to moderate it.

Output measures for the services sector–especially for the government component–are admittedly weak, which seriously affects international comparisons for this sector. This weakness will also affect, though to a lesser extent, comparisons at the level of the total economy as well.

Chart 3.

Output per Employed Civilian, by Sector, 1950-71

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

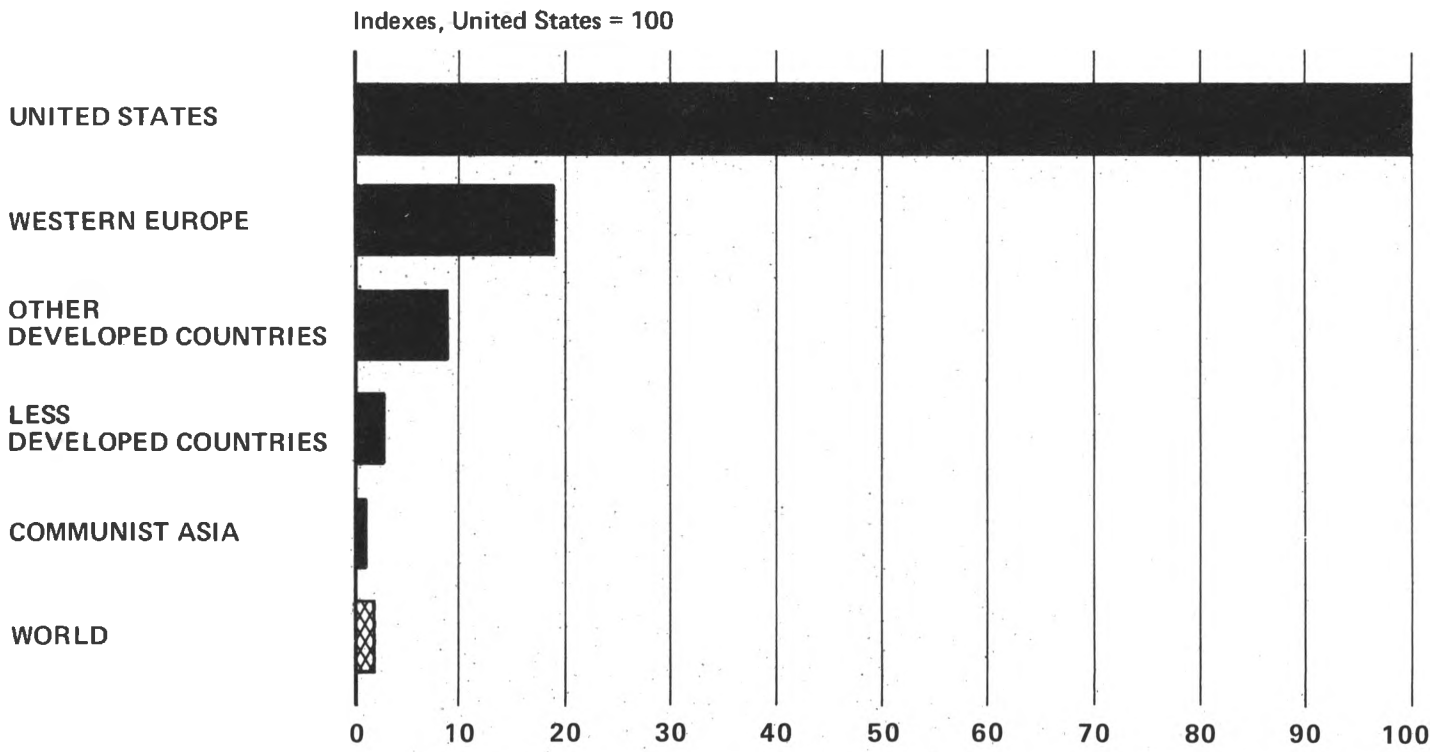
Levels of Food Production per Person in the Farm Population

The average person tends to regard developed countries as leaders in industry and to think of developing countries as suppliers of raw materials and agricultural produce. However, the rough estimates available clearly show the advantages the United States has over other major economic areas in food production per person in the farm population. In 1970, Western Europe was at a level about one-fifth that of the United States. Other developed countries were at less than 10 percent of the U.S. level and the developing countries and Communist Asia at about 1 percent. This differential allowed the United States, where less than 5 percent of the population are on the farm, to enjoy a higher standard of living with respect to food than the developing countries, where over 60 percent of the population are on the farm.

The world level is affected primarily by the data for the less developed countries, as more than 90 percent of the world farm population reside in these areas.

Chart 4.

Food Production per Person in the Farm Population, 1970



Source: U.S. Department of Agriculture

Productivity Trends in Manufacturing

Growth in manufacturing productivity between 1960 and 1972 varied substantially among the countries whose productivity is compared regularly by the Bureau of Labor Statistics. Between 1960 and 1972, average annual gains in output per man-hour ranged from 3.2 percent in the United States to 10.4 percent in Japan.

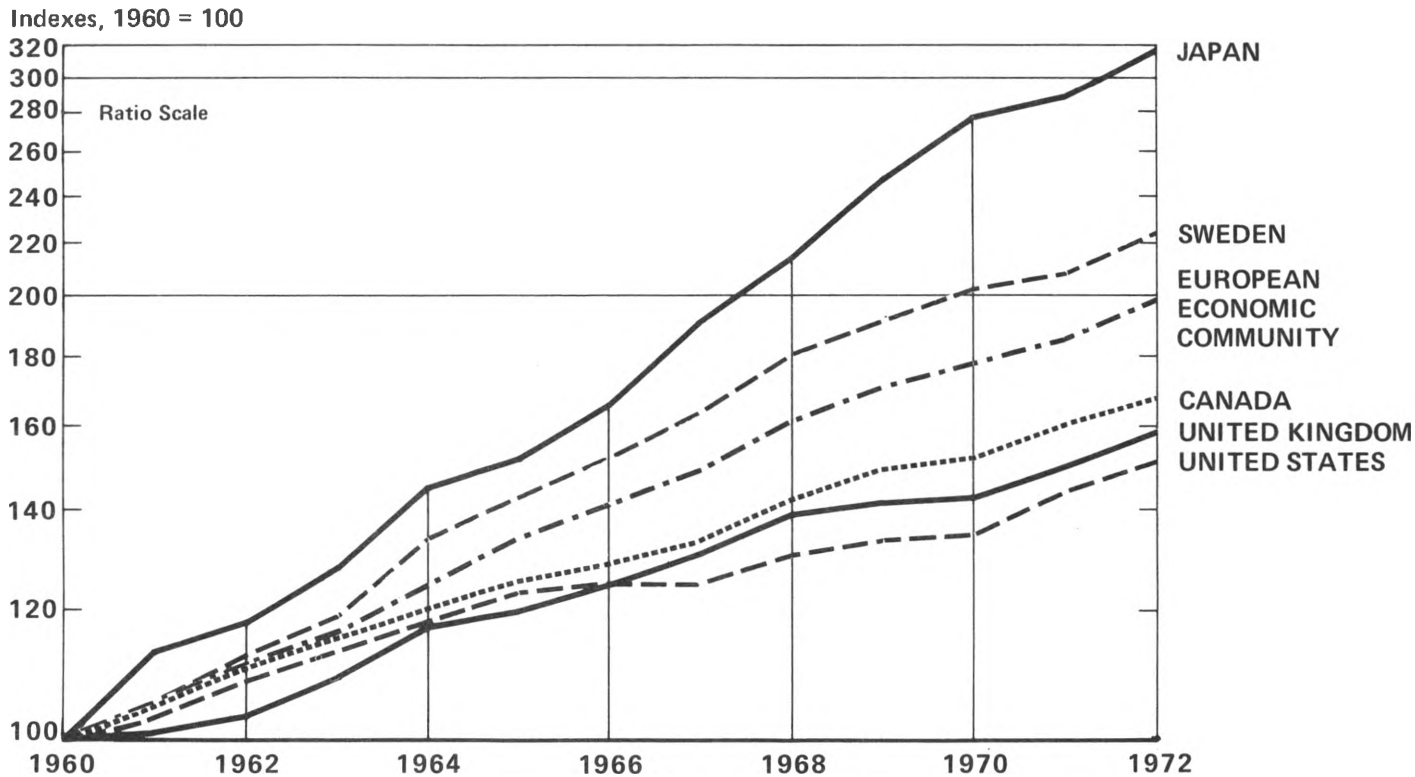
The largest spread in productivity growth rates among the countries compared existed between 1965 and 1970; during this period, manufacturing productivity grew 2.0 percent a year in the United States and 13.4 percent a year in Japan. The economic recovery that began late in 1970 brought about a substantial improvement in U.S. productivity growth: Though productivity still grew at a faster rate in some of the other countries between 1970 and 1972, the margins by which these rates exceeded the U.S. rate were reduced significantly.

Output per man-hour measures for manufacturing in the past were often limited to production worker man-hours. These latter rates tend to be higher than the comparable rates for all persons in the United States and most of the countries studied in this report.

Country	Average annual percent change in output per man-hour in manufacturing			
	1960-72	1960-65	1965-70	1970-72
United States	3.2	4.3	2.0	6.2
Canada	4.2	4.4	4.4	5.0
European Economic Community (5 countries)	6.0	5.9	6.1	6.0
Belgium	6.5	5.1	7.7	7.3
France	5.9	4.9	6.5	6.0
Germany	5.8	6.4	5.6	6.0
Italy	6.1	6.8	5.3	5.6
Netherlands	7.1	5.2	8.5	6.5
Japan	10.4	8.5	13.4	6.8
Sweden	7.3	7.6	7.5	5.2
United Kingdom	4.0	4.1	3.7	5.6

Chart 5.

Output per Man-Hour in Manufacturing, 1960-72



Source: Bureau of Labor Statistics

Trends in Output per Man-Hour, Output, and Man-Hours in Manufacturing

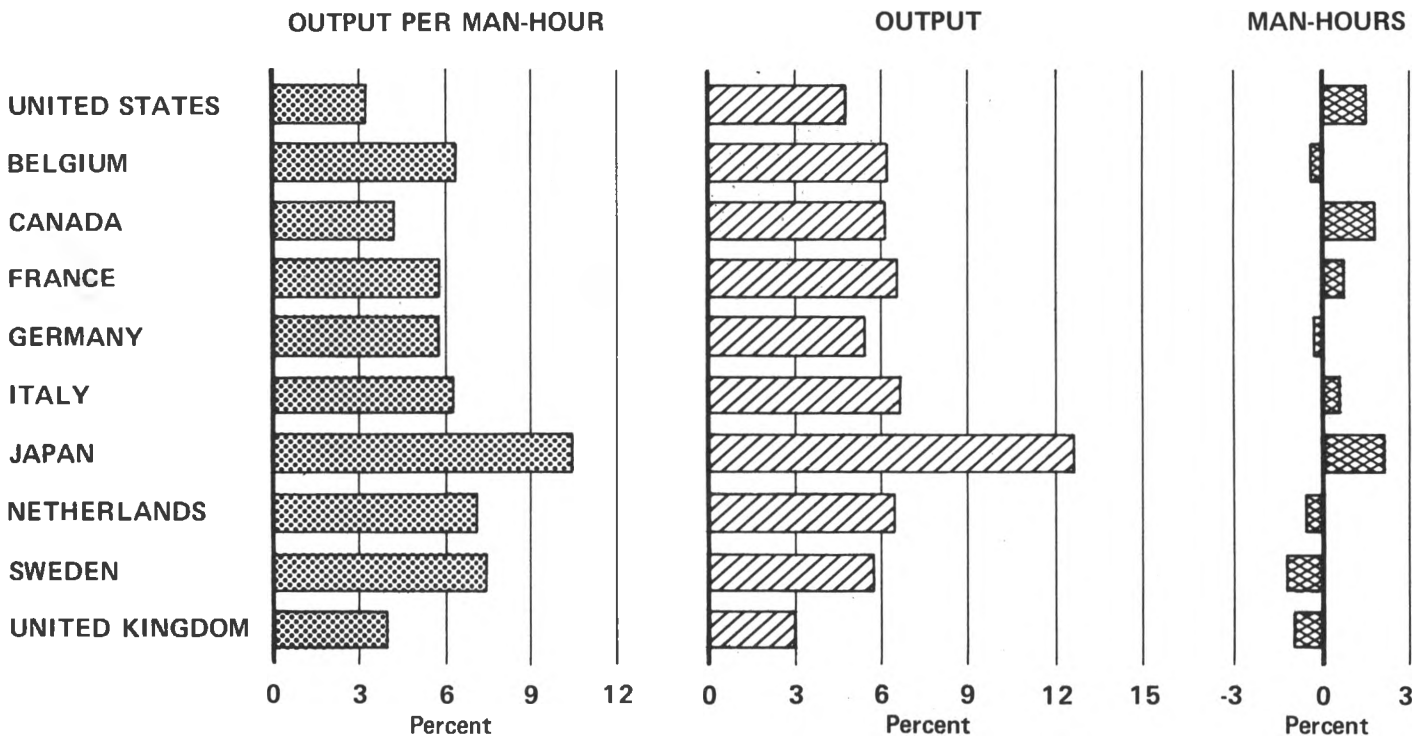
Output changes in manufacturing among all the industrial countries reviewed were more volatile than productivity movements. For all the countries on the European continent, however, the range within which output rates and productivity rates fell was relatively narrow.

Man-hour changes ranged from modest increases where output rates exceeded productivity to modest declines where productivity exceeded output.

Chart 6.

Output per Man-Hour, Output, and Man-Hours in Manufacturing, 1960-72

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

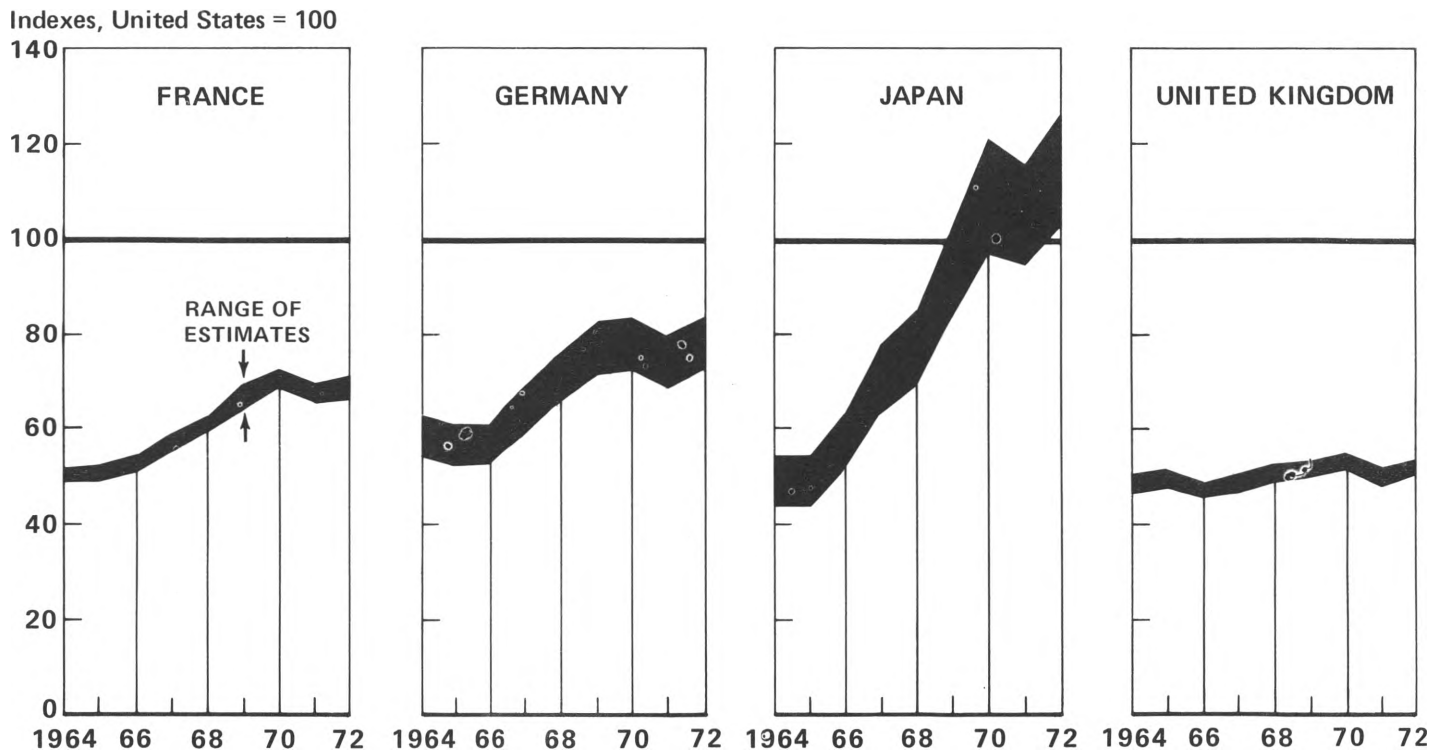
Productivity in the Iron and Steel Industry

Productivity growth in the U.S. iron and steel industry lagged behind the rates attained in other major steel-producing countries between 1964 and 1972. In 1964, output per man-hour was about 60 percent of the U.S. level in Germany and about 50 percent in France, Japan, and the United Kingdom. In 1972, though labor productivity in the British steel industry was still only about half the U.S. level, the French industry was up to two-thirds the U.S. level, the German to about four-fifths, and the Japanese appear to have exceeded it.

A significant determinant of the variation in productivity rates is the variation in output growth. Japanese iron and steel output more than doubled in 8 years, while U.S. output grew less than 5 percent and United Kingdom output declined. Iron and steel output in France and Germany increased more than 20 percent over the period.

Chart 7.

Relative Levels of Output per Man-Hour in the Iron and Steel Industry, 1964-1972



Source: Bureau of Labor Statistics

Trends in Output per Man-Hour, Output, and Man-Hours in the Iron and Steel Industry

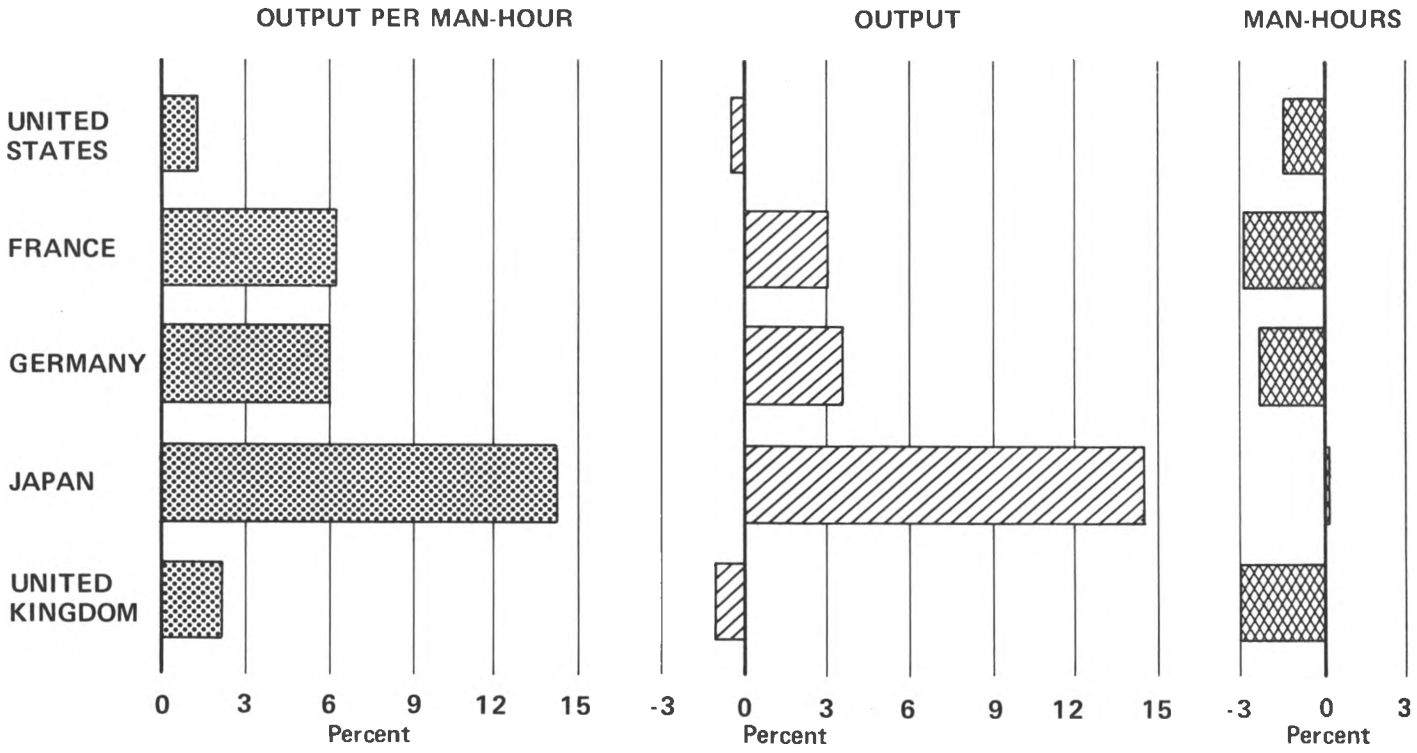
Variation among countries in rates of iron and steel output for the 1964-72 period was an important determinant of productivity change. Japan had a substantial lead in rates of output and output per man-hour. Both the United States and the United Kingdom experienced decreasing output and low productivity gains.

Employment levels dropped in 4 out of 5 countries and barely increased in Japan.

Chart 8.

Output per Man-Hour, Output, and Man-Hours in the Iron and Steel Industry, 1964-72

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

PART II. Implications of Productivity Growth for Costs and Prices

Productivity movements have an important influence on cost and price stability. This aspect of productivity change stems from the fact that output per man-hour is a critical link between the cost of labor and the price of goods.

In many industries, labor costs, including hourly rates of pay, overtime, and all types of fringe benefits, are the largest element in the value added by the industry. Consequently, the trend of labor costs per unit of output plays a major role in determining price changes. If the effect of an increase in hourly compensation can be minimized by a large increase in productivity, pressure to increase prices will be lessened, although increases in profits or materials costs per unit may partially or wholly offset this effect.

In turn, prices affect costs. Those price increases which are attributed to demand increases tend to boost costs, as producers are now able to compete more vigorously for labor and materials.

At the international level, relative cost changes are of great importance. If costs go up more in one country than in others, the resultant impact on exports and imports can worsen that country's international reserve position and lead to pressures to devalue its currency. Governments may try to offset the influence of cost differentials by granting subsidies and raising tariffs.

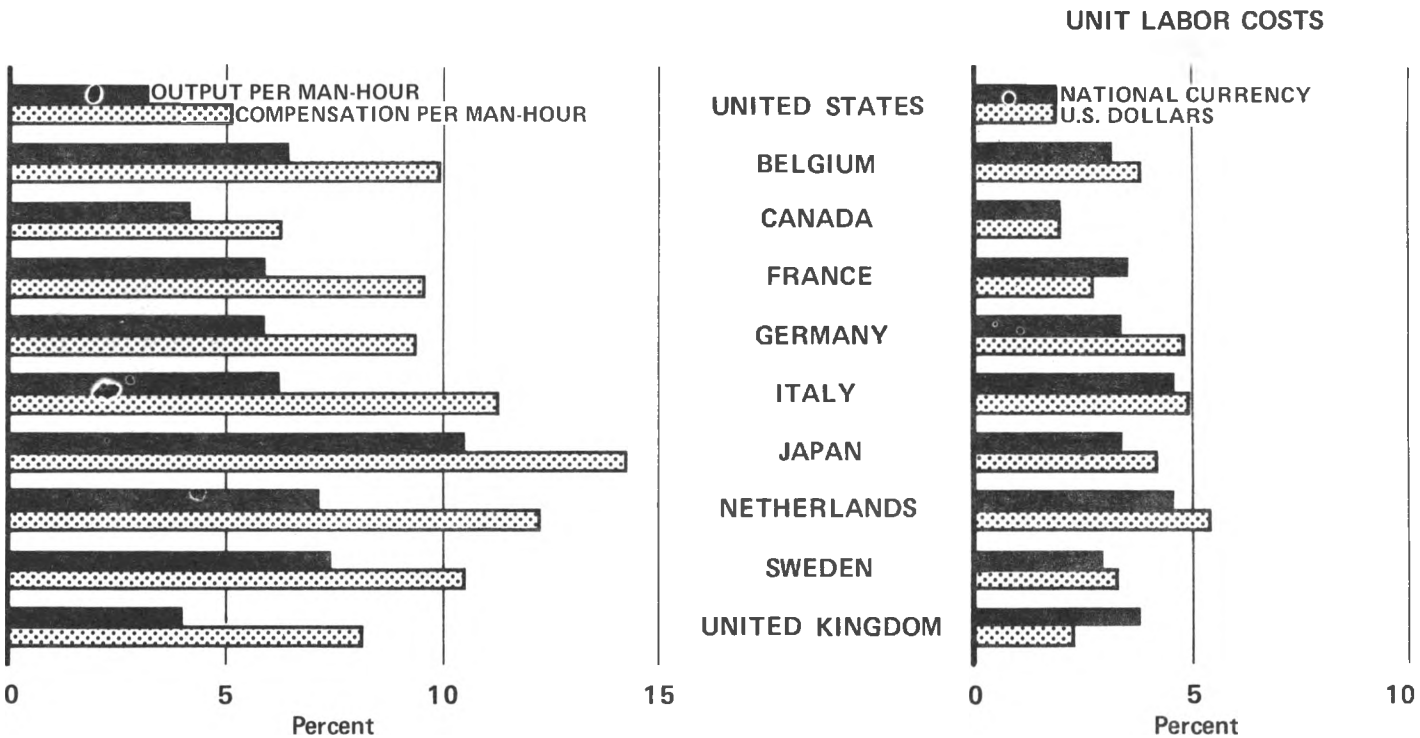
Trends in Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1960-72

Unit labor costs in manufacturing, expressed in terms of U.S. dollars, rose about 2 percent a year in the United States, Canada, and the United Kingdom between 1960 and 1972. Increases in unit labor costs in manufacturing in the other countries ranged from 2.7 percent in France to 5.4 percent in the Netherlands over the same period. The relatively small rise in unit labor costs in the United States and Canada was primarily due to relatively lower rates of increase in hourly compensation; in the United Kingdom, it also reflected the currency devaluation. Taking the 1960-72 period as a whole tends to obscure divergent movements; therefore, three subperiods are shown in the following charts.

Chart 9.

Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1960-72

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

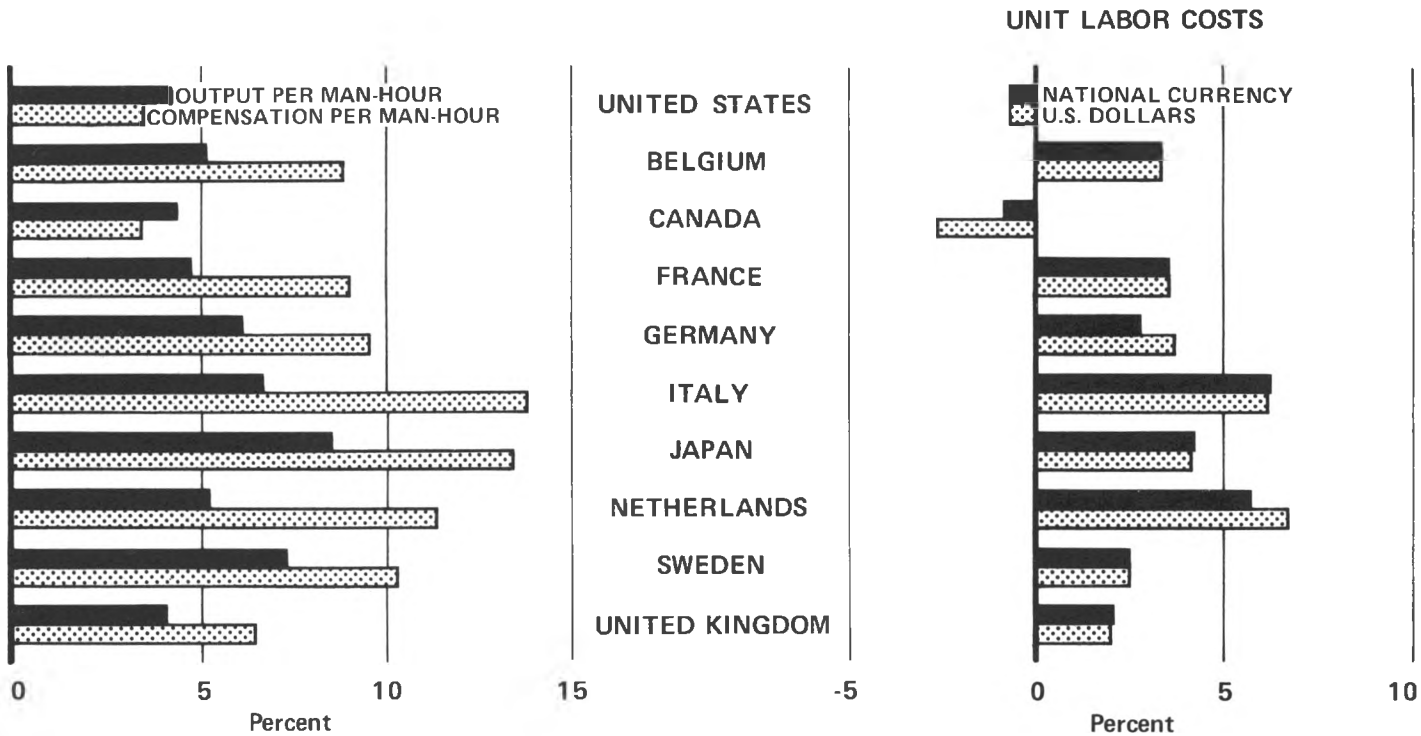
Trends in Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1960-65

Between 1960 and 1965, unit labor costs in manufacturing declined in the United States and Canada. Gains in productivity in these countries, though relatively low, were still sufficient to more than offset the relatively small increases in compensation per man-hour. Compensation per man-hour grew much more in the other countries compared.

Chart 10.

Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1960-65

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

Trends in Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1965-70

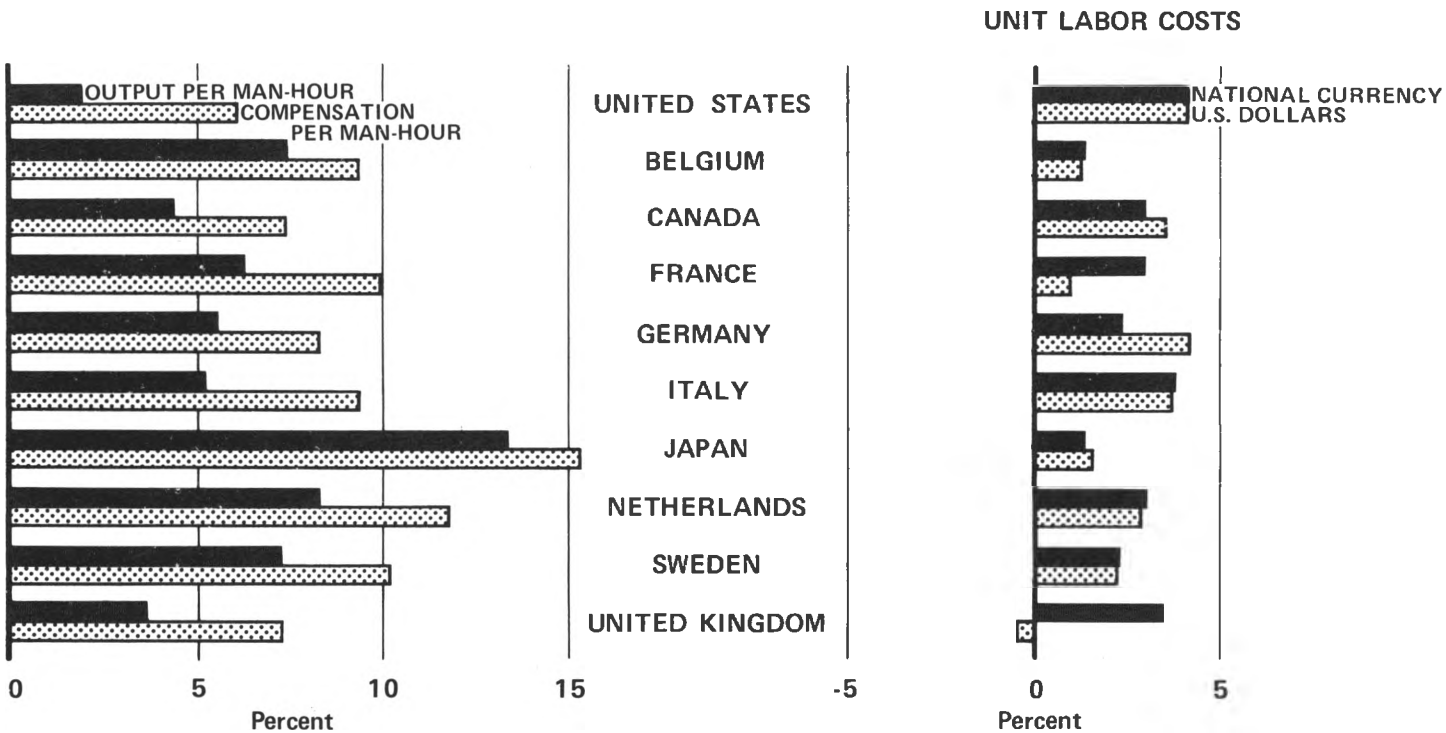
Unit labor costs in manufacturing, measured in national currencies, rose more in the United States between 1965 and 1970 than in Canada, Japan, or Western Europe. Hourly compensation rose over 6 percent a year in the United States, while output per man-hour increased only 2 percent a year. The result was an average rise in U.S. unit labor costs of 4 percent a year. All of the foreign countries had larger percentage increases in hourly compensation than the United States, but they also had faster rates of productivity growth.

On a U.S. dollar basis, Canada and Germany had rates of increase in unit labor costs about as large as the United States because their currencies were revalued during the period. Similarly, the United Kingdom had a decline in unit labor costs and France a relatively small increase because they devalued their currencies.

Chart 11.

Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1965-70

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

Trends in Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1970-72

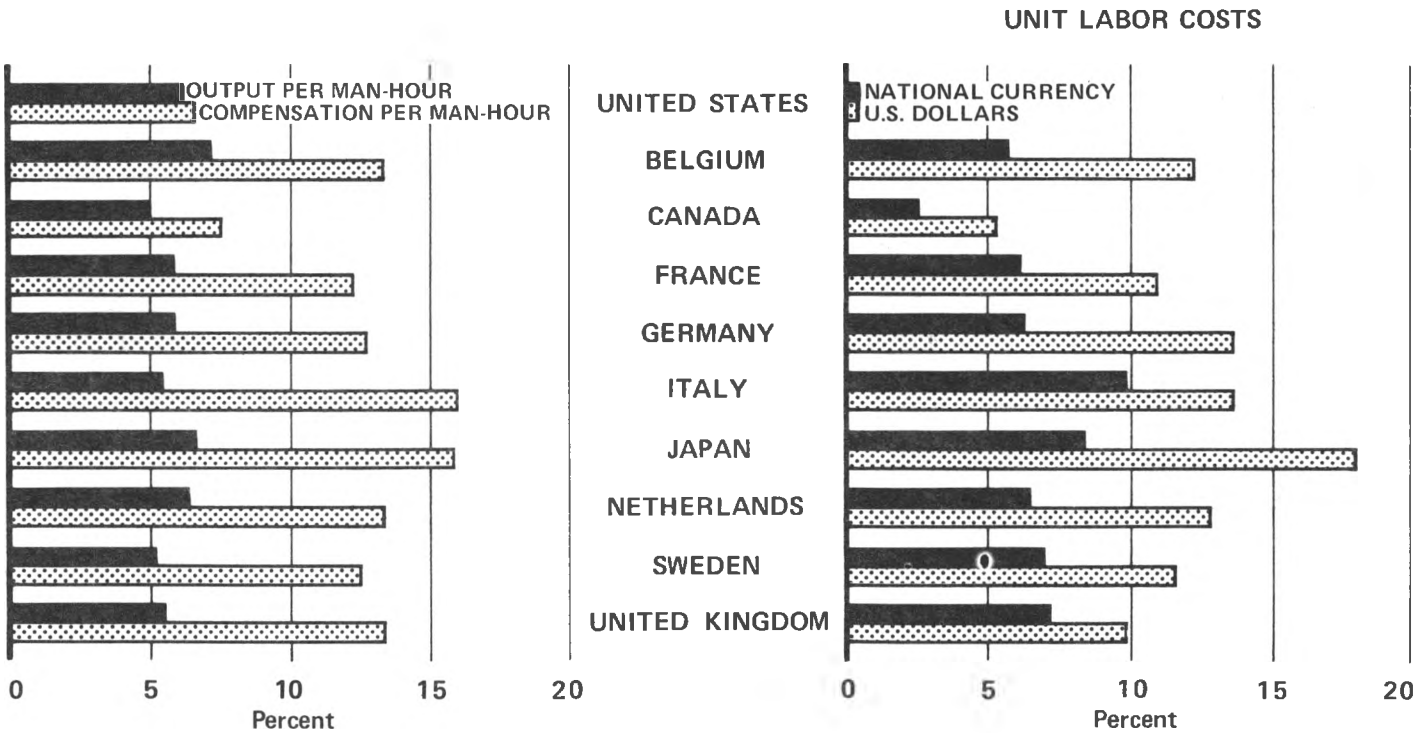
Beginning in 1970, the position of U.S. unit labor costs relative to other industrial countries improved. This reversal was due to a speedup in output per man-hour in the United States and sharp increases in hourly compensation in most of the other countries. Though productivity continued to grow at a faster rate in most of the foreign countries than in the United States, growth rates in hourly compensation abroad exceeded productivity growth rates by a wider margin than was the case in the United States.

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. After taking these changes in currency values into account, the average 1970-72 rates of increase in unit labor costs abroad ranged from about 5 percent in Canada to 18 percent in Japan, compared with 0.4 percent in the United States.

Chart 12.

Output per Man-Hour, Compensation per Man-Hour, and Unit Labor Costs in Manufacturing, 1970-72

(Average Annual Rate of Change)



Source: Bureau of Labor Statistics

Levels of Output per Man-Hour, Unit Labor Costs, and Hourly Labor Costs in the Iron and Steel Industry

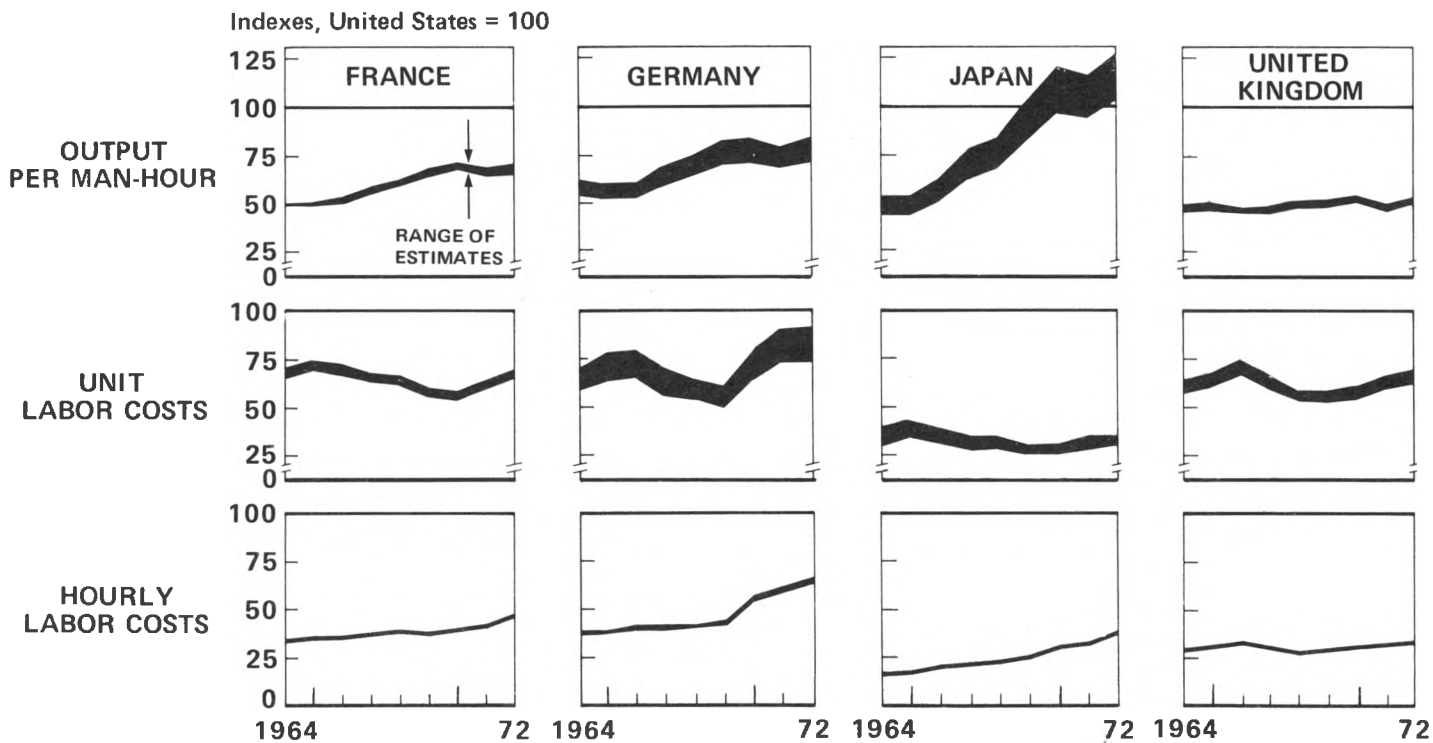
International comparisons are preferably based not only on a knowledge of relative trends in productivity and unit labor costs but also on a knowledge of relative levels. However, the iron and steel industry is the only major industry for which information on relative levels is regularly available. Even here the scarcity of information means that the different products of each country's steel industry must be combined according to their labor requirements in the U.S. industry.

Though hourly labor costs in steel remained substantially higher in the United States than in the other countries between 1964 and 1972, the gap between them narrowed over the period. Consequently, unit labor costs in three of the four foreign iron and steel industries compared were within 60 to 90 percent of U.S. levels. In the fourth country, Japan, unit labor costs declined relative to the United States. The Japanese iron and steel industry was the only one where productivity levels rose to equal or perhaps surpass those recorded for the U.S. industry.

Unit labor costs should not be regarded as a direct measure of price competitiveness, since materials, electricity, and capital costs must be taken into account along with relevant transportation and trade costs. An analysis of trade movements would also require consideration of governmental actions such as subsidies to increase exports or actions to decrease imports by use of tariffs and quotas. Finally, indexes which reflect the total range of industry products do not necessarily apply to each individual product.

Chart 13.

Relative Output per Man-Hour, Unit Labor Costs, and Hourly Labor Costs in the Iron and Steel Industry, 1964-72



Source: Bureau of Labor Statistics

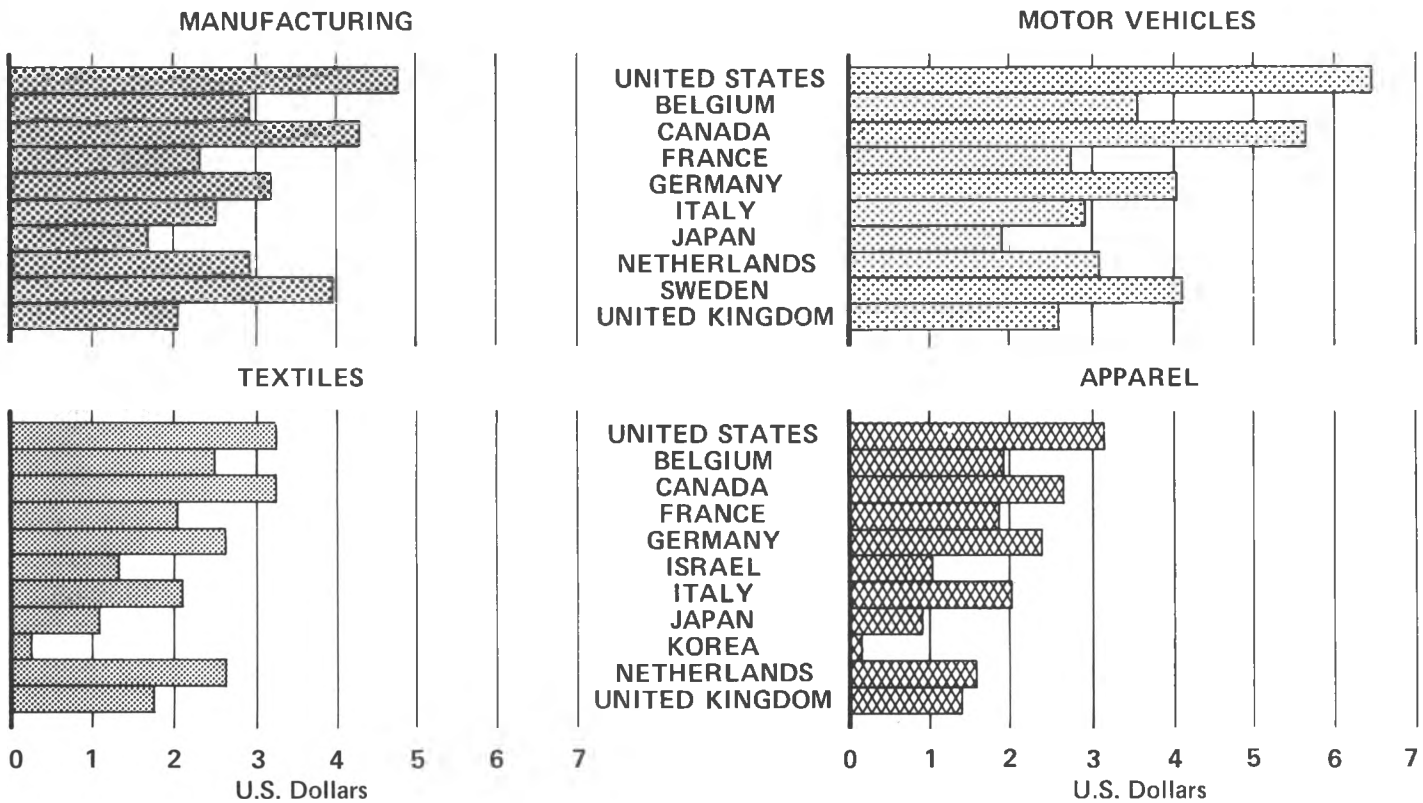
Compensation in Manufacturing and Selected Industries

The preceding charts show how unit labor costs are directly affected by both productivity and hourly compensation. Thus, in the absence of productivity data, a comparison of compensation from country to country provides only a partial though still useful insight into relative costs.

In manufacturing as a whole, as well as in three industries in which imports to the United States are important, compensation was higher in the United States in 1972 than in the other countries compared. However, the differences among countries varied according to industry; they were substantial in the motor vehicles industry, but less pronounced in the apparel and textile industries.

Chart 14.

Hourly Compensation of Wage Earners in Manufacturing and Selected Industries, 1972



Source: Bureau of Labor Statistics

Trends in Consumer Prices

Consumer prices are determined by demand and supply pressures and also by autonomous factors such as taxes, rent controls, and other governmental rulings. Thus, changes in food supplies, import prices, and general monetary and fiscal policies all affect consumer prices.

Productivity growth can moderate consumer price increases. For example, when productivity growth keeps pace with hourly labor costs, unit labor costs remain the same.

In most countries, prices of services rose more than commodity prices between 1960 and 1972. This situation resulted in large part from the faster rates of productivity growth in the industrial and agricultural sectors than in the services sector.

Within commodity groupings, prices rose more for food items than for nonfood items. Several reasons make it impossible to relate these differentials to the differences between industrial and agricultural productivity rates. Most consumer food items are processed and final prices include not only payments to farmers but also manufacturing, trade, and transportation costs. In addition, some countries like the United States are primarily exporters of agricultural products, while other countries like Japan are primarily importers.

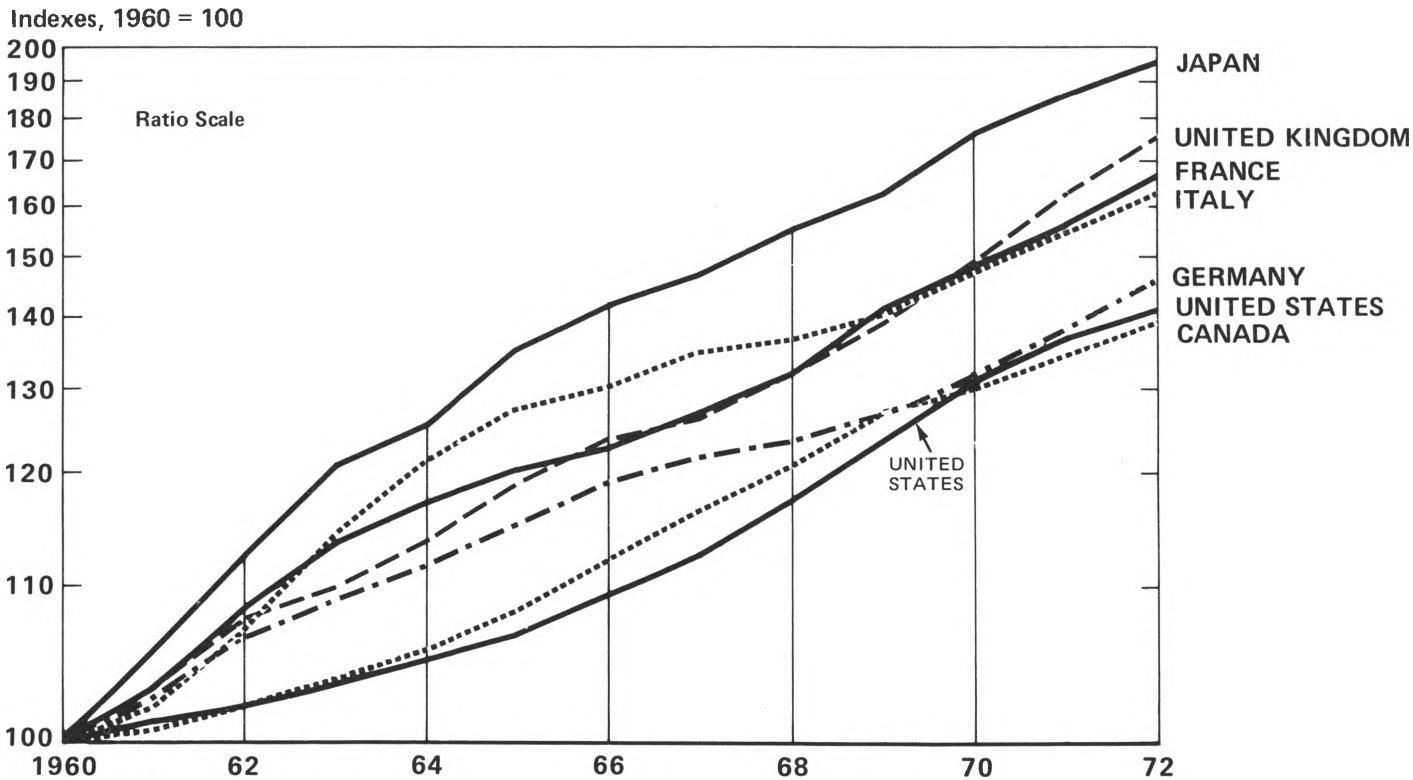
Comparative rates of increase in consumer prices also reflect differences in expenditure patterns. In countries where services are particularly important and where their prices are rising rapidly, as in the United States, the overall rate of consumer prices will be forced up more than in countries where services account for a smaller proportion of consumer expenditures. In countries where food accounts for a larger proportion of consumer expenditures and food prices are increasing faster than the average prices of nonfood items, as in Japan, there will also be greater pressure on the overall rate.

Country	Average annual percent change in consumer prices					
	1960-72				1960-65	1965-72
	All items	Services	Commodities		All items	All items
			Food	Nonfood		
United States	2.9	4.0	2.6	2.1	1.3	4.1
Canada	2.8	3.6	3.0	1.8	1.6	3.8
France	4.3	6.6	4.8	3.0	3.8	4.7
Germany	3.2	5.3	2.6	2.3	3.0	3.4
Italy	4.2	6.1	3.8	2.9	4.9	3.6
Japan	5.8	7.0	6.4	3.6	6.2	5.4
United Kingdom	4.7	[1]	4.8	[1]	3.5	5.6

[1]Not Available

Chart 15.

Consumer Prices, 1960-72



Source: Bureau of Labor Statistics

Trends in the GNP Implicit Price Deflator

The implicit price deflator is the overall price index for a national economy; it is implied when the gross national product (GNP) is estimated in terms of constant as well as current values. Such estimation is necessary to separate real growth from apparent growth due to price inflation.

Trends in the GNP implicit price deflator between 1960 and 1972 by and large paralleled trends in the consumer price index for the countries compared: The deflator rose most in Japan, least in the United States and Canada. However, consumer prices in Japan rose much more than the GNP deflator did, because the prices of capital investment goods, which make up a large proportion of the Japanese deflator, rose only moderately. In Germany, on the other hand, the GNP deflator rose faster than the consumer price index because of a rapid rise in the price of government consumption expenditures, supplemented by a faster rise in the prices of capital investment goods than of consumption goods. To a large extent the same disparity occured for the same reasons in France and Italy.

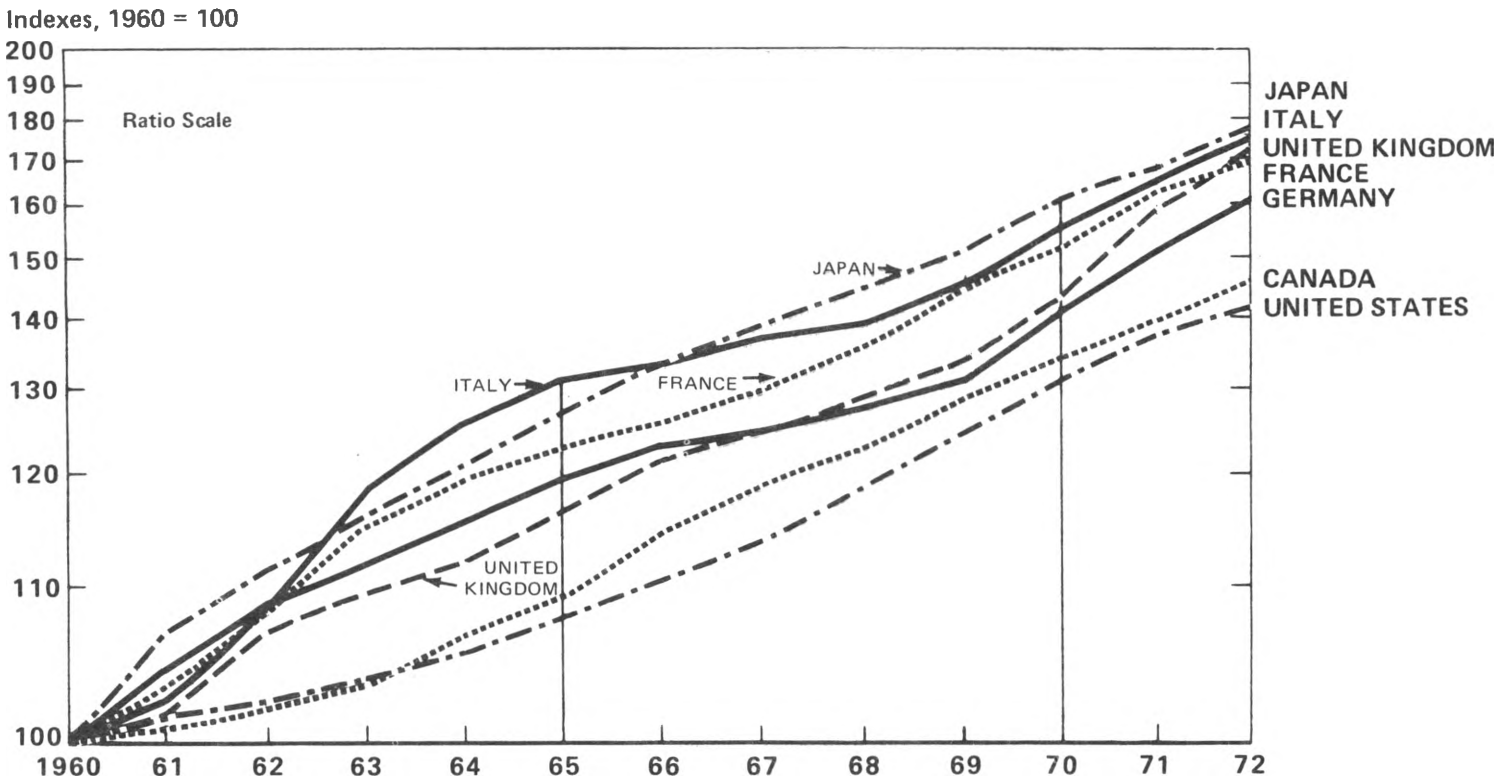
The GNP deflators for the United States and Canada were much lower than for other countries during 1960-65. However, sharp increases occurred for the two countries from 1965 to 1972.

The GNP deflator differs from the consumer price index for several reasons. It is more comprehensive in its inclusion of government expenditures, capital investment, and the net foreign balance, and often covers a wider population base for consumer expenditures. The GNP deflator is also influenced by shifts in expenditures.

Country	Average annual percent change in GNP implicit price deflator		
	1960-72	1960-65	1965-72
United States	2.9	1.4	4.0
Canada	3.1	1.8	4.1
France	4.5	4.1	4.8
Germany	4.0	3.6	4.3
Italy	4.8	5.5	4.3
Japan	4.8	5.0	4.7
United Kingdom	4.7	3.4	5.9

Chart 16.

Implicit Price Deflator for GNP, 1960-72



Source: Bureau of Labor Statistics

PART III. Implications of Productivity Growth for Living Standards

Productivity growth means essentially that resources are being used more efficiently to produce a nation's goods and services—an achievement which is a key factor in obtaining higher levels of economic well-being and national strength. What a nation produces or obtains through trade allows it to consume or invest that much more. As productivity goes up, a country can obtain more output for the same labor input and consequently can offer its citizens more to consume.

This increase in real purchasing power, whether measured for the population as a whole—real GNP per capita—or for 1 man-hour—real hourly compensation—shows up in the structure of consumer expenditures. In countries with higher standards of living, consumers need to devote a smaller proportion of their income to essentials such as food and clothing.

Productivity increases may also improve living standards by increasing the leisure time granted the work force. Thus, two potential benefits of productivity are alternatives: An increase in output per man-hour means 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. Less labor time may be realized through shorter work weeks, reductions in employment—often by means of longer schooling and earlier retirement—or increased vacation time. The prospect of reducing labor time through reductions in employment is a matter of concern to workers when unemployment is already high, but experience has shown that productivity growth often goes hand in hand with increased employment.

Comparative Levels of Real GNP per Capita

Probably the most important consequence of productivity growth is the effect it has on real product per capita. The degree of productivity improvement determines in large part the increase in the amount of goods produced and thus available for purchase by each member of the population.

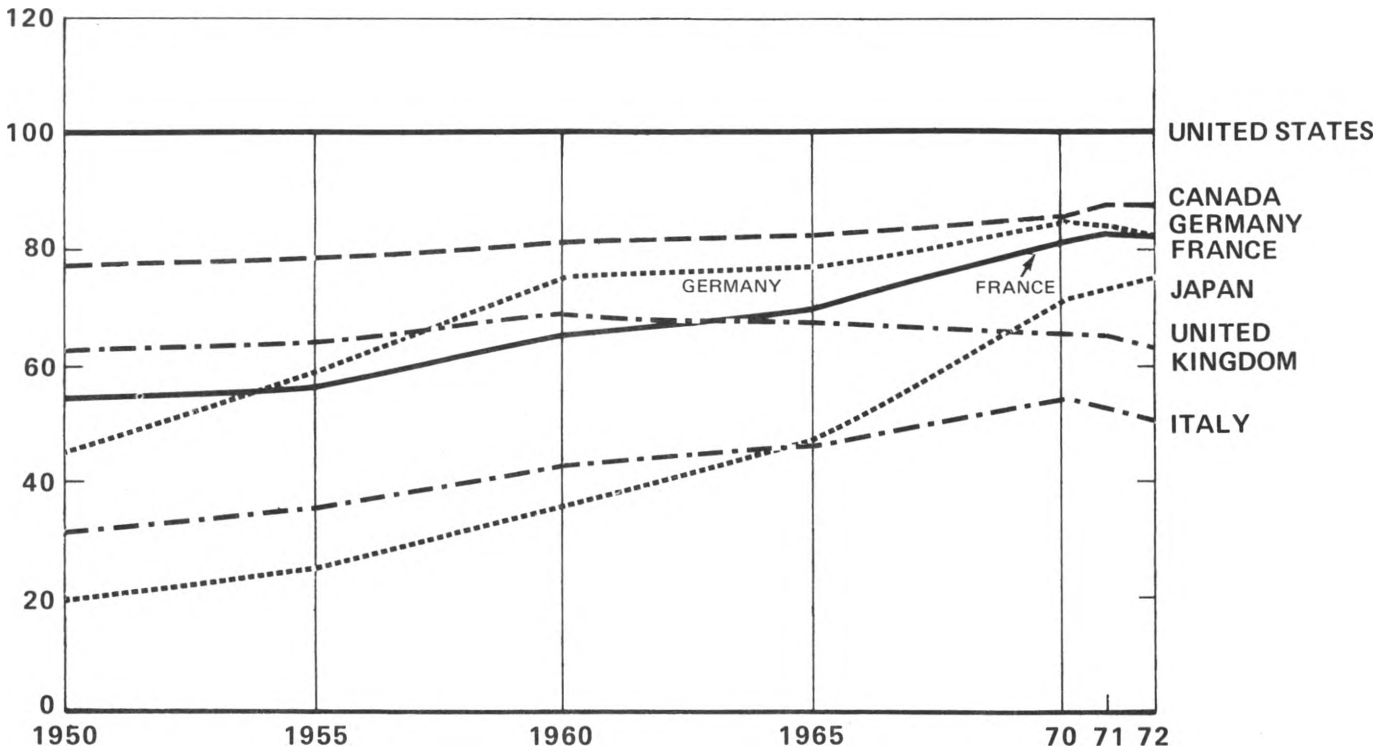
Under the influence of high rates of productivity growth, real product per person rose rapidly relative to the United States in Germany, France, Japan, and Italy between 1950 and 1972. By 1972, real product per person had reached at least four-fifths of the U.S. level in three countries: Canada, Germany, and France.

Though productivity growth is the major factor influencing trends in product per capita, it is not the only one. The proportion of the population in the labor force, the proportion of the labor force that is employed, and average hours per worker all interact with productivity to determine product per capita.

Chart 17.

Real GNP per Capita, 1950-72

Indexes, United States = 100



Source: Bureau of Labor Statistics

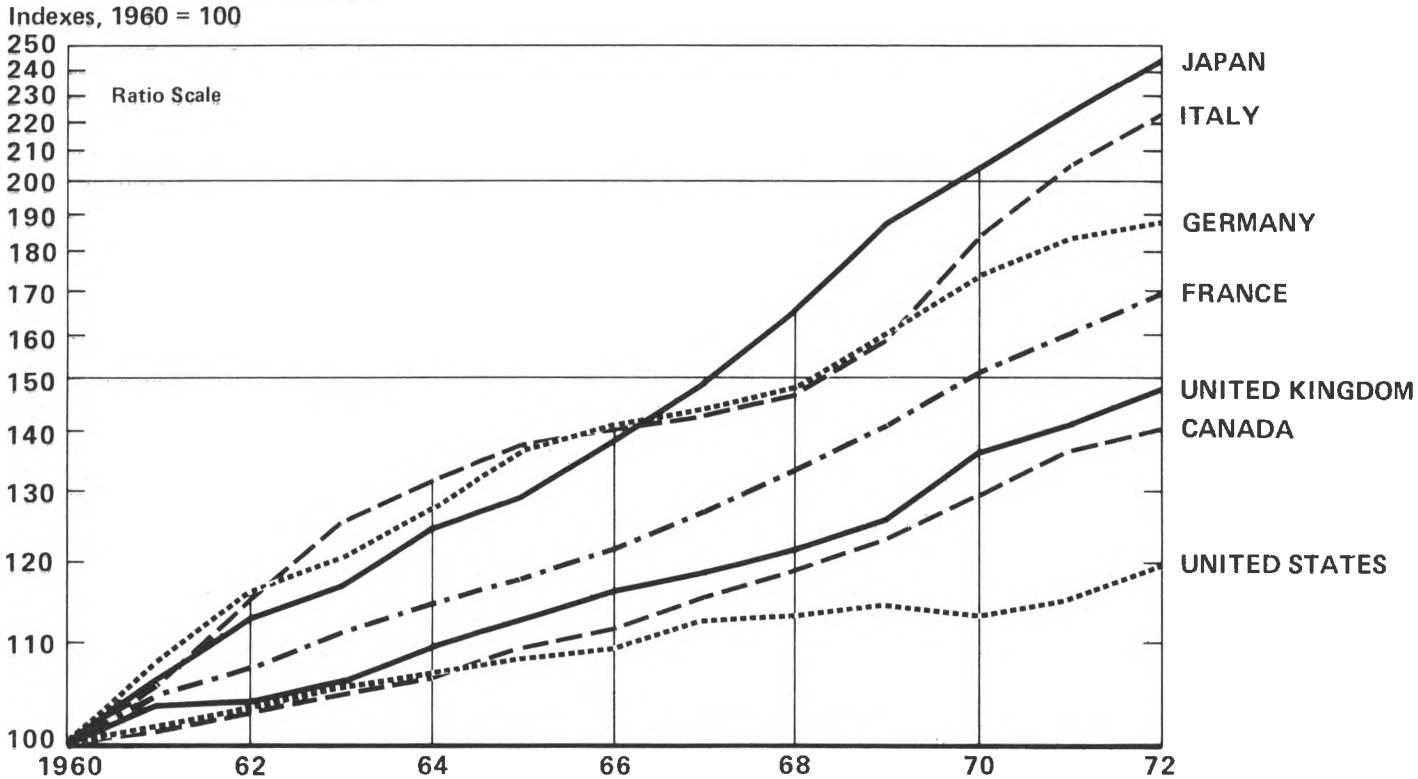
Trends in Real Hourly Earnings

Although GNP per capita is considered the most relevant measure of real purchasing power, the growth in real hourly earnings for manufacturing employees – hourly compensation adjusted to take account of changes in purchasing power – is also of interest. Differences between GNP per capita and real hourly earnings may reflect changes in factors such as the proportion of workers in the population, hours of work, the distribution of income between labor and nonlabor services, shifts of GNP towards or from such items as national defense, and investment expenditures which do not show up in the consumer market basket used to adjust hourly earnings. The fastest growth in real hourly earnings in manufacturing between 1960 and 1972 took place in the countries where manufacturing productivity grew the fastest.

Country	Average annual percent change in real hourly earnings		
	1960-72	1960-65	1965-72
United States	1.4	1.6	1.4
Canada	2.8	1.8	3.6
France	4.5	3.3	5.4
Germany	5.4	6.4	4.7
Italy	6.9	6.6	7.2
Japan	7.8	5.3	9.6
United Kingdom	3.3	2.4	4.0

Chart 18.

Real Hourly Earnings of Manufacturing Wage Earners, 1960-72



Source: Bureau of Labor Statistics

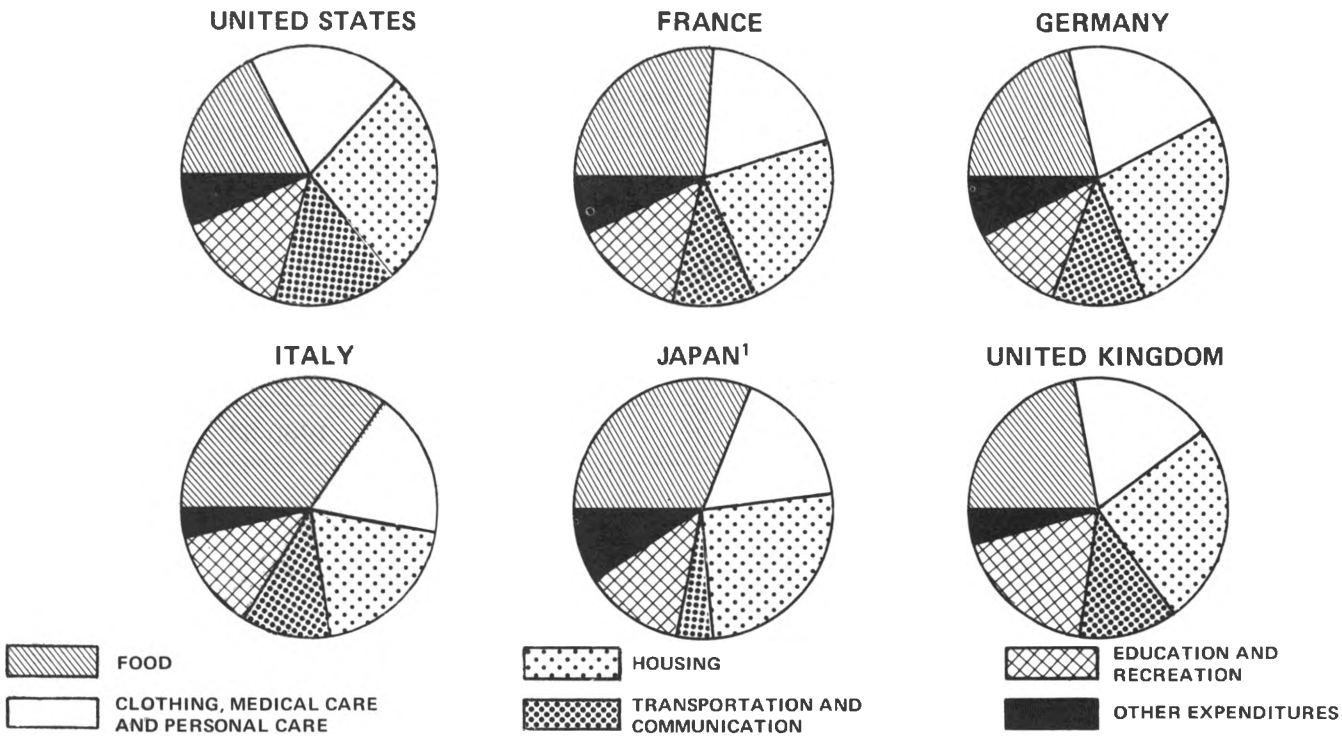
The Structure of Consumer Expenditures

Levels of productivity combine with other economic and social factors to shape the structure of consumer expenditures. The proportion of consumer expenditures going to food is often cited as reflecting the influence of productivity differentials. In the United States, where productivity levels were the highest, consumers devoted proportionally half as much to food expenditures in 1971 as they did in Italy, where productivity levels were among the lowest of the countries compared. Differences in the proportion of expenditures on housing and transportation and communication were also great, but factors such as personal preferences, geography, and government policy were probably more important than productivity in causing these differentials.

Chart 19.

Distribution of Consumer Expenditures, 1971

Percent Distribution



[1] 1970

Source: Bureau of Labor Statistics

Trends in Unemployment

Productivity growth has sometimes been associated with worker displacement, and sometimes with increases in employment. In countries where productivity information is available for individual industries, as in the United States, the data show that productivity growth more often than not has been associated with employment growth.

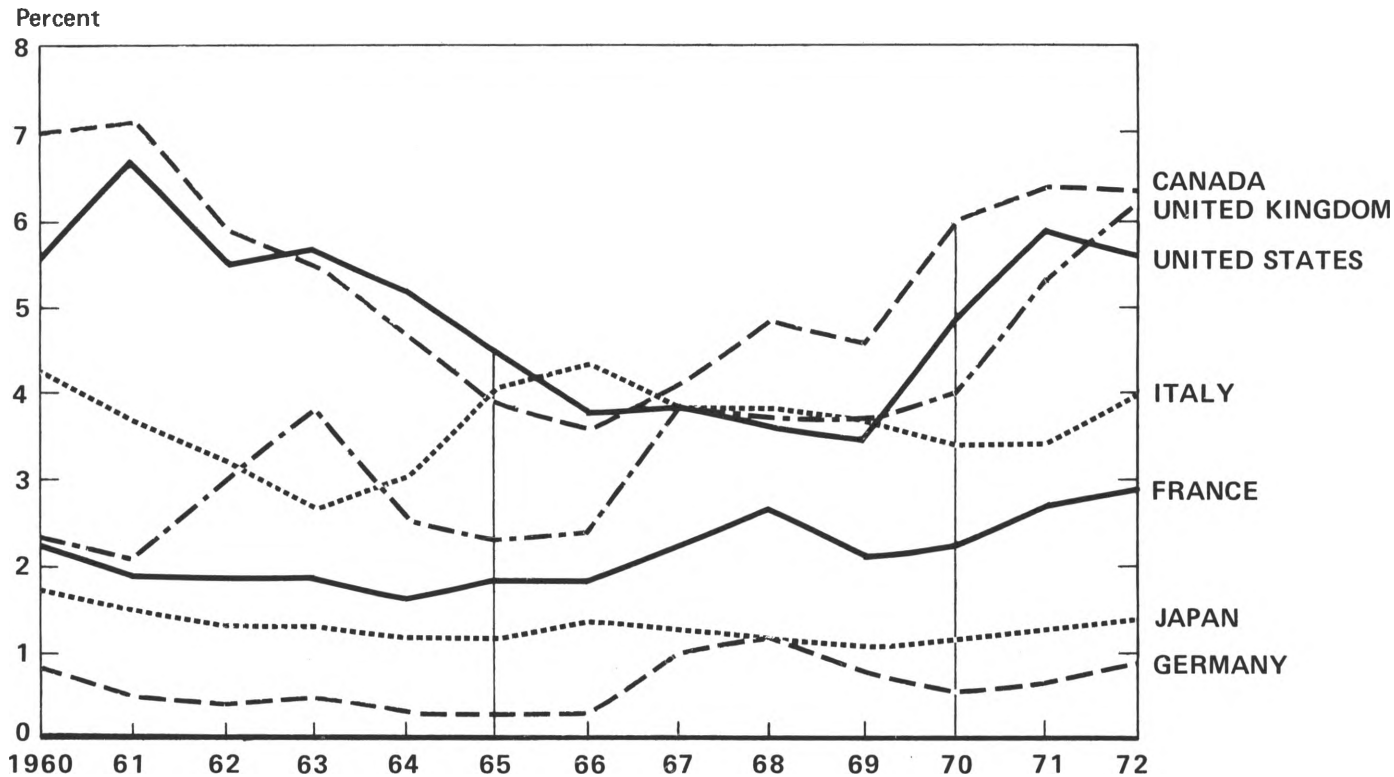
On the international level, the relationship between productivity growth and unemployment rates is not clear. However, it is often thought that countries where productivity is rising will have low unemployment, because productivity growth is generally associated with increases in output which generally also result in increases in employment.

Chart 20 suggests that there may be some merit to this analysis. The countries where unemployment has been consistently low–Germany, Japan, and France–are countries where productivity has made rapid advances, as shown in chart 1. The countries where unemployment has been consistently high–the United States and Canada–are countries where productivity has been growing relatively slowly. Nevertheless, one should be cautious about inferring a direct relationship, as many other factors are involved. Perhaps such a relationship represents the favorable effect of low unemployment rates on productivity rates.

Country	Average unemployment rates (percent)		
	1960-72	1960-64	1965-72
United States	5.0	5.7	4.6
Canada	5.4	6.0	5.0
France	2.2	1.7	2.3
Germany	.6	.5	.7
Italy	3.6	3.4	3.8
Japan	1.3	1.4	1.3
United Kingdom	3.5	2.6	3.9

Chart 20.

Unemployment Rates, 1960-72



Source: Bureau of Labor Statistics

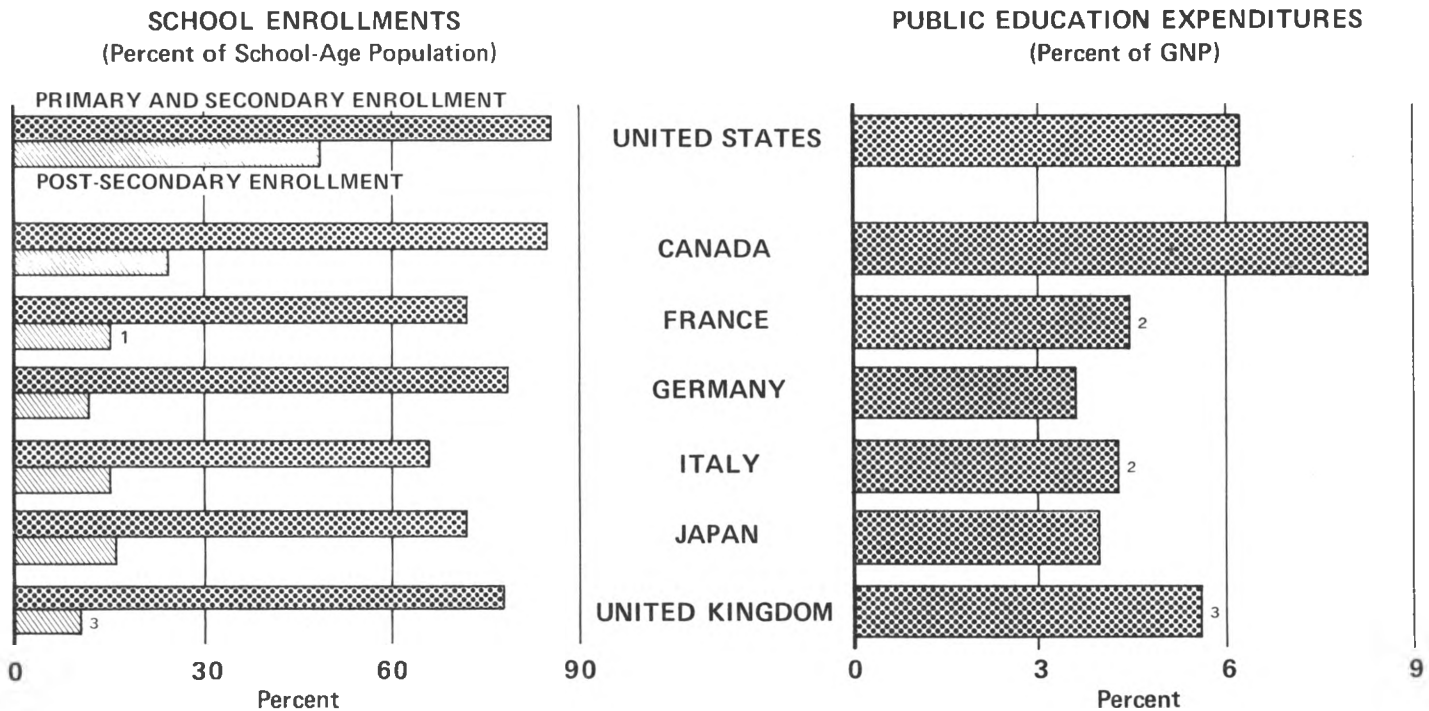
School Enrollments and Education Expenditures

The proportion of young people enrolled in school and the proportion of GNP devoted to education indirectly reflect the rate of productivity growth. A high level of productivity permits a nation to divert some of its resources from immediate production to purposes such as education. In turn, the consequent improvement in labor quality will increase productivity levels when the young people enter the production process.

The countries with the highest levels of productivity–the United States and Canada– had the largest proportion of young people enrolled in school at all levels in 1969. These two countries also devoted the largest share of GNP to public expenditures on education.

Chart 21.

School Enrollments and Education Expenditures, 1969



1 Public University Enrollment Only
2 Ministry of Education Expenditures Only
3 1967

Source: United Nations Educational, Scientific, and Cultural Organization

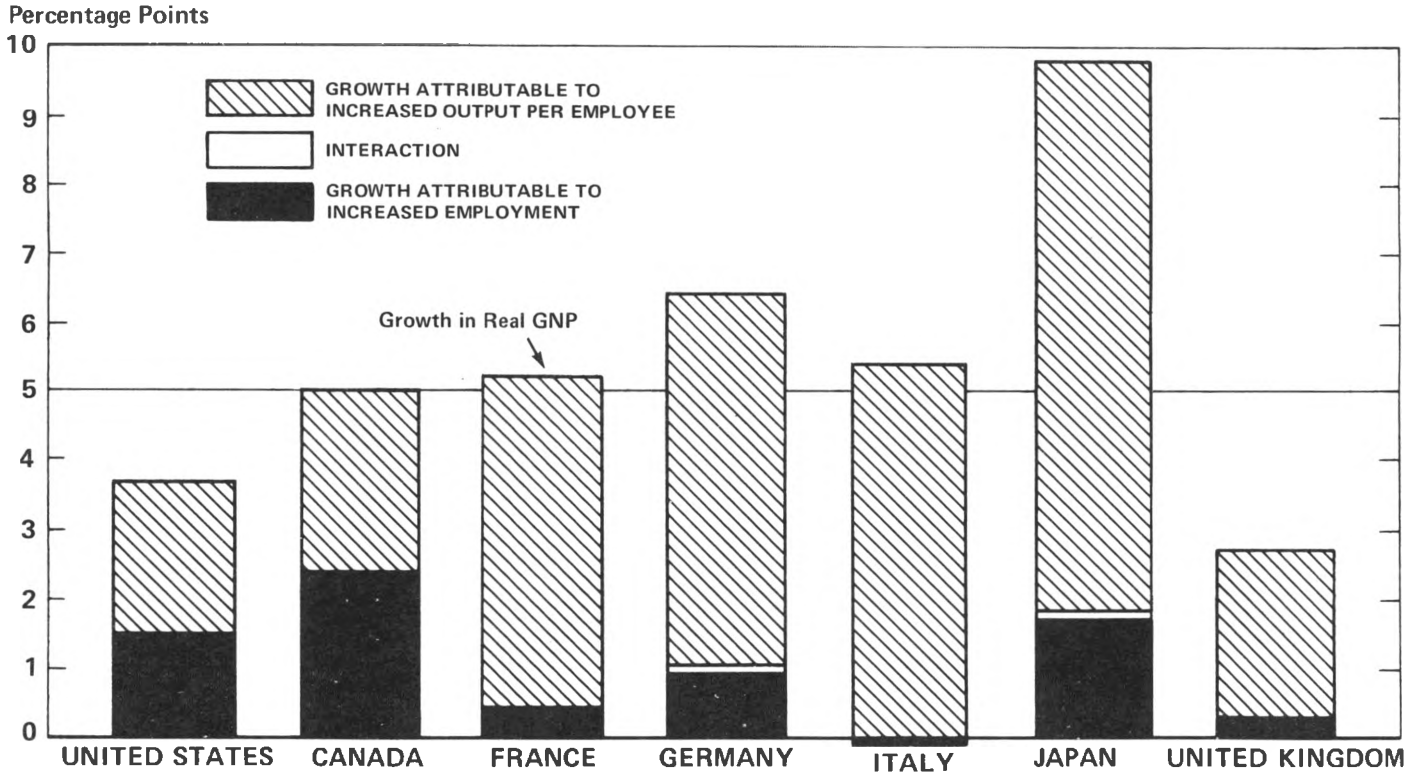
The Contribution of Productivity to Economic Growth

Economic growth refers to the increase in the output of an economy. This increase can occur only if inputs such as employment increase or if productivity increases.

Productivity increases made the major contribution to economic growth between 1950 and 1972. Productivity growth accounted for at least half the total growth in all of the countries compared, and for the entire growth in Italy. These data suggest that, for developed countries, growth rates are more influenced by productivity changes than by population increases.

Chart 22.

Contribution of Growth in Output per Employee to Growth in Real GNP, 1950-72



Source: Bureau of Labor Statistics

PART IV. Factors Affecting Productivity Growth

The factors which influence changes in productivity vary from the short to the long term. Short-term movements in productivity are directly related to the business cycle as labor inputs tend to lag behind demand changes.

Improvements in the quality of labor, increased availability of capital, and advances in technology constitute the basic sources of growth in output per unit of labor input. Other sources include improvements in the allocation of resources, increased economies of scale, and advances in managerial know-how. All of these factors are so interrelated that it is difficult to determine the separate effect of each one. Consequently, the charts that follow show changes in some of the factors that affect productivity, without attempting to assess the extent of their influence.

In a dynamic economy, the interaction between factors affecting productivity and factors affected by productivity make it often seem valid to include the same data under either heading. Thus, expenditures on education and capital investment are both a result of past productivity gains and a force tending to increase future productivity rates. Likewise, energy consumption per capita is a measure of past growth and an indicator of technological progress and increased capital investment.

Changes in the type of labor input affect productivity growth. An increase in the educational attainment of the labor force can spur productivity by improving the quality of the labor input. A change in the labor supply, such as that represented by the changing labor force participation of women in many countries, may also influence productivity change. Shifts of employment between sectors of the economy affect productivity to the extent that productivity levels in the sectors where employment is expanding differ from those where it is contracting.

Capital investment has made an important contribution to productivity improvement in industrialized countries, in large part because the amount of capital supporting each worker has grown substantially.

Land, or natural resources, tends to be ignored as a factor in the growth of national productivity. Land, which is essentially constant, can be important in explaining the differences in productivity levels between countries, especially for agricultural production.

Technological change is the other important source of productivity growth. Some indicators of technological change include research and development (R&D) programs, diffusion of selected innovations, patent activities, and energy consumption.

Population, Labor Force, Employment, and Unemployment

The relations between population, labor force, and productivity growth are unclear. Between 1960 and 1972, labor force participation rates (labor force as a percent of working age population) declined in all major industrial countries except the United States and Canada. In both of these countries, the increase was entirely due to a significant rise in female labor force participation, particularly on the part of married women. Male participation rates declined in all the countries studied. Migration from rural to urban areas in Japan and Italy contributed to a sharp decline in participation rates, as many women and children who formerly worked as unpaid farm laborers withdrew from the labor force when their families left agriculture.

Changes in the proportion of the working age population in the labor force and in the proportion of the labor force employed have more of an effect on economic growth–GNP–than on productivity growth–GNP per employee. If more of the population works, the national product will grow, though the amount of growth will depend on how efficient the additional workers are.

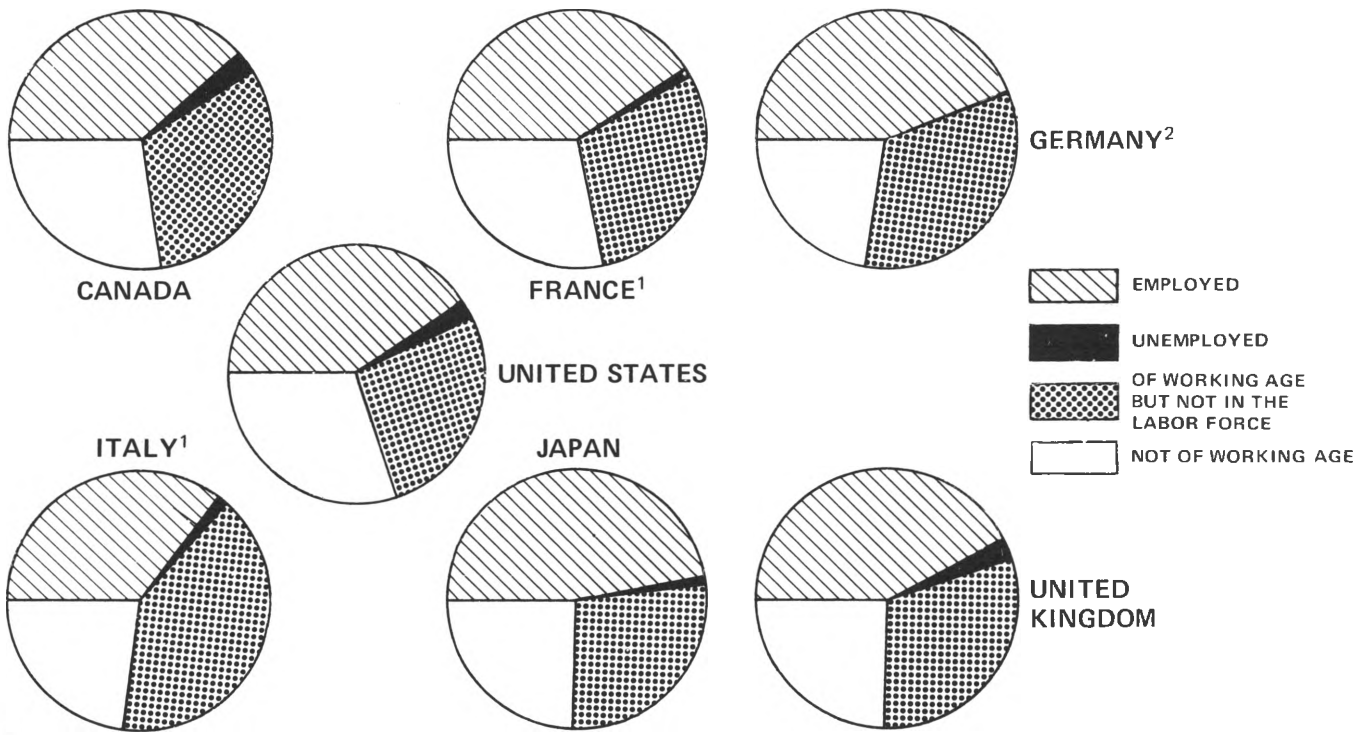
Country	Working age population[1] as percent of civilian population		Civilian labor force as percent of working age population		Percent of civilian labor force			
					Employed		Unemployed	
	1960	1972[2]	1960	1972[2]	1960	1972	1960	1972[2]
United States	65.8	69.4	59.4	60.4	94.5	94.4	5.5	5.6
Canada	66.5	72.3	54.2	56.5	93.0	93.7	7.0	6.3
France	69.2	71.7	62.0	58.1	97.8	97.8	2.2	2.2
Germany	78.6	77.5	60.0	57.0	99.2	99.3	.8	.7
Italy	76.4	76.9	54.8	47.4	95.7	96.6	4.3	3.4
Japan	69.9	75.2	67.9	63.7	98.3	98.6	1.7	1.4
United Kingdom	76.6	75.8	60.4	59.9	97.7	93.7	2.3	6.3

[1]Sixteen and over in the United States and France; 15 and over in Germany, Japan, and the United Kingdom; 14 and over in Canada and Italy.
[2]1970 for France and Italy; 1971 for Germany.

Chart 23.

Work Status of the Civilian Population, 1972

Percent Distribution



[1] 1970

[2] 1971

Source: Bureau of Labor Statistics

Trends in the Industrial Structure of Employment

Shifts of employment from one sector to another reflect different rates of change in demand and productivity. In turn, these shifts affect overall rates of change in productivity and economic growth.

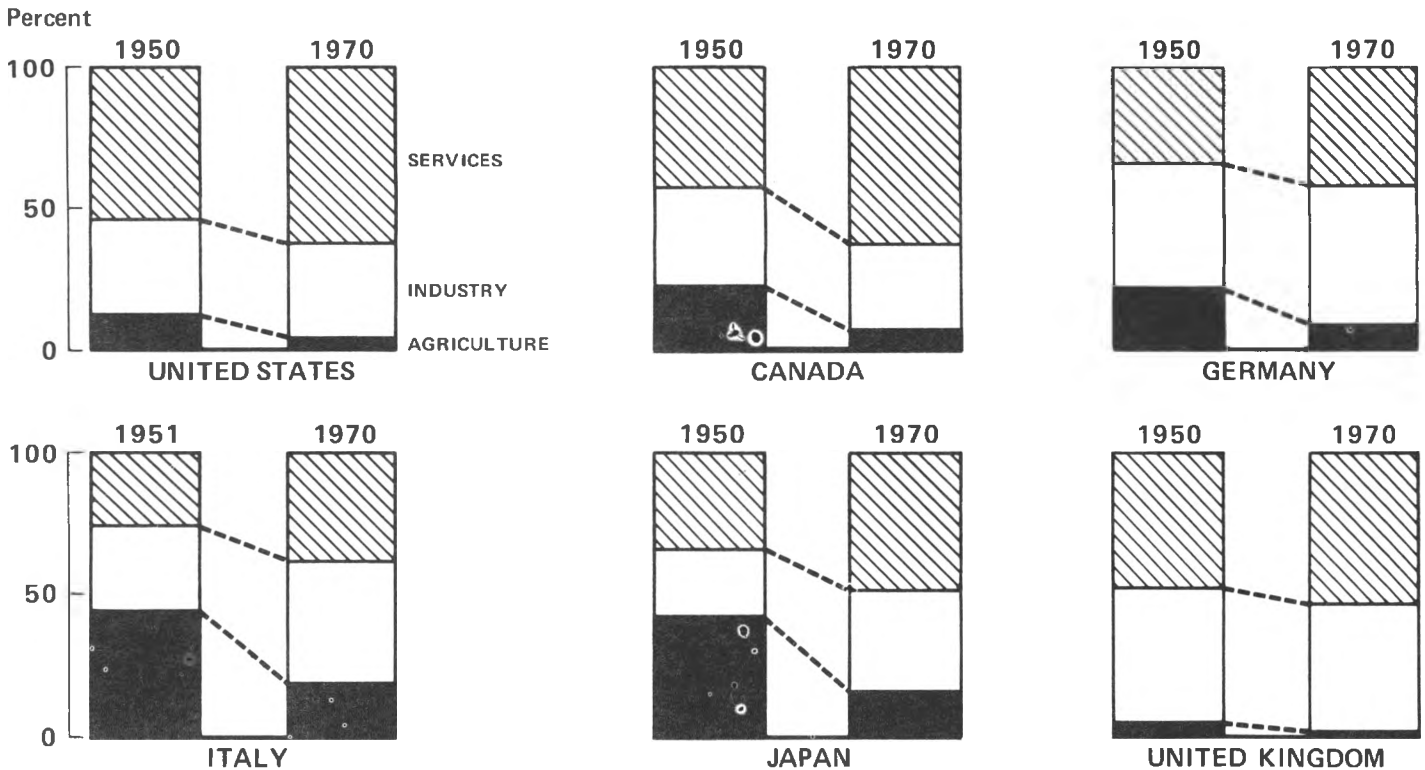
From 1950 to 1970 the most pronounced shifts out of agriculture took place in Italy and Japan; in 1950, these two countries were the least developed of the countries compared. During the period almost all the countries compared had large shifts into services. By 1970, the employment structures of the six countries resembled each other considerably more than they had in 1950.

Country	Change in share of total employment by sector, 1950-70 (in percentage points)		
	Agriculture	Industry	Services
United States	- 7.8	- 0.5	8.3
Canada	-15.2	- 4.3	19.5
Germany	-13.7	6.4	7.3
Italy[1]	-25.7	13.1	12.0
Japan	-26.2	12.1	14.1
United Kingdom	- 2.4	- 1.5	4.0

[1] 1951-70

Chart 24.

Distribution of Civilian Employment by Economic Sector, 1950-70



Source: Bureau of Labor Statistics

Trends in the Sex Composition of the Labor Force

Changes in the sex composition of the labor force can affect productivity to the extent that they promote or retard the more efficient utilization of the labor force. Such changes are almost always accompanied by changes in the total labor supply, as well as by shifts in age composition.

Women make up a potential source of new labor force entrants, as family and social responsibilities until recently limited their participation in industrialized economies. Technological progress has both eased the burdens associated with these responsibilities and diminished the proportion of jobs that require great physical strength.

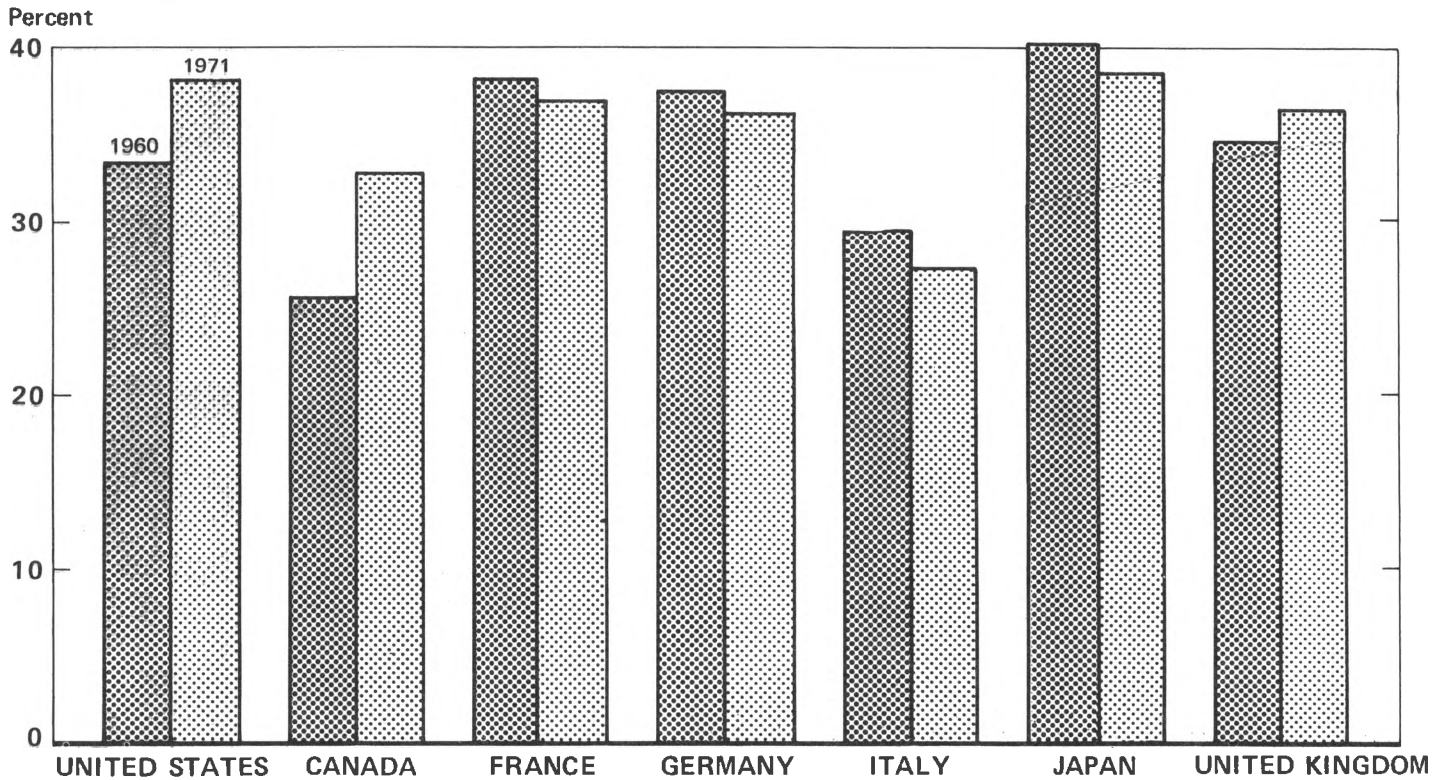
Women are an extremely important source of labor supply since male participation rates have been declining in all of the countries studied as a result of longer schooling and earlier retirement. The higher proportion of females in the labor force in the United States, the United Kingdom, and Canada in 1971 reflect both higher participation rates for women and lower rates for men compared with 1960. The lower rates reflect movement out of agriculture where women are an important part of the work force.

Country	Change in proportion of women in civilian labor force, 1960-71 (in percentage points)
United States	4.8
Canada	7.0
France	-1.3[1]
Germany	-1.3
Italy	-2.4
Japan	-1.8
United Kingdom	2.1

[1]October 1960 to March 1967

Chart 25.

Women as a Percent of the Total Civilian Labor Force, 1960 and 1971



Source: Bureau of Labor Statistics

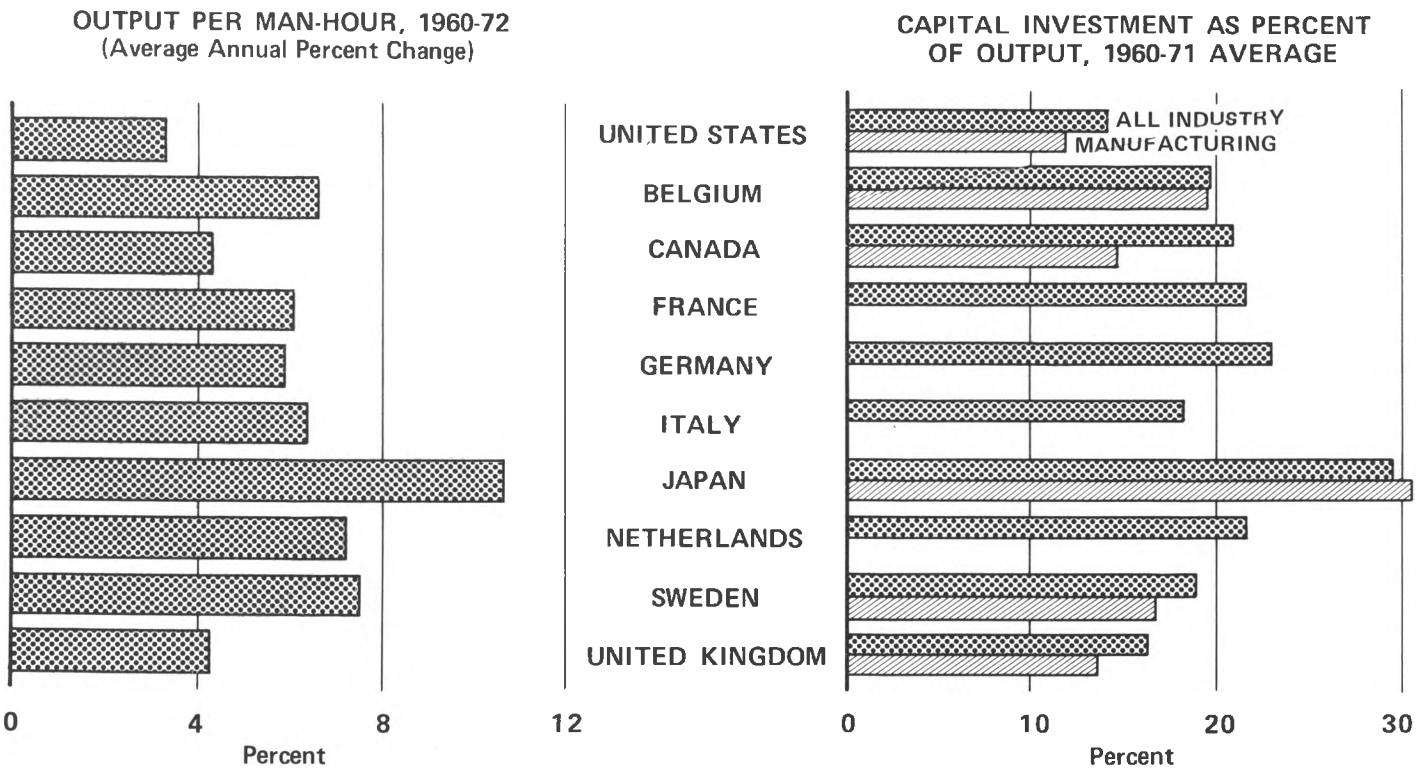
Capital Investment

Since growth in output per man-hour is closely related to the amount of capital stock supporting each worker, a high ratio of capital investment to output is a precursor of growth in productivity. However, too much of a correlation should not be expected. Since capital investment refers to additions to capital stock as well as replacements, comparing rates of capital investment fails to take into account differences in the capital stock already in use. In addition, the lags that exist between the decision to invest in new capital stock, its installation, and the realization of productivity gains tend to obscure the relationship between investment and productivity in country-to-country comparisons. Nevertheless, chart 26 shows a surprising correlation between the rates of growth in productivity and capital investment in manufacturing over a short period of time.

During the 1960's, Japan had the highest rate of investment as well as the highest rate of productivity gain. Yet the United States, which has the highest level of productivity, also has the highest level of capital stock per worker, according to the scant data available.

Chart 26.

Growth in the Output per Man-Hour in Manufacturing and Rate of Capital Investment



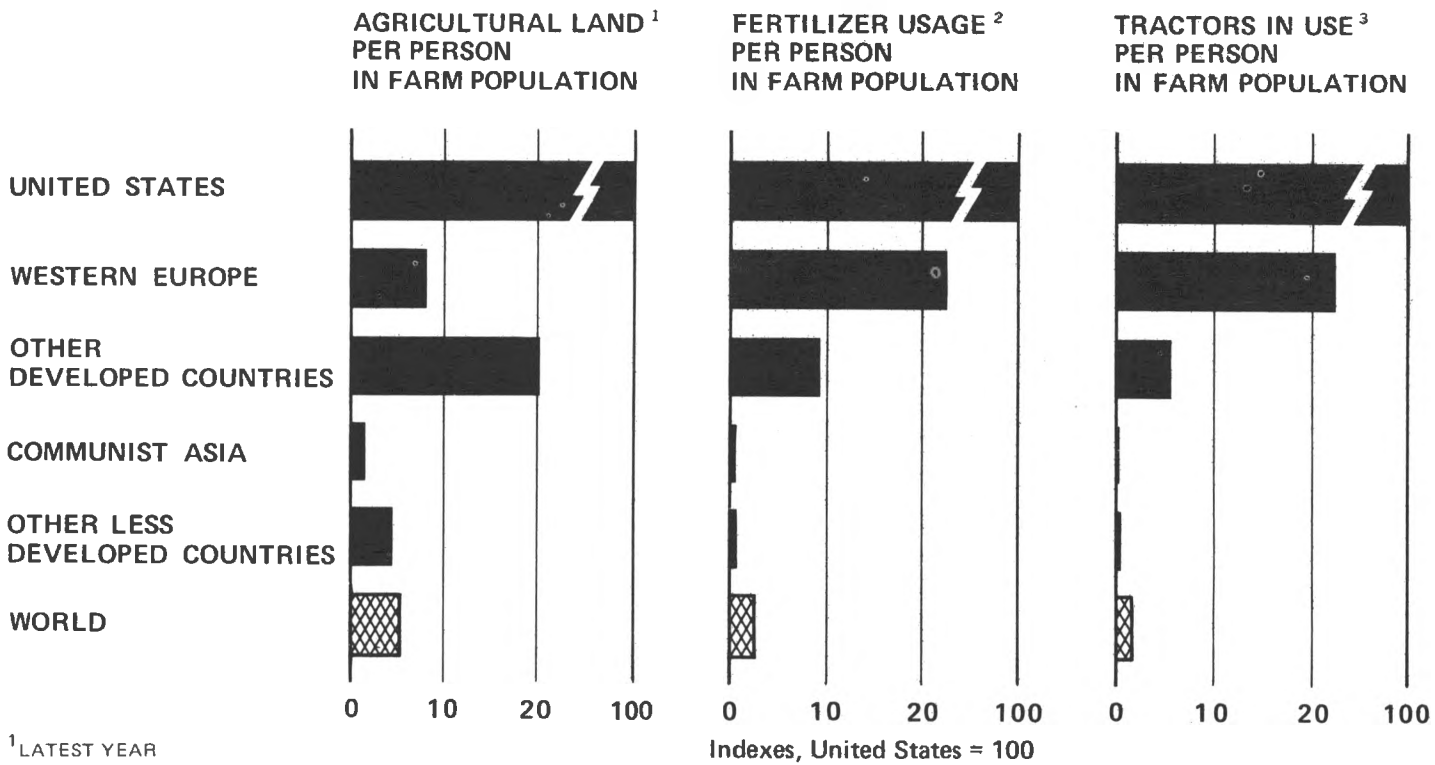
Source: Bureau of Labor Statistics

Some Sources of Agricultural Productivity

Three types of data highlight some of the reasons for the U.S. advantage in food output per person in 1970: agricultural land available per farm person, fertilizer usage per farm person, and tractors per farm person. None of the geographic areas shown reached even one-fourth of the U.S. level for any of the three measures.

Chart 27.

Factors Affecting Agricultural Productivity, 1970



[1] LATEST YEAR

[2] 1970/71

[3] 1971

Source: U.S. Department of Agriculture

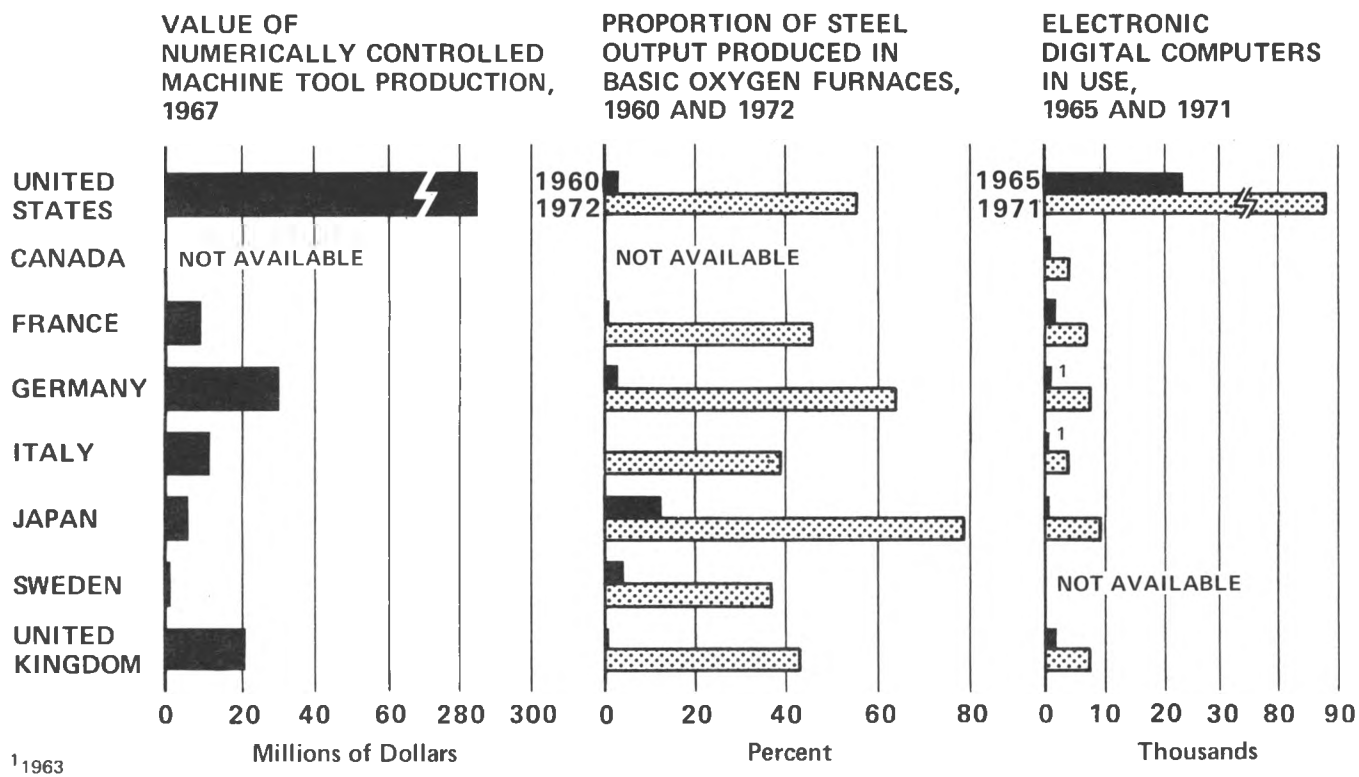
Trends in the Diffusion of Major Technological Innovations

Productivity growth is directly affected by the rate of acceptance of new technology. Researchers generally agree that the rate of diffusion of new technology varies considerably within and between industries and countries, but disagree as to the specific factors causing this variation and their relative importance. Factors which reportedly affect the diffusion rate include the cost and profitability of the innovation, the growth of multinational corporations, and the size of the firm.

Productivity improvement that results from technological change is an important element in international competition. Information available for three major technological innovations of the post-World War II period shows that the United States led other major industrial countries in both computer installations and the production of numerically controlled machine tools, but that it trailed Japan and Germany in the proportion of steel produced in basic oxygen furnaces.

Chart 28.

Diffusion of Three Innovations



Source: Organisation for Economic Co-operation and Development

Source: United Nations

Sources: U.S.-EDP Industry Report, March 1972. Other Countries- National Bureau of Standards, EDP Industry Report, December 1971, and Japan Information Processing Center

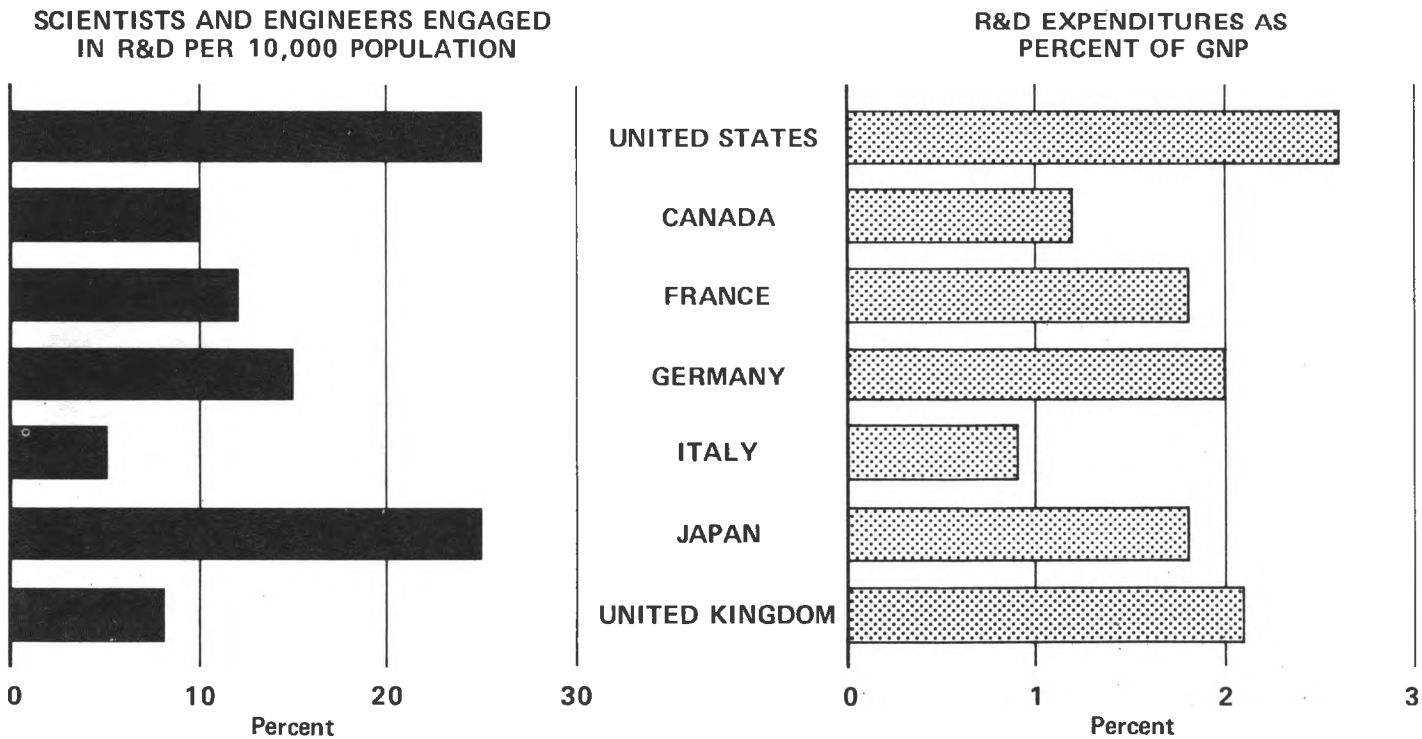
Research and Development: Employment and Expenditures

Expenditures for research and development (R&D) can generate increases in productivity through the development and subsequent application of more efficient equipment, processes, and products. Chart 29 shows that the most advanced economy – the United States – spent the largest proportion of GNP on R&D in 1971, the most recent year for which data are available, while Italy assigned the smallest proportion to it (1969). The three countries with the highest rates of spending on R&D were also countries with large expenditures in the military sector, which accounts for a major portion of R&D activity.

Another measure of potential growth in productivity is the proportion of scientists and engineers in the population engaged in R&D. The United States and Japan led in the employment of scientists and engineers.

Chart 29.

Research and Development: Employment and Expenditures, 1971



Sources: National Science Foundation and Organisation for Economic Development and Co-operation

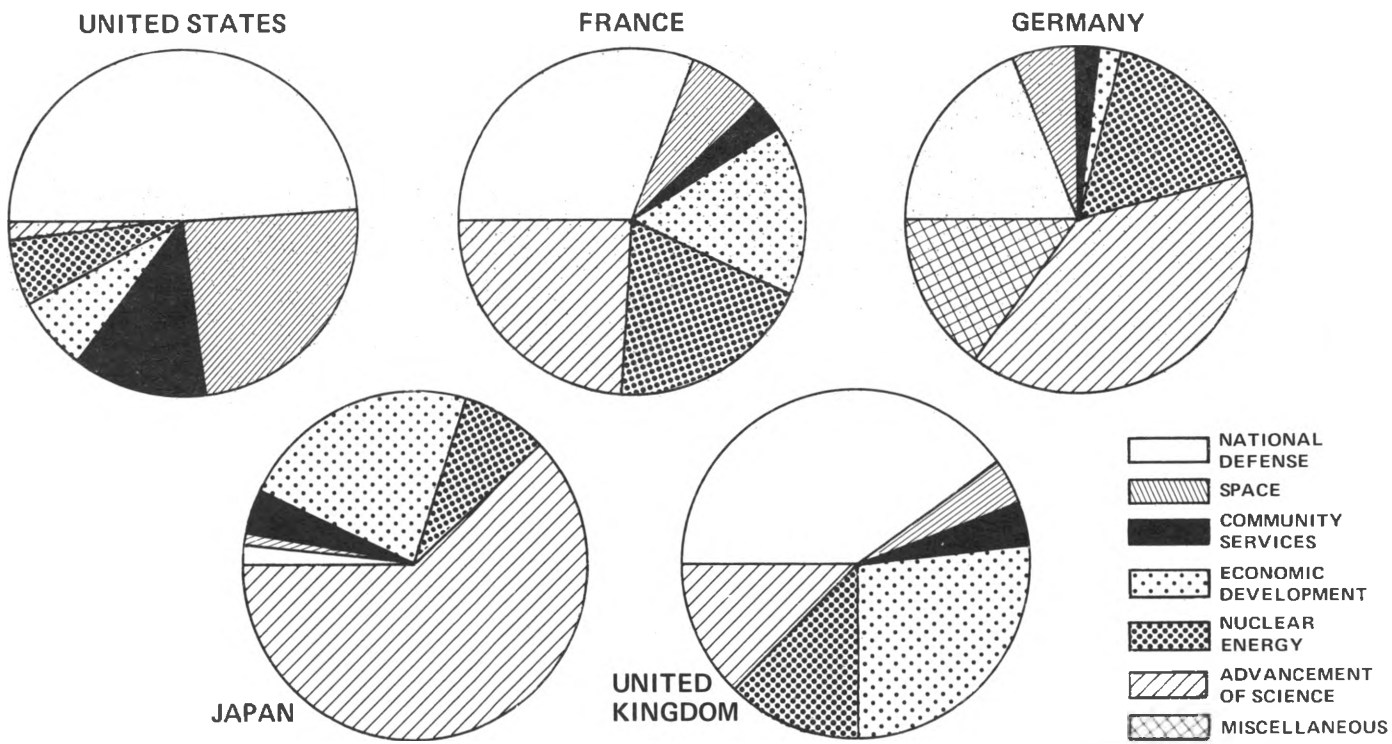
Objectives of Government Research and Development Expenditures

The effect of research and development programs upon productivity is determined in part by the allocation of governmental expenditures among major objectives. The United States and the United Kingdom, which had the lowest rates of productivity growth of the countries compared, devoted the highest proportion of R&D expenditures to national defense. Japan, with the highest rate of productivity growth, spent very little on national defense or space; well over half its total expenditures went towards the advancement of science.

Chart 30.

Government Expenditures for R&D by National Objective, 1969

Percent Distribution



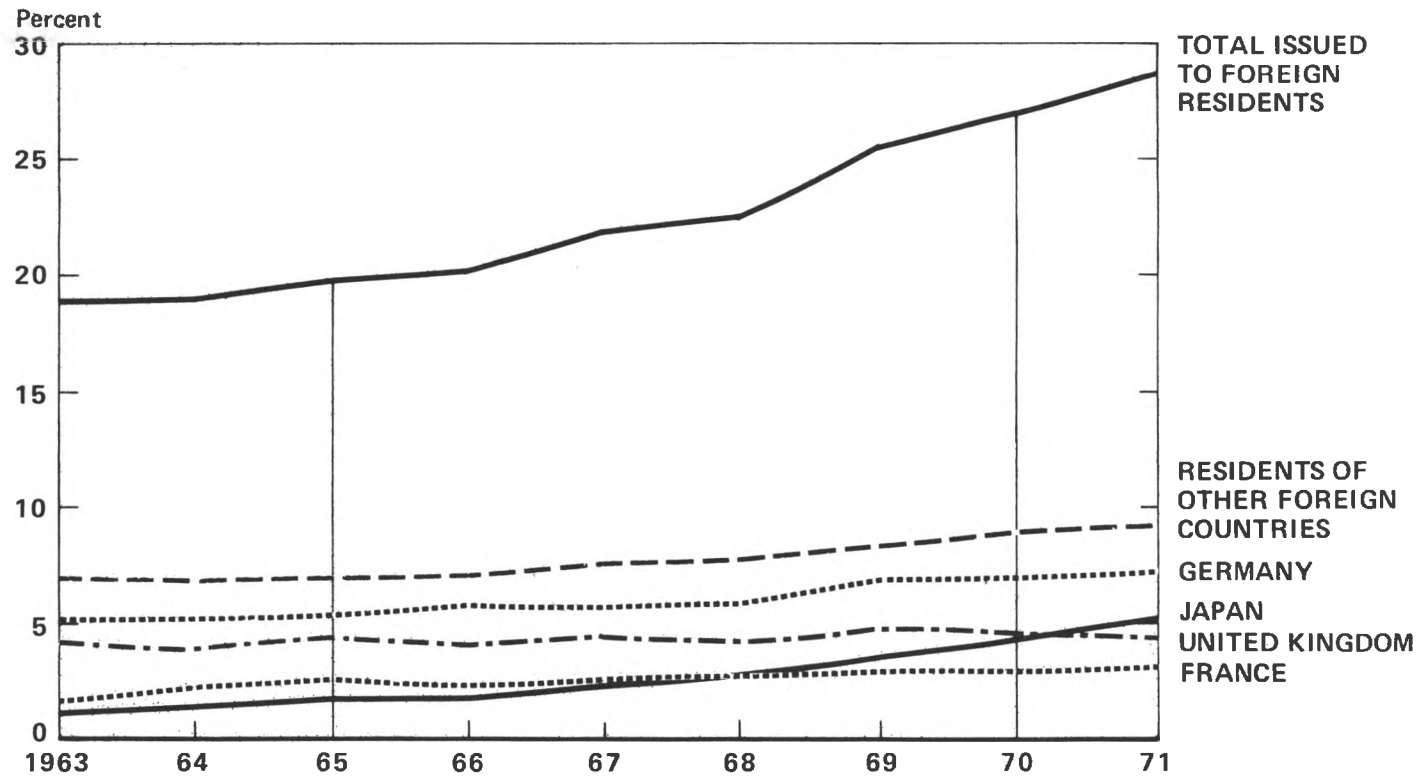
Source: Organisation for Economic Co-operation and Development

Trends in Patent Activity

Patent activity in the United States can be regarded as an indicator of technological innovation throughout the world since foreign concerns tend to file applications here to protect their more important inventions. The proportions of patents issued to foreign residents rose steadily between 1963 and 1971. Four countries accounted for more than half of the total. Germany ranked consistently highest among the four; however, Japan evidenced the greatest rate of increase.

Chart 31.

Percent of U.S. Patents Issued to Foreign Residents, 1963-71



Source: U.S. Department of Commerce

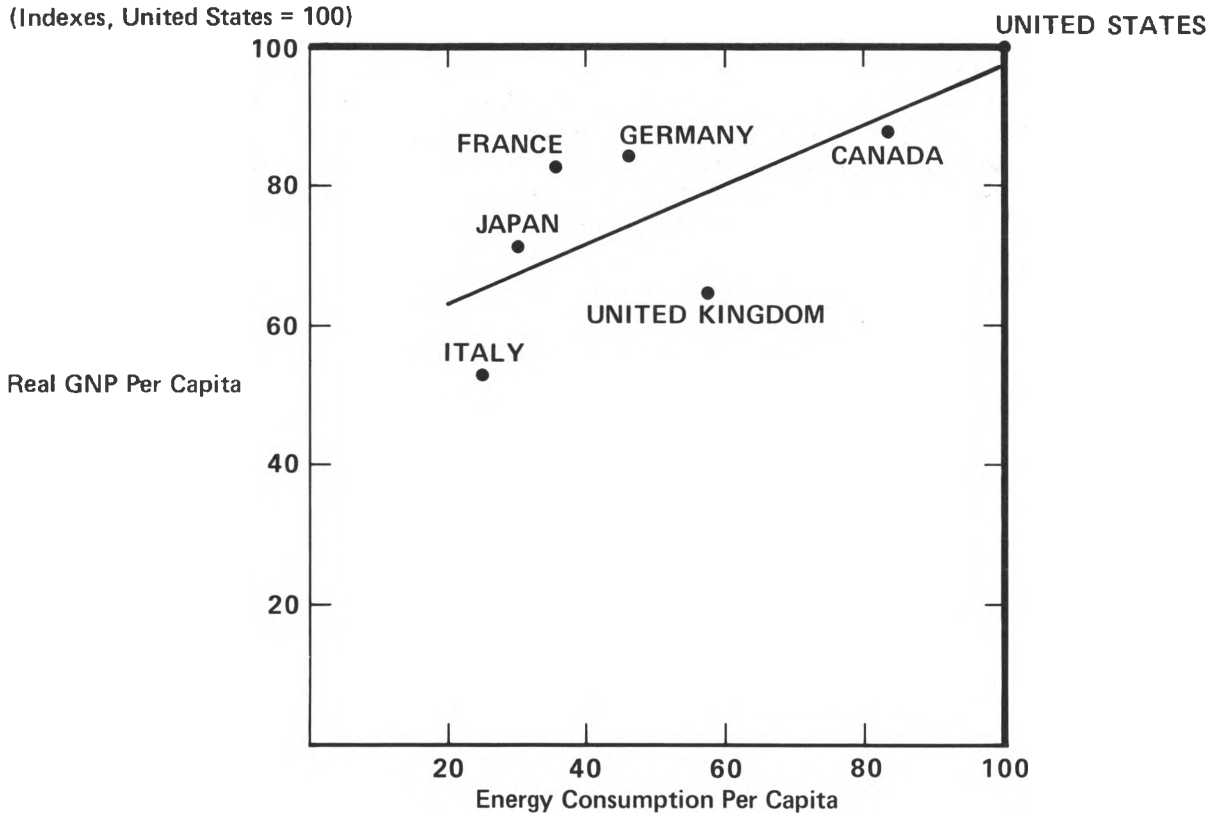
Energy Consumption

The consumption of energy is one consequence of many technological advances which contribute to productivity growth. Energy consumption per capita would be expected to show a correlation with either GNP per capita or GNP per civilian employee. On a per capita basis, the United States and Canada had both the highest consumption of energy and the highest levels of real GNP in 1972.

Energy consumption per capita not only contributes to real GNP per capita but also is influenced by it, as higher incomes result in higher consumer demands. Variations between countries in the use of energy are also influenced by differences in the cost of energy, climate, industrial structure, measures for environmental protection, and consumer tastes.

Chart 32.

Relationship of Energy Consumption per Capita to Real GNP per Capita, 1971



Sources: Bureau of Labor Statistics and United Nations

Appendix A. Supporting Tables for Charts

Users of the following tables should recognize that data on international comparisons have substantial limitations. Problems arise from such diverse sources as variations in concepts, methodology, ability and willingness of respondents to provide information, and stage of economic development. In addition, the use of aggregated measures of economic activity requires reference to some pattern of expenditure or production. These broad measures vary depending on the particular national patterns selected.

For almost all tables, adjustments to the original country data by either international organizations or U.S. statistical agencies improved the consistency of the series. However, in general the accuracy attained would not equal that of U.S. data.

Two important problems deserve special attention. The fairly common statistical procedure of converting GNP measures in foreign currencies to U.S. dollars via use of existing exchange rates was rejected since the bulk of GNP does not enter into foreign trade. Instead, rough estimates based on three detailed studies and extended by the most appropriate existing series were prepared and checked against alternative procedures.

A second major problem centers on governmental activities (and to a lesser degree other services). Output measures here are weak, which may influence comparisons where either measurement techniques differ or the proportion of GNP associated with governmental output differs. The official statistics on productivity for the United States relate to the private economy only and the information presented here for total GNP per person is provided for comparative purposes and does not supersede the official data.

Table 1. Real GNP Per Employed Civilian, 1950-72
(Indexes, 1950 = 100)

Year	United States	Canada	France	Germany	Italy	Japan	United Kingdom
1950	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1955	116.9	120.6	122.6	137.1	127.9	136.7	112.0
1960	123.0	131.5	156.3	192.3	166.5	189.6	123.4
1965	144.1	150.3	201.5	237.7	222.1	287.8	139.1
1970	152.4	165.4	254.1	300.1	299.0	468.9	158.0
1971	156.2	170.7	266.5	308.7	305.5	495.6	164.2
1972	160.4	175.2	278.0	320.4	321.2	541.1	168.9

Table 2. Real GNP Per Employed Civilian, 1950-72
(Indexes, United States = 100)

Year	Canada	France	Germany	Italy	Japan	United Kingdom
1950	82	46	38	30	18	56
1955	85	48	44	33	21	54
1960	88	59	59	41	28	56
1965	86	65	62	46	37	54
1970	89	77	74	59	57	58
1971	90	78	74	59	58	59
1972	90	80	75	60	62	59

Table 3. Output Per Employed Civilian, by Sector, 1950-71
(Average annual percent change)

Sector	United States	Canada	France [1]	Germany	Italy [2]	United Kingdom
Total	2.2	2.4	4.9	5.4	5.3	2.2
Agriculture	5.6	5.3	5.7	6.6	6.9	5.3
Industry	2.2	3.6	5.6	5.9	5.2	2.5
Services	1.8	0.6	2.9	3.6	3.1	1.5

[1] 1955-71

[2] 1951-71

Table 4. Food Production Per Person in the Farm Population, 1970
(Indexes, United States = 100)

Country	Index
United States	100.0
Western Europe	18.8
Other developed countries	9.3
World, including United States	2.8
Communist Asia	.9
Other less developed countries	1.6

Table 5. Output Per Man-Hour in Manufacturing, 1960-72
(Indexes, 1960=100)

Year	United States	Canada	EEC (5 Countries)	Japan	Sweden	United Kingdom
1960	100.0	100.0	100.0	100.0	100.0	100.0
1961	102.5	105.5	104.6	113.1	104.7	100.8
1962	108.3	111.1	111.0	118.1	112.5	103.3
1963	112.7	115.2	116.3	127.6	118.4	108.9
1964	118.0	120.2	124.5	144.6	132.9	116.8
1965	122.7	124.5	133.4	150.7	142.8	120.3
1966	124.3	127.9	140.6	165.9	152.0	124.6
1967	124.2	131.8	148.6	190.5	162.9	130.2
1968	130.2	141.4	160.6	214.5	180.0	139.1
1969	133.3	149.1	170.3	247.6	192.2	141.0
1970	134.2	151.5	177.1	279.0	202.4	141.9
1971	143.7	160.2	186.2	289.0	207.8	149.7
1972	151.3	167.2	199.7	318.1	224.1	158.2

Table 6. Output Per Man-Hour, Output, and Man-Hours in Manufacturing, 1960-72
(Average annual percent change)

Country	Output Per Man-Hour	Output	Man-Hours
United States	3.2	4.8	1.6
Belgium	6.5	6.2	-0.3
Canada	4.2	6.1	1.8
France	5.9	6.6	.7
Germany	5.9	5.6	-0.2
Italy	6.2	6.8	.6
Japan	10.4	12.7	2.1,
Netherlands	7.1	6.5	-0.5
Sweden	7.3	5.9	-1.3
United Kingdom	4.0	3.0	-1.0

Table 7. Relative Levels[1] of Output Per Man-Hour in the Iron and Steel Industry, 1964-72
(Indexes, United States = 100)

Year	France	Germany	Japan	United Kingdom
1964	48-51	54-63	43-54	46-50
1965	48-52	52-61	43-54	47-51
1966	50-54	52-61	51-63	45-48
1967	55-59	59-69	63-78	46-50
1968	59-63	65-76	68-85	48-52
1969	64-69	71-83	83-103	49-53
1970	68-72	72-84	97-121	51-55
1971	65-69	68-80	94-116	47-51
1972	66-71	72-84	102-126	49-53

[1] Range of estimates.

Table 8. Output Per Man-Hour, Output, and Man-Hours in the Iron and Steel Industry, 1964-72
(Average annual percent change)

Country	Output Per Man-Hour	Output	Man-Hours
United States	1.2	-0.4	-1.5
France	6.2	3.1	-2.9
Germany	6.0	3.6	-2.2
Japan	14.3	14.5	.2
United Kingdom	2.2	- .9	-3.0

Table 9. Output Per Man-Hour, Compensation Per Man-Hour, and Unit Labor Costs in Manufacturing, 1960-72
(Average annual percent change)

Country	Output Per Man-Hour	Compensation Per Man-Hour	Unit Labor Costs: National Currency	Unit Labor Costs: U.S. Dollars
United States	3.2	5.1	1.8	1.8
Belgium	6.5	9.9	3.2	3.7
Canada	4.2	6.2	1.9	1.9
France	5.9	9.5	3.5	2.7
Germany	5.9	9.3	3.3	4.8
Italy	6.2	11.2	4.7	4.9
Japan	10.4	14.1	3.3	4.1
Netherlands	7.1	12.1	4.7	5.4
Sweden	7.3	10.4	2.9	3.2
United Kingdom	4.0	8.0	3.8	2.2

Table 10. Output Per Man-Hour, Compensation Per Man-Hour, and Unit Labor Costs in Manufacturing, 1960-65
(Average annual percent change)

Country	Output Per Man-Hour	Compensation Per Man-Hour	Unit Labor Costs: National Currency	Unit Labor Costs: U.S. Dollars
United States	4.3	3.7	-0.7	-0.7
Belgium	5.1	8.8	3.5	3.5
Canada	4.4	3.5	-0.8	-2.9
France	4.9	9.0	3.8	3.8
Germany	6.4	9.6	3.0	3.7
Italy	6.8	13.6	6.3	6.2
Japan	8.5	13.2	4.3	4.2
Netherlands	5.2	11.4	5.9	6.7
Sweden	7.6	10.3	2.6	2.6
United Kingdom	4.1	6.4	2.2	2.1

Table 11. Output Per Man-Hour, Compensation Per Man-Hour, and Unit Labor Costs in Manufacturing, 1965-70
(Average annual percent change)

Country	Output Per Man-Hour	Compensation Per Man-Hour	Unit Labor Costs: National Currency	Unit Labor Costs: U.S. Dollars
United States	2.0	6.1	4.0	4.0
Belgium	7.7	9.4	1.5	1.4
Canada	4.5	7.6	3.1	3.5
France	6.5	10.0	3.2	1.0
Germany	5.6	8.3	2.6	4.1
Italy	5.3	9.4	3.9	3.8
Japan	13.4	15.2	1.6	1.8
Netherlands	8.5	11.9	3.1	3.0
Sweden	7.5	10.1	2.4	2.3
United Kingdom	3.7	7.4	3.6	-0.4

Table 12. Output Per Man-Hour, Compensation Per Man-Hour, and Unit Labor Costs in Manufacturing, 1970-72
(Average annual percent change)

Country	Output Per Man-Hour	Compensation Per Man-Hour	Unit Labor Costs: National Currency	Unit Labor Costs: U.S. Dollars
United States	6.2	6.6	0.4	0.4
Belgium	7.3	13.5	5.8	12.4
Canada	5.0	7.7	2.6	5.3
France	6.0	12.5	6.1	11.1
Germany	6.0	12.9	6.5	13.9
Italy	5.6	16.1	9.9	13.9
Japan	6.8	15.9	8.6	18.1
Netherlands	6.5	13.5	6.6	13.1
Sweden	5.2	12.7	7.1	11.8
United Kingdom	5.6	13.6	7.6	9.9

Table 13. Relative Output Per Man-Hour, Unit Labor Costs, and Hourly Labor Costs in the Iron and Steel Industry, 1964-72
(Indexes, United States = 100)

	Output Per Man-Hour				Unit Labor Costs in U.S. Dollars				Hourly Labor Costs			
Year	France	Germany	Japan	United Kingdom	France	Germany	Japan	United Kingdom	France	Germany	Japan	United Kingdom
1964	48-51	54-63	43-54	46-50	66-72	58-72	31-40	57-64	34-35	37-39	17-17	29-30
1965	48-52	52-61	43-54	47-51	69-75	63-78	34-43	61-68	35-36	38-40	18-18	31-32
1966	50-54	52-61	51-63	45-48	67-73	65-80	31-39	67-75	36-37	39-42	20-20	32-33
1967	55-59	59-69	63-78	46-50	63-68	57-71	27-35	60-67	37-38	39-42	21-22	30-31
1968	59-63	65-76	68-85	48-52	62-67	53-65	28-35	53-59	39-40	40-42	23-24	27-28
1969	64-69	71-83	83-103	49-53	56-61	50-62	25-32	52-58	38-39	41-44	26-26	28-29
1970	68-72	72-84	97-121	51-55	54-59	64-80	25-31	55-62	39-40	54-48	30-31	30-31
1971	65-69	68-80	94-116	47-51	60-65	73-90	27-35	60-67	41-42	58-62	32-32	31-32
1972	66-71	72-84	102-126	49-53	65-70	73-91	29-35	62-69	46-46	62-66	37-38	33-34

Table 14. Hourly Compensation of Wage Earners in Manufacturing and Selected Industries, 1972
(U.S. dollars)

Country	Manufacturing	Motor Vehicles	Textiles	Apparel
United States	$ 4.75	$ 6.49	$ 3.25	$ 3.12
Belgium	2.89	3.59	2.51	1.90
Canada	4.28	5.68	3.23	2.65
France	2.31	2.75	2.01	1.84
Germany	3.18	4.03	2.61	2.42
Israel	-	-	1.36	1.03
Italy	2.54	2.90	2.08	2.01
Japan	1.69	1.86	1.11	.92
Korea	-	-	.23	.19
Netherlands	2.93	3.08	2.63	1.59
Sweden	3.98	4.12	-	-
United Kingdom	2.04	2.65	1.69	1.37

Table 15. Consumer Prices, 1960-72
(Indexes, 1960 = 100)

Year	United States	Canada	France	Germany	Italy	Japan	United Kingdom
1960	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1961	101.1	100.9	103.3	102.5	102.1	105.3	103.4
1962	102.2	102.1	108.3	106.2	106.8	112.4	107.8
1963	103.5	104.0	113.5	109.2	114.8	120.9	110.0
1964	104.8	105.8	117.4	111.9	121.6	125.5	113.6
1965	106.6	108.4	120.3	115.4	127.1	135.1	119.0
1966	109.7	112.4	123.5	119.6	130.1	142.0	123.7
1967	112.8	116.5	126.9	121.7	134.9	147.7	126.7
1968	117.6	121.2	132.6	123.6	136.7	155.5	132.7
1969	123.9	126.7	141.2	126.9	140.3	163.6	139.9
1970	131.2	130.9	148.5	131.6	147.2	176.2	148.8
1971	136.8	134.7	156.7	138.4	154.3	187.3	162.8
1972	141.3	141.1	166.4	146.4	163.1	196.5	174.4

Table 16. Implicit Price Deflator for GNP, 1960-72
(Indexes, 1960 = 100)

Year	United States	Canada	France	Germany	Italy	Japan	United Kingdom
1960	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1961	101.3	100.5	103.3	104.4	102.7	106.9	103.3
1962	102.4	101.9	108.3	108.6	108.6	111.3	106.8
1963	103.8	103.5	114.8	112.0	118.0	116.1	109.1
1964	105.3	106.3	119.4	115.1	125.4	120.8	112.0
1965	107.4	109.7	122.3	119.3	130.4	127.4	116.5
1966	110.3	114.5	125.9	123.4	133.2	133.3	121.2
1967	113.8	118.9	129.5	125.0	137.1	138.9	124.8
1968	118.4	122.8	135.4	127.0	139.1	144.3	128.8
1969	124.1	128.3	144.3	131.5	144.9	150.2	133.7
1970	130.9	134.0	152.2	140.8	154.6	160.2	143.8
1971	137.1	138.3	160.5	151.5	164.9	167.7	158.5
1972	141.4	145.0	169.7	160.7	174.6	176.1	173.3

Table 17. Real GNP per Capita, 1950-72
(Indexes, United States = 100)

Year	Canada	France	Germany	Italy	Japan	United Kingdom
1950	77	54	45	31	20	63
1955	78	56	59	35	25	64
1960	81	66	75	43	36	69
1965	82	70	77	46	47	67
1970	86	81	85	54	71	65
1971	88	83	84	53	73	65
1972	88	82	82	51	75	63

Table 18. Real Hourly Earnings of Manufacturing Wage Earners, 1960-72
(Indexes, 1960 = 100)

Year	United States	Canada	France	Germany	Italy	Japan	United Kingdom
1960	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1961	101.6	101.3	104.4	108.0	104.8	105.7	103.5
1962	103.5	102.8	107.8	116.1	115.4	112.3	103.1
1963	105.1	104.7	111.7	121.0	125.5	116.5	105.2
1964	106.8	106.6	114.7	127.5	131.5	124.8	109.9
1965	108.3	109.2	117.4	136.3	137.9	129.5	112.6
1966	109.8	111.8	121.3	141.1	140.9	138.0	116.7
1967	111.0	115.1	126.3	144.3	143.7	148.9	118.4
1968	113.3	118.9	133.8	147.9	147.3	165.7	121.4
1969	114.0	123.0	141.6	158.8	157.3	187.9	125.9
1970	113.3	128.5	151.7	172.9	184.0	204.3	136.1
1971	115.1	136.0	160.2	183.7	205.0	222.2	140.6
1972	119.3	140.2	170.0	188.0	224.2	246.4	148.2

Table 19. Distribution of Consumer Expenditures, 1971
(Percent)

Item	United States	France	Germany	Italy	Japan [1]	United Kingdom
Total Expenditures	100.0	100.0	100.0	100.0	100.0	100.0
Food	17.6	26.5	21.9	35.0	30.7	22.3
Clothing, Medical Care and Personal Care	19.4	19.8	20.5	18.2	16.8	17.2
Housing	27.1	22.2	26.5	19.3	25.6	24.7
Transportation and Communication	15.4	10.7	11.8	11.0	4.3	12.4
Education and Recreation	14.1	13.8	11.9	12.6	12.8	18.7
Other	6.4	7.0	7.4	3.9	9.8	4.7

[1] 1970.

Table 20. Unemployment Rates, 1960-72
(Percent)

Year	United States	Canada	France	Germany	Italy	Japan	United Kingdom
1960	5.5	7.0	2.2	0.8	4.3	1.7	2.3
1961	6.7	7.1	1.9	.5	3.7	1.5	2.1
1962	5.5	5.9	1.9	.4	3.2	1.3	3.0
1963	5.7	5.5	1.9	.5	2.7	1.3	3.8
1964	5.2	4.7	1.6	.3	3.0	1.2	2.6
1965	4.5	3.9	1.8	.3	4.0	1.2	2.3
1966	3.8	3.6	1.8	.3	4.3	1.4	2.4
1967	3.8	4.1	2.3	1.0	3.8	1.3	3.8
1968	3.6	4.8	2.7	1.2	3.8	1.2	3.7
1969	3.5	4.7	2.1	.8	3.7	1.1	3.7
1970	4.9	5.9	2.2	.5	3.4	1.2	4.0
1971	5.9	6.4	2.7	.7	3.4	1.3	5.3
1972	5.6	6.3	2.9	.9	4.0	1.4	6.2

Table 21. School Enrollments and Education Expenditures, 1969

Country	Proportion of school-age population enrolled in school: Primary and Secondary	Proportion of school-age population enrolled in school: Post-secondary	Public expenditures on education as a percent of GNP
United States	86.2	48.0	6.3
Canada	85.7	24.8	8.3
France	72.8	15.2 [1]	4.5 [2]
Germany	79.5	12.0	3.6
Italy	67.0	15.3	4.3 [2]
Japan	72.8	16.1	4.0
United Kingdom	78.6	10.4 [3]	5.6 [3]

[1] Public university enrollment only.
[2] Ministry of Education expenditures only.
[3] 1967.

Table 22. Contribution of Growth in Output Per Employee to Growth in Real GNP, 1950-72
(Average annual percent change)

Country	Growth in real GNP	Growth in civilian employment	Growth in real GNP per employed civilian	Interaction
United States	3.7	1.5	2.2	.
Canada	5.0	2.4	2.6	.
France	5.2	.4	4.8	.
Germany	6.4	.9	5.4	0.1
Italy	5.4	- 0.1	5.4	0.1
Japan	9.8	1.7	8.0	0.1
United Kingdom	2.7	.3	2.4	.

Table 23. Work Status of the Civilian Population, 1972
(Percent distribution)

	Of Working Age			Not of Working Age
	Civilian Labor Force			
	Employed	Unemployed	Not in Labor Force	
United States	39.6	2.3	27.5	30.6
Canada	38.3	2.6	31.5	27.7
France [1]	40.7	.9	30.1	28.3
Germany [2]	43.9	.3	33.4	22.5
Italy [1]	35.2	1.2	40.4	23.1
Japan	47.2	.7	27.3	24.8
United Kingdom	42.2	2.8	30.8	24.2

[1] 1970.
[2] 1971.

Table 24. Distribution of Civilian Employment by Economic Sector, 1950 and 1970
(Percent)

Country	1950			1970		
	Agriculture	Industry	Services	Agriculture	Industry	Services
United States	12.3	33.7	54.0	4.5	33.2	62.3
Canada	22.9	34.6	42.5	7.7	30.3	62.0
Germany	22.7	43.1	34.2	9.0	49.5	41.5
Italy	44.6 [1]	29.9 [1]	25.6 [1]	19.5	43.0	37.6
Japan	43.1	23.5	33.4	16.9	35.6	47.5
United Kingdom	5.3	46.5	48.2	2.9	45.0	52.2

[1] 1951.

Table 25. Women as a Percent of the Total Civilian Labor Force, 1960 and 1971

Country	1960	1971
United States	33.4	38.2
Canada	25.8	32.8
France	38.2	36.9
Germany	37.5	36.2
Italy	29.6	27.2
Japan	40.3	38.5
United Kingdom	34.6	36.7

Table 26. Growth in Output Per Man-Hour in Manufacturing and Rate of Capital Investment

Country	Output Per Man-Hour in Manufacturing 1960-72 (Average annual percent change)	Capital Investment as Percent of Output 1960-71 Average	
		All industry [1]	Manufacturing
United States	3.2	14.3 [2]	12.0
Belgium	6.5	19.7	19.5
Canada	4.2	21.0	14.7
France	5.9	21.3	N.A.
Germany	5.8	22.4 [3]	N.A.
Italy	6.1	17.9	N.A.
Japan	10.4	29.6	30.5
Netherlands	7.1	21.4	N.A.
Sweden	7.3	18.7	16.6
United Kingdom	4.0	16.6	13.5

[1] Mining, manufacturing, construction, and public utilities.
[2] Excludes construction.
[3] Total capital investment, excluding residential dwellings, as percent of total output.

Table 27. Factors Affecting Agricultural Productivity, 1970
(Indexes, United States = 100)

Item	United States	Western Europe	Other developed countries	Communist Asia	Other less developed countries	World
Agricultural land [1] per person in farm population	100.0	7.8	20.4	1.5	4.2	5.1
Fertilizer usage [2] per person in farm population	100.0	22.3	9.6	0.4	0.5	2.2
Tractors in use [3] per person in farm population	100.0	22.6	5.9	0.1	0.2	1.6

[1] For latest year.
[2] For 1970-71.
[3] For 1971.

Table 28. Diffusion of Three Innovations

Country	Value of Numerically Controlled Machine Tool Production, 1967 (Millions of Dollars)	Percent of Steel Output Produced in Basic Oxygen Furnaces		Electronic Digital Computers in Use	
		1960	1972	1965	1971
United States	$ 284.9	3.4	56.0	23,200	88,000
Canada	N.A.	N.A.		[1] 750	3,800
France	9.0	.7	45.8	[1] 500	6,700
Germany	29.5	2.5	64.6	[1] 996	7,800
Italy	12.0	0	39.1	[1] 500	3,300
Japan	5.9	11.9	79.4	1,445	9,482
Sweden	1.6	3.9	36.5	N.A.	
United Kingdom	20.1	0.5	42.6	1,850	7,600

[1] 1963.
N.A. Not Available.

Table 29. Research and Development: Employment and Expenditures, 1971

Country	Scientists and Engineers Engaged in R &D per 10,000 Population	R & D Expenditures as Percent of GNP
United States	25	2.6
Canada	10	1.2
France	12	1.8
Germany	15	2.0
Italy	[1] 5	[1] .9
Japan	25	1.8
United Kingdom	[1] 8	2.1

[1] 1969.

Table 30. Government Expenditures for R&D by National Objective, 1969
(Percent distribution)

Objective	United States	France	Germany	Japan	United Kingdom
Total	100	100	100	100	100
National defense	49	31	19	2	40
Space	24	7	6	1	4
Community services	12	3	2	4	4
Economic development	7	16	2	23	26
Nuclear energy	6	18	17	8	12
Advancement of science	2	24	39	61	13
Miscellaneous	---	---	15	---	---

Table 31. Percent of U.S. Patents Issued to Foreign Residents, 1963-71

Year	Total issued to Foreign Residents	France	Germany	Japan	Residents of United Kingdom	Other Foreign Countries
1963	18.6	1.9	5.1	0.9	4.0	6.7
1964	18.9	2.1	5.1	1.2	3.9	6.6
1965	19.9	2.2	5.4	1.5	4.1	6.7
1966	20.1	2.1	5.8	1.6	3.9	6.7
1967	21.9	2.4	5.7	2.2	4.3	7.3
1968	22.5	2.4	5.8	2.5	4.2	7.6
1969	25.4	2.7	6.7	3.2	4.7	8.1
1970	26.9	2.7	6.9	4.1	4.6	8.6
1971	28.5	2.8	7.1	5.1	4.4	9.1

Table 32. Energy Consumption Per Capita and Real GNP Per Capita, 1971
(Indexes, United States = 100)

Country	Real GNP Per Capita	Energy Consumption Per Capita
United States	100	100.0
Canada	88	82.9
France	83	34.9
Germany	84	46.5
Italy	53	23.9
Japan	73	29.1
United Kingdom	65	49.0

Appendix B. Sources

Sources of the data for the charts and methods of adjustment are as follows:

1. Trends in real GNP per employed civilian: BLS estimates based on national sources. GNP is in constant market prices and is based on OECD definitions, which differ somewhat from the official U.S. concepts. The employment figures are partially estimated. In addition, the employment data for France, Germany, Italy, Japan, and the United Kingdom have been adjusted for rough comparability with U.S. concepts. Data on output per employed person for the United States differ from the indexes regularly published by the Bureau of Labor Statistics since the latter figures exclude general government. Data for 1950-70 calculated at 5 year intervals only.

2. Comparative levels of real GNP per employed civilian: Relative levels of real GNP for the European countries for 1955 were derived from Gilbert and associates, *Comparative National Products and Price Levels* (Paris, Organisation for European Economic Co-operation, 1958). The relative level of Canadian real GNP in 1960 was derived from Dorothy Walters, *Canadian Growth Revisited, 1950-1967* (Ottawa, Staff Study No. 28, Economic Council of Canada, 1970). The relative of Japanese real GNP in 1960 was derived from *A Study of International Comparison of Levels of Living* (Tokyo, Institute of People's Living, March 1965) as quoted in Angus Maddison, *Economic Growth in Japan and the U.S.S.R.* (New York, W.W. Norton and Company, Inc., 1969). The base year estimates are at U.S. relative prices; if the base year comparisons were to be made using relative prices in each of the foreign countries, it would lower the foreign real GNP estimates relative to the United States. Real GNP and employment for other years were then estimated based on trend data described in (1) above.

3. Trends in output per employed civilian by sector: BLS estimates based on national statistics. The methods followed were similar but not identical to those used for chart 1. Output refers to gross domestic product rather than gross national product. Output trends were measured in constant market prices for the United States, France, and Germany and at constant factor cost for Canada, Italy, and the United Kingdom. Output by sector at constant prices is not available for Japan. The employment figures for Italy have been adjusted for major conceptual differences. The employment figures for the other countries have not been similarly adjusted, but such adjustments would have little effect on the trends.

The agricultural sector includes farming, forestry, hunting, and fishing. Industry is defined as mining, manufacturing, and construction. Services cover transportation, communication, public utilities, trade, finance, public administration, private household services, and miscellaneous services. Employment in government enterprises is classified according to the sector appropriate to the output of the enterprise.

4. Levels of food production per person in the farm population: Based on unpublished data from the Economic Research Service, U.S. Department of Agriculture. Value of food production based on the previously published benchmark for 1959-61 (in 1959-61 world prices) extended to 1971 by the Economic Research Service using indexes of food production. Farm Population statistics from Food and Agricultural Organisation, except for the United States. Regional groups include the following countries:

Other developed countries—Australia, Canada, New Zealand, Union of South Africa, U.S.S.R., and Eastern Europe.
Less developed countries (except Communist Asia)—Africa except Union of South Africa, Asia except Japan and Communist Asia, and all of Latin America.
Communist Asia—China, Mongolia, North Korea, and North Vietnam.

This listing may differ from UN regional groups established for other purposes.

5, and 6. Productivity, output, and man-hour trends in manufacturing: BLS estimates based primarily on aggregate manufacturing output statistics from national economic accounts and national data on employment and man-hours worked by all employees.

7, and 8. Productivity, output, and man-hours in the iron and steel industry: Comparative 1964 data for the United States, France, Germany, and the United Kingdom are from *An International Comparison of Unit Labor Cost in the Iron and Steel Industry, 1964: United States, France, Germany, United Kingdom,* Bulletin 1580 (Bureau of Labor Statistics, 1968); comparative 1964 data for Japan are preliminary unpublished estimates. The estimates for 1964 are essentially based on the U.S. definition of the iron and steel industry. Estimates for later years were obtained by applying trend indexes for each country–unadjusted for comparability among the countries–to the 1964 relatives.

9, 10, 11, and 12. Trends in output per man-hour, compensation per man-hour, and unit labor costs in manufacturing, 1960-72: BLS estimates based primarily on aggregate manufacturing output statistics from national economic accounts, estimates of the number of man-hours worked by all employees, and aggregate labor compensation statistics. Trends in unit labor costs on a U.S. dollar basis were calculated using the average daily exchange rates published in the *Federal Reserve Bulletin*, Board of Governors of the Federal Reserve System.

13. Levels of output per man-hour, unit labor costs, and hourly labor costs in the iron and steel industry: See (7 and 8) above.

14. Compensation in manufacturing and selected industries: BLS estimates based on published average hourly earnings adjusted for compensation items excluded from earnings. The adjustments were based primarily on labor cost survey statistics. Total compensation refers to all payments made by the employer directly to the worker before deductions of any kind, plus employer contributions to legally required insurance programs and to contractual and private plans for the benefit of employees. The earnings and labor cost data are from national and EEC statistical publications. Hourly compensation was converted into U.S. dollars using the average daily exchange rate for 1972.

15. Trends in consumer prices: Consumer price indexes published in national statistical publications converted to a common base year.

16. Trends in the GNP implicit price deflator: Derived from country national accounts data and converted to a common base year.

17. Comparative levels of real GNP per capita: BLS estimates. For derivation of real GNP estimates, see (2) above. Population estimates relate to the resident population.

18. Trends in real hourly earnings: Average hourly earnings of manufacturing wage workers adjusted for changes in consumer prices as measured by consumer price indexes. The earnings data are from national and EEC statistical publications; the consumer price data are from national statistical publications.

19. The structure of consumer expenditures: National accounts statistics of private consumption expenditures in current prices. National accounts data for Germany, Japan, and the United Kingdom were adjusted by BLS in order to obtain statistics for comparable expenditure categories.

20. Trends in unemployment: BLS estimates of unemployment rates adjusted to U.S. labor force survey concepts and definitions. No adjustments were made to the published Canadian data. Adjustments of national data for most countries were based primarily on the results of labor force surveys. For Great Britain, adjustments were based on the results of the 1961 population census and the 1966 "sample census."

21. School enrollment and education expenditures: School enrollment ratios calculated by BLS from enrollment figures published in the UNESCO *Statistical Yearbook* and population figures by age published in the United Nations *Demographic Yearbook*, The first and second levels cover primary and secondary education. Third level includes: (1) universities and equivalent degree-granting institutions; (2) teacher training in nonuniversity institutions (e.g., teacher colleges); and (3) other post-secondary education in nonuniversity institutions (technical colleges, etc.). Both full-time and part-time students are included except in the Canadian data which exclude part-time students. Educational expenditure ratios are from the UNESCO *Statistical Yearbook.* Public expenditures on education comprise recurring and capital expenditures at all levels of government. Recurring expenditures cover public expenditures on: (1) school administration; (2) preschool through third level education; (3) other types of education such as special education, adult education, religious schools, and similar institutions; and (4) scholarships, student transport, and other types of education-related subsidies, if applicable.

22. The contribution of productivity to economic growth: See (1) above.

23. Population, labor force, employment, and unemployment: BLS

estimates of data adjusted to U.S. labor force survey concepts and definitions. See (20) above.

24. Trends in the industrial structure of employment: BLS estimates of sectoral employment adjusted to U.S. labor force survey definitions wherever major conceptual differences exist. Other adjustments were also made by BLS to achieve consistency in the employment series.

Total civilian employment includes wage and salary workers, unpaid family workers, and the self-employed. Data for the United Kingdom exclude a small number of unpaid family workers.

For definition of sectors, see (3) above.

25. Trends in the sex composition of the labor force: BLS estimates adjusted to U.S. labor force survey definitions. See (20) above.

26. Capital investment: The capital investment ratios are BLS estimates derived from published national accounts data. Output is at factor cost while investment is in purchasers' values. The ratios are based on data at current prices as figures in constant prices are not available for several of the countries. U.S. ratios based on constant and current prices are not significantly different over the time period covered. Ratios for all industry include public utilities for this chart only. U.S. total excludes construction.

27. Some sources of agricultural productivity: Compiled by the Economic Research Service, U.S. Department of Agriculture, from F.A.O. sources, except for U.S. population. For regional listing, see (4) above.

28. Trends in the diffusion of major technological innovations: See sources listed on chart.

29. Research and development: employment and expenditures: 1969 data from Organisation for Economic Co-operation and Development. 1971 estimates from National Science Foundation developed to be consistent with earlier OECD data. Employment of scientists and engineers are full-time equivalents.

30. Objectives of government R&D expenditures: Organisation for Economic Co-operation and Development.

31. Trends in patent activity: Unpublished data from the U.S. Patent Office, U.S. Department of Commerce. Comparable charts have been published previously from the Patent Office data.

32. Energy consumption: Statistical Office of the United Nations. For real GNP per capita, see (2) and (17) above.

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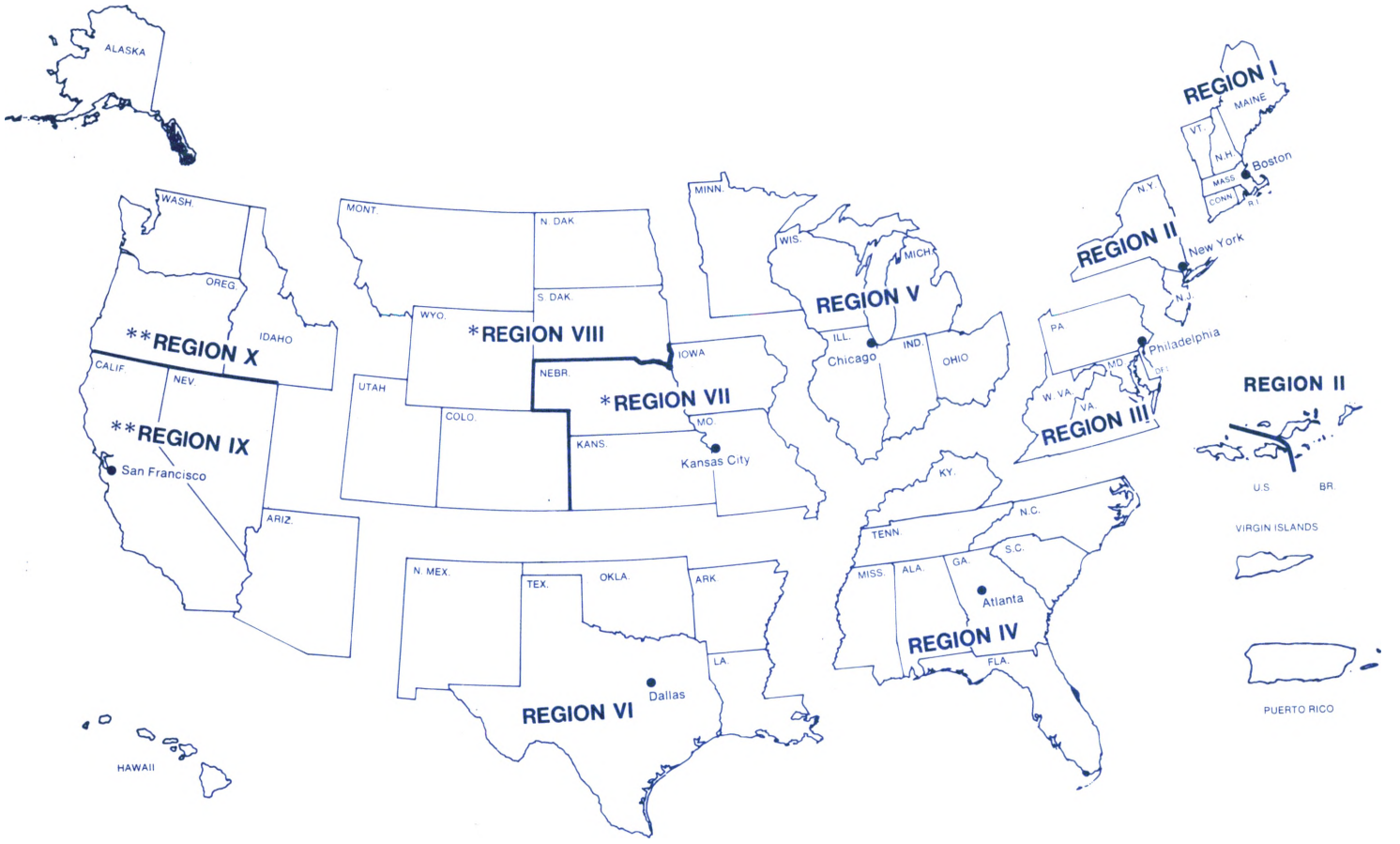

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