study surveyed available estimates, including the foregoing one, and concluded that environmental regulations had accounted for 5 to 15 percent of the slowdown in productivity since the mid-1960s. 6/

Such estimates tend to be limited to the static impact of government regulation and do not include all of the dynamic aspects discussed above. Moreover, the available estimates deal with only certain kinds of regulations, not including the most recent developments. Hence, they probably understate the full impact of the increased scope and extent of government regulations.

Will the impact of government regulations on productivity decrease in the future? Some analysts believe that most of the impact has already been felt. According to this view, increasing the safety standards in the mining industry, for example, can be expected to produce a "once-over" decline in the level of productivity. This should have only a temporary impact on productivity growth unless the standards are continually raised. Similarly, it is argued that once the capital stock has been replaced or retrofitted to reduce pollution, the effects on productivity should diminish. In the aggregate, however, it is not at all clear whether the impact of regulation on productivity growth will become less or greater. For one thing, policymakers have continued to tighten regulations and broaden them to include new areas such as controlling toxic wastes. For another, as mentioned earlier, the standards being applied to new facilities tend to be more stringent than those for existing facilities; thus, it could take years to adjust the capital stock fully to the more stringent standards. Finally, the dynamic impact of regulation--the retardation of investment and innovation--would tend to lower the rate of productivity growth indefinitely. This effect could even intensify over time rather than diminish.

6/ Gregory Christiansen, Frank Gollop, and Robert Haveman, Environmental and Health/Safety Regulations, Productivity Growth, and Economic Performance: An Assessment, Joint Economic Committee, 96:2 (1980), p. 71.

POLICY OPTIONS

The Current Approach: Command and Control

The current approach to government regulation of the private economy relies on what might be called "command and control" techniques. Authority is vested in a centralized agency, which establishes many detailed rules to carry out its mandate. The authorizing legislation generally focuses on one objective, without giving explicit recognition to possible consequences in other areas--such as the market costs of achieving nonmarket objectives.

One cost of the command and control approach is slower productivity growth. In requiring that certain engineering standards or particular technologies be used, it prevents businesses from choosing less costly alternatives. 7/ Moreover, with the regulatory approach there is no incentive to do more than just meet the standard. Another criticism is that current procedures do not give firms an incentive to find new ways of reducing pollution or industrial accidents and in some cases actually discourage such innovations. 8/

Alternative Approaches

Most of the ideas for reducing the negative effects of government regulation on productivity focus either on regulating less or

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7/ An example is the regulation of sulfur dioxide (SO_2) emitted from electric generating plants. Current regulations require that a new plant must install expensive "scrubbers" to reduce the emission of SO_2, since that is the "best available" technology as required by law. But some grades of coal give off less SO_2 than others, and the use of some types of coal could enable the utilities to meet the standard more cheaply. See the discussions in Charles L. Schultze, The Public Use of Private Interest (Brookings Institution, 1977), pp. 46-64; and Advisory Committee on Industrial Innovation, pp. 96-7.

8/ For instance, by calling for "best available technology" current legislation discourages firms from developing better technology because they would then have to meet more stringent standards. See Schultze, The Public Use of Private Interest, p. 53.

on improving the regulatory process. Proposals for improving the process include:

- o Adopting flexible, market-type incentives such as an effluent tax on pollution as a partial substitute for detailed regulations;
- o Applying management tools to government regulation, such as benefit-cost analysis, cost-effectiveness analysis, or a "regulatory budget";
- o Reforming administration so as to reduce duplication and improve the monitoring of regulations;
- o Modifying regulatory legislation to recognize tradeoffs between market and nonmarket objectives.

Market Incentives. Economists have written extensively about the advantages of relying on market incentives to control "externalities" such as pollution. In brief, this approach would increase the cost of producing pollution-intensive goods relative to the costs of producing other goods and services; and it would give businesses a financial incentive to find ways to remove pollution. It would involve such techniques as taxing firms according to the degree of their pollution, or permitting firms to buy and sell limited rights to pollute. 9/

There are, however, some practical difficulties in relying on market incentives to control the unwanted side effects of production. One is that the information requirements may be quite extensive: For example, to tax pollution it would be necessary to measure it by source and to monitor the amount of it by source.

9/ For a discussion of the advantages and disadvantages of alternative approaches to the control of pollution, see, for example, W.J. Baumol and W.E. Oates, Economics, Environmental Policy and the Quality of Life (Prentice-Hall, 1979), chap. 16; and Allen V. Kneese and Charles L. Schultze, Pollution, Prices and Public Policy (Brookings Institution, 1975). The Environmental Protection Agency has been experimenting with market-type incentives. For a discussion, see Environmental Quality, Tenth Annual Report of the Council on Environmental Quality (1979), chap. 12.

This would become less practical where there are many sources of pollution.

A second criticism is that it might be difficult to know how high to set the tax in order to achieve environmental objectives. If it were too high, it might drive away too much industry; if it were too low, it might not be effective. (To meet the latter objection, some have advocated the use of marketable permits that would limit total emissions.)

Third, the tax approach could add to the uncertainty faced by businesses, since they might not know the level of the tax in the future.

Fourth, some critics believe that taxing pollution would do little to discourage it, and might even appear to condone it. Some firms might just "pay the tax" and go on polluting as before.

Management Tools. This approach includes a range of proposals such as the "regulatory budget," cost-effectiveness analysis, and benefit-cost analysis. A regulatory budget would include estimates of the private costs of compliance as well as the federal budget costs of administration. It would set limits to the growth in the estimated cost of federal government regulation. Proponents of the regulatory budget also believe that it would force policymakers to weigh alternative regulatory objectives--in short, to apply budgeting techniques and budget discipline to regulations.

A criticism of the regulatory budget is that policymakers might find it inherently difficult or infeasible to measure the private-sector costs of regulation. For one thing, firms would have an incentive to exaggerate the costs, and there might be no good way of checking accuracy. 10/

Cost-effectiveness analysis involves estimating the costs of alternative ways of reaching the same goal and choosing the least costly approach. The principles of a cost-effectiveness approach to regulation are perhaps best illustrated by an example from the

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10/ For discussions of the regulatory budget, see U.S. Department of Commerce, Regulatory Reform Seminar: Proceedings and Background Papers (1978); and John H. Young, "Mechanisms for Linking Regulatory and Economic Policy" (Office of Technology Assessment 1980; processed).

area of occupational health and safety. OSHA (the Labor Department agency responsible for administering the Occupational Safety and Health Act of 1970) proposed specific engineering standards for meeting noise standards. According to one study, the same goal might have been achieved at much less cost if OSHA had permitted personal protective devices (such as ear plugs) instead of requiring engineering standards. Moreover, cost-effectiveness might have been greater if different noise standards had been applied to different industries, because the cost of reducing noise levels varies greatly among industries. 11/

Benefit-cost analysis, applied to government regulation, weighs the present (discounted) value of the estimated economic benefits and costs of a regulation. If the benefit-cost ratio for a particular regulation is less than one, the economic benefits alone do not justify its costs (although there may be other, non-economic justifications). One criticism of benefit-cost analysis is that some of the benefits, such as health or saving lives, cannot or should not be costed out in this way.

Administrative Reform. Currently, no government agency coordinates the manifold activities of different regulatory agencies. Some people believe that a mechanism is needed for considering the combined impact of numerous regulations of different agencies on a particular industry. 12/ The Carter Administration took several steps to monitor the regulatory process and to reduce the burden of government regulations on the private sector. These include Executive Order No. 1274 to reduce paperwork and the establishment of a Regulatory Analysis Review Group (RARG), chaired by the Council of Economic Advisers. 13/

11/ John F. Morrall III, "Exposure to Occupational Noise," in James C. Miller III and Bruce Yandle, eds., Benefit-Cost Analyses of Social Regulation (American Enterprise Institute, 1979), pp. 33-58.

12/ This could involve an "industrial policy" approach to regulation and other aspects of government influence on private industry. The industrial-policy approach is discussed in Chapter VIII of this report.

13/ For a discussion of the effectiveness of RARG, see Christopher C. DeMuth, "Constraining Regulatory Costs," Parts I and II, Regulation (January-February and March-April 1980).

An attempt to introduce more flexibility into the regulatory process is EPA's use of the "bubble concept." Under this policy, a firm is allowed to balance an increase in pollution from one source against a decline from another source within the same plant. This approach, however, may have heavier information requirements than the more detailed approach. 14/

Modifying Legislation. To alter the current procedures of regulation substantially would require modifying the underlying legislation. This might include a more explicit recognition of important economic tradeoffs. Such tradeoffs between market and nonmarket objectives are already being made implicitly by regulatory agencies. An explicit recognition of the need for them in the underlying legislation might lead to regulatory decisions more in accord with the intentions of the Congress.

14/ For a discussion of the "bubble concept," see Environmental Quality, pp. 678-79.

CHAPTER VII. ENERGY AND PRODUCTIVITY GROWTH

The availability and price of energy are other important factors affecting productivity growth. The dramatic increases in energy prices during the 1970s played a significant role in the productivity slowdown, although their exact or quantitative importance is hotly disputed by economists. The implications for policy are not clear. No policy can fundamentally change the likelihood of long-run increases in the real cost of energy. The relationships among energy, the environment, and productivity involve difficult tradeoffs. Policies that reduce the use of energy are likely to have negative effects on productivity, while policies that increase the supply of energy may be destructive of the environment. Other policies might be considered as well: a clearly delineated energy policy to hold uncertainty to a minimum, and effective stabilization policies to offset the depressing effect of energy price shocks.

THE IMPACT OF HIGHER ENERGY COSTS ON LABOR PRODUCTIVITY

Throughout much of the post-World War II period, the price of energy relative to other goods in the U.S. economy was stable or slightly falling; this contributed to the rapid growth of productivity. But the era of cheap energy came to a sudden end in the early 1970s. After declining an average of 1.4 percent a year from 1960 to 1970, the relative price of energy increased approximately 9 percent annually during the 1970s (see Table 32). Of course, the price of imported crude oil rose much more rapidly than energy prices in general. In addition, the U.S. economy was now dependent on unstable sources of foreign oil.

An increase in the cost of energy adversely affects labor productivity through several channels:

- Depresses the demand for goods and services generally;
- Causes businesses to substitute labor for more expensive energy;

TABLE 32. ENERGY TRENDS IN THE UNITED STATES, 1960 TO 1970 AND 1970 TO 1979 (Percent change per year)

	1960-1970	1970-1979
Relative Price of Energy a/	-1.4	8.9
Relative Price of Imported Crude Oil b/	-2.3	16.8
Oil Consumption	4.0	2.5
Oil Imports	6.5	9.3
Cost of Oil Imports	6.6	37.5

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Energy, Energy Information Administration; U.S. Department of Commerce, Bureau of Economic Analysis; Data Resources, Incorporated; Central Intelligence Agency, National Foreign Assessment Center.

a/ Producers Price Index for fuels and related products and power, deflated by the implicit price deflator for domestic business output.

b/ Price of imported oil, deflated by the implicit price deflator for business output.

- Shifts the pattern of demands toward services, which have more limited potential for productivity growth, and away from goods, transportation, and power generation;
- Outmodes part of the capital stock because it is not energy efficient;
- Adds to uncertainty about future economic conditions;
- Produces chronic inflationary pressures that call for restrictive monetary and fiscal policies;

- Reduces growth in real incomes, stimulating labor force growth; and

- Shifts the focus of investment and innovation toward energy efficiency rather than labor efficiency. 1/

Much of the impact on the productivity growth rate is believed to be temporary, associated with the structural changes in the economy brought about by higher energy costs, and productivity growth can be expected to recover partially after these adjustments are completed. But some of the effects on productivity may be gradual and require an extended period to work themselves out. The obsolescence of capital due to higher energy prices, and the channeling of relatively more investment and innovation into achieving energy efficiency rather than labor efficiency, might have such longer-run effects. These adjustments are necessary because of changes in the relative prices of labor, capital, and energy.

Analysts agree that an increase in energy prices tends to retard labor productivity growth, but they disagree as to the size of the effect or the precise channels of causation. At one end of the spectrum, some analysts believe that the increase in energy prices may have reduced productivity growth as little as 0.1 or 0.2 percentage point between 1972 and 1976. 2/ At the other end, some believe that it accounted for at least 0.7 percentage point of the

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1/ For a more detailed discussion of the relationship between energy costs and productivity, see J.M. Griffin and P.R. Gregory, "An Intercountry Translog Model of Energy Substitution Responses," American Economic Review, vol. 66 (December 1976), pp. 845-57; and Edward A. Hudson and Dale W. Jorgenson, "Energy Prices and the U.S. Economy, 1972-1976," DRI Review (September 1978), pp. 1.24-1.37.

2/ See, for example, George Perry, "Potential Output: Recent Issues and Present Trends," in Center for the Study of American Business, U.S. Productive Capacity: Estimating the Utilization Gap, Working Paper 23 (1977), pp. 6-13; and Edward F. Denison, Accounting for Slower Economic Growth (Brookings Institution, 1979), p. 142.

slowdown in productivity growth. 3/ The larger estimates tend to include both direct and indirect effects such as the depressing effect on aggregate demand and investment, and the shift in the composition of demand toward services.

Circumstantial evidence suggests that higher energy prices may have played quite an important role in the productivity slowdown during the 1970s. Productivity growth slowed substantially in practically every industrialized country after 1973 (see Table 33). This suggests that if energy was not a direct cause of the slowdown, it may have contributed to a set of conditions that, taken together, had a severe impact on productivity.

TABLE 33. ANNUAL GROWTH IN GROSS DOMESTIC PRODUCT PER EMPLOYED WORKER IN LEADING INDUSTRIAL COUNTRIES, 1965-1979 (Percent change per year)

Country	1965-1973	1973-1979 a/
United States	1.6	0.3
Belgium	4.3	2.7
Canada	2.4	0.4
France	4.5	2.9
Germany	4.3	3.1
Italy	5.8	1.7
Japan	9.1	3.4
Netherlands	4.6	2.6
United Kingdom	3.4	1.1

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, unpublished data.

a/ 1979 data are preliminary.

3/ See, for example, Hudson and Jorgenson, "Energy Prices and the U.S. Economy, 1972-1976;" and John A. Tatom, "The Productivity Problem," Federal Reserve Bank of St. Louis Review, vol. 61, no. 9 (September 1979), pp. 3-16.

Some have suggested that, if higher energy prices were the major factor responsible for slower productivity growth, the slowdown in the United States would have been less than in most other industrial countries that import a larger share of their energy. But this overlooks two facts: First, energy consumption per unit of gross domestic product is higher in the United States than in most other countries (see Table 34). Second, most industrialized countries other than the United States and Canada had already adjusted their economies to a regime of expensive energy--through such means as high excise taxes on gasoline. The United States, on the other hand, had maintained a policy of cheap energy in the post-World War II period. For those reasons, the adjustments to higher energy prices may have been even more severe in the United States than in other countries. 4/

ENERGY POLICIES AND PRODUCTIVITY GROWTH

Government policies cannot fundamentally change the likelihood of long-run increases in the real cost of energy, and these rising costs can be expected to slow down future productivity growth. Policymakers will be faced with some very difficult and uncertain choices: between conserving energy at the expense of higher productivity, or increasing the supply of energy at some cost to the environment.

Tradeoffs Between Energy Use and Other Objectives

Policies to conserve energy may be directed at two main classes of energy users: consumers and businesses. In general, policies that reduce the use of energy by businesses tend to retard productivity growth. Policies that reduce energy used by consumers

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4/ The impact of higher energy prices on per capita real income in a country would, however, be importantly affected by the share of energy that was domestically produced. Moreover, some argue that the adverse impact on living standards might be greater in a country that already had high energy prices because "all the easy adjustments had been made."

TABLE 34. COMPARISON OF ENERGY USED PER UNIT OF GROSS DOMESTIC PRODUCT IN LEADING INDUSTRIAL COUNTRIES, 1972

Country	Index (U.S. = 100)
United States	100
Canada	120
France	54
Germany	70
Italy	62
Japan	57
Netherlands	86
Sweden	72
United Kingdom	76

SOURCE: Sam H. Schurr and others, Energy in America's Future: The Choices Before Us (Johns Hopkins University Press, 1979), p. 102.

do not have such a direct, adverse effect on productivity. 5/ If energy conservation policies were applied to both businesses and consumers, they would tend to lower labor productivity. But they might in the long run increase real income in the United States. The reason for this seeming paradox is that the United States buys so much oil on world markets that a reduction in its oil purchases might have a substantial effect in lowering the world price of oil. Also, by purchasing less oil, the exchange value of the

5/ There may, of course, be indirect or transitional effects. A higher gasoline tax, for example, would tend to reduce the demand for automobiles, which are produced by a high-productivity industry.

dollar might increase, thus improving the terms of international trade. 6/

Policies designed to increase the production of energy tend to conflict at many points with goals of maintaining or improving the environment. Notable examples are the expanded use of atomic energy and coal as alternatives to petroleum. 7/ The United States has an abundant supply of coal, but burning coal releases more sulfur dioxide, a pollutant, into the air. Similarly, nuclear energy could be rapidly expanded, but the accident at Three Mile Island has forcefully raised questions in the public mind as to the safety of nuclear power plants. Moreover, government regulations in some situations add to construction costs or prevent utilities from choosing the most economical fuel (see Chapter VI).

Reducing Uncertainty About Energy Policies

Some believe that uncertainty over the future course of energy policy served to retard investment and innovation during much of the 1970s. Before deciding what kind of plant to build and where to build it, a firm frequently needs to estimate the future energy situation and, therefore, future energy policies. For example, price controls on oil may have reduced the near-term uncertainty about the energy situation, but added to uncertainty about the more distant future.

6/ See William D. Nordhaus, "Policy Responses to the Productivity Slowdown," in The Decline in Productivity Growth, Conference Series No. 22 (Federal Reserve Bank of Boston, June 1980), pp. 166-69.

7/ For recent discussions of alternative energy policies see, for example, Energy: The Next Twenty Years (Ballinger, 1979); Sam H. Schurr and others, Energy in America's Future: The Choices Before Us (Johns Hopkins University Press, 1979); Robert Stobaugh and Daniel Yergin, eds., Energy Future (Random House, 1979); and Nuclear Power Issues and Choices, Report of the Nuclear Energy Policy Study Group sponsored by the Ford Foundation (Ballinger, 1977).

Effective Stabilization Policies

A stable economy encourages productivity growth. Rapid escalations in energy prices, such as those occurring in 1973-1974 and 1979, tend to cause recessions. They also cause worldwide imbalances that can impair the flow of international trade.

An effective stabilization policy is difficult to define in a broad context, but the implications for productivity are clear. A recession or severe economic slack tends to slow productivity growth through numerous channels. On the other hand, if an initial inflationary shock is permitted full play, it may lead to even higher rates of inflation, and inflation itself tends to undermine some of the sources of productivity growth, especially in conjunction with the federal income tax system. 8/

8/ The effects of energy-related price shocks on the U.S. economy and the world economy have been discussed in several reports by the Congressional Budget Office. See, for example, Recovery: How Fast and How Far? (1975), chap. V; President Carter's Energy Proposals: A Perspective (1977), chap. IX; and The World Oil Market in the 1980s: Implications for the United States (1980), chap. VI.

CHAPTER VIII. INDUSTRIAL POLICIES TO INCREASE PRODUCTIVITY

The search for ways to stimulate productivity growth in the United States has fostered a growing interest in an "industrial policy" approach. Although a precise and agreed-upon definition of this term has not emerged, it frequently is used to mean measures that would spur the movement of resources into industries where productivity is high, as well as measures designed to improve the international competitiveness of specific industries. Industrial policies thus differ from policies that attempt to raise productivity throughout the economy by increasing the quantity and quality of productive resources.

Industrial policies have been employed in other countries such as Japan, France, West Germany, and the United Kingdom. In the United States, decisions regarding the allocation of resources among industries have traditionally been left to private enterprise, and a plan for restructuring industry would represent a major change in approach.

This chapter examines the differences in productivity among U.S. industries. It also contains a brief survey of experience with industrial policies in other countries, and a discussion of some issues related to the selection of an industrial policy strategy.

PRODUCTIVITY AND EMPLOYMENT IN DIFFERENT INDUSTRIES

Industries vary considerably in levels of productivity and rates of productivity growth. Movements of labor among industries can affect the growth of aggregate productivity because of these differences. When labor moves from low-productivity to high-productivity industries, aggregate productivity rises, even if everything else remains the same. On the other hand, when employment shifts from slow-productivity-growth to fast-productivity-growth industries, aggregate productivity can fall if the level of productivity is below average in the fast-productivity-growth industries. It is important, therefore, to distinguish between productivity level and productivity growth. Industries characterized by high rates of productivity growth are not necessarily those with above-average levels of productivity.

Interindustry Differences in the Growth of Productivity

Aggregate productivity growth in the private business sector (excluding government enterprises) declined from an average 3.3 percent in the 1949-1965 period to 1.2 percent in the 1974-1978 period (see Table 35). Productivity growth slowed in all major industries except communications. The slowdown was especially pronounced in mining, construction, utilities, and wholesale trade. During the 1974-1978 period, mining, construction, and wholesale trade experienced negative average rates of productivity growth.

A number of special factors have been cited as partial explanations for the recent productivity slowdown in various industries. 1/ In agriculture, the decline may largely reflect the impact of the corn blight and the removal of acreage controls. Higher energy costs and oil and gas shortages undoubtedly are responsible for some of the slowdown in mining, transportation, and utilities. Various health, safety, and environmental regulations also are thought to have reduced productivity growth in mining and utilities.

In construction, however, there is no discernible cause for most of the productivity decline. 2/ Nor is there any apparent reason why productivity in wholesale trade has fallen. In the case

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1/ Reasons for slower productivity growth in particular industries are discussed by Lester C. Thurow, "The U.S. Productivity Problem," The DRI U.S. Review (August 1979), Section 1, pp. 14-19; J.R. Norsworthy, Michael J. Harper, and Kent Kunze, "The Slowdown in Productivity Growth: An Analysis of Some Contributing Factors," in Brookings Papers on Economic Activity (1979:2), pp. 387-421; Council on Wage and Price Stability, Productivity: A Report Submitted to the Congress (July 23, 1979); and H. Kemble Stokes, Jr., An Examination of the Productivity Decline in the Construction Industry, U.S. Department of Commerce (March 1979).

2/ Estimates of productivity in construction are relatively unreliable because, to a significant extent, output is measured as the deflated costs of labor and material inputs. The use of labor inputs to measure output in services and in finance, insurance, and real estate also results in questionable estimates of productivity in these sectors.

TABLE 35. RATES OF PRODUCTIVITY GROWTH AND STANDARDIZED LEVELS OF VALUE ADDED PER WORKER HOUR, BY INDUSTRIAL SECTOR

Industrial Sector	Average of Annual Productivity Growth Rates (percent)			Standardized Value Added Per Worker Hour a/ (average = 1.00)		
	1949-1965	1966-1973	1974-1978	1948-1965	1966-1973	1974-1978
Agriculture, Forestry, and Fisheries	5.0	3.7	2.1	0.46	0.58	0.60
Mining	4.3	1.9	-4.8	1.78	1.98	1.51
Construction	3.4	-2.1	-1.0	1.16	0.99	0.77
Nondurable Goods Manufacturing	3.3	3.3	2.4	0.91	0.94	1.02
Durable Goods Manufacturing	2.8	2.2	1.2	1.06	1.02	1.03
Transportation	3.1	2.9	0.8	1.06	1.09	1.11
Communications	5.4	4.6	7.2	1.32	1.73	2.29
Electric, Gas, and Sanitary Services	6.4	3.5	0.8	2.07	2.65	2.69
Wholesale Trade	3.1	3.4	-0.5	1.25	1.30	1.24
Retail Trade	2.7	2.1	1.1	0.66	0.63	0.63
Finance, Insurance, and Real Estate	2.0	0.2	1.8	3.68	3.02	2.90
Services	1.2	1.7	0.3	0.80	0.65	0.63
Total	3.3	2.2	1.2	1.00	1.00	1.00

SOURCE: Congressional Budget Office calculations based on data from the U.S. Department of Commerce and the U.S. Department of Labor, Bureau of Labor Statistics.

a/ Standardized value added per worker hour is the level of gross product per worker hour originating in a particular industry divided by the average level for all industries. A value greater (less) than 1.00 is above (below) average.

of finance-insurance-real estate, failure to take full account of factors such as quality changes in output resulting from the technological impact of electronic data processing may explain some of the deceleration. Within the service sector, interindustry shifts appear to be responsible for a major part of measured productivity change. It is likely that the extension of retail trade store hours for the convenience of customers has reduced productivity growth in that industry.

In the case of manufacturing, the productivity slowdown between 1966-1973 and 1974-1978 is dominated by the impact of the 1974-1975 recession. In 1974, productivity declined by 5.5 percent in durable goods manufacturing and by 3.7 percent in nondurable goods manufacturing. When the 1974 productivity declines are excluded from the 1974-1978 calculations, the rate of productivity growth in manufacturing shows practically no decline relative to the 1966-1973 period.

Interindustry Differences in the Level of Productivity

For comparison with productivity growth rates, standardized levels of productivity also are presented in Table 35. Each entry is the level of productivity in an industry divided by the average level for all industries. A value greater (less) than one indicates that the level of productivity in that industry is above (below) average.

In general, industries that were below (above) average in the 1948-1965 period were also below (above) average in the 1974-1978 period. The industries with the highest productivity levels during the 1974-1978 period were finance-insurance-real estate, utilities, and communications. Except for utilities, these industries had an above-average productivity growth rate for the 1974-1978 period. The four industries with below-average productivity levels in the 1974-1978 period were agriculture, construction, retail trade, and services. Productivity growth was above average in agriculture, but below average in retail trade, construction, and services.

Although the level of productivity in manufacturing was roughly equal to the average for all industries during the 1974-1978 period, productivity varied considerably within manufacturing (see Table 36). For example, value added per hour worked was especially low in the textile, apparel, furniture, and leather industries, but high in the tobacco, petroleum and coal, and motor

TABLE 36. RATES OF PRODUCTIVITY GROWTH AND STANDARDIZED LEVELS OF VALUE ADDED PER WORKER HOUR IN MANUFACTURING INDUSTRIES

Industry	Average of Annual Productivity Growth Rates (percent)			Standardized Value Added Per Worker Hour a/ (average = 1.00)		
	1949-1965	1966-1973	1974-1978	1948-1965	1966-1973	1974-1978
Food and Kindred Products	3.0	3.1	3.8	1.00	1.03	1.09
Tobacco	3.2	4.3	5.4	3.30	3.65	4.42
Textile Mill Products	5.1	2.5	4.6	0.45	0.58	0.62
Apparel and Other Textile Products	1.9	4.4	3.0	0.55	0.51	0.58
Lumber and Wood Products	4.3	2.0	1.9	0.68	0.86	0.88
Furniture and Fixtures	2.0	1.6	1.2	0.74	0.63	0.62
Paper and Allied Products	2.6	4.9	0.5	1.03	0.98	1.04
Printing and Publishing	1.9	1.3	0.6	1.11	0.97	0.89
Chemicals and Allied Products	4.8	4.6	0.6	1.09	1.34	1.37
Petroleum and Coal Products	5.3	3.1	1.6	2.15	2.77	2.71
Rubber Products	2.6	2.5	1.0	0.97	0.94	0.91
Leather and Leather Products	1.2	1.9	2.0	0.61	0.53	0.56
Stone, Glass, and Clay Products	2.6	1.5	1.5	1.10	0.97	0.92
Primary Metals	1.7	1.1	-2.6	1.57	1.26	1.08
Fabricated Metals	2.3	1.7	0.9	1.00	0.92	0.85
Machinery, Except Electrical	1.9	2.1	0.2	1.20	1.05	0.98
Electrical Equipment and Supplies	4.7	4.2	2.1	0.74	0.94	0.99
Motor Vehicles	5.0	3.2	6.0	1.43	1.64	1.85
Transportation Equipment, Except Motor Vehicles	3.0	1.6	-2.2	1.07	1.05	0.87
Instruments and Related Products	3.4	2.5	0.4	0.96	0.99	0.94
Miscellaneous Manufacturing Industries	2.6	4.0	4.3	0.72	0.73	0.78
Total	3.0	2.6	1.7	1.00	1.00	1.00

SOURCE: Congressional Budget Office calculations based on data from the Department of Commerce and the Bureau of Labor Statistics.

a/ Standardized value added per worker hour is the level of gross product per worker hour originating in a particular industry divided by the average level for all industries. A value greater (less) than 1.00 is above (below) average.

vehicles industries. In terms of productivity growth, six manufacturing industries experienced average annual gains in excess of 3 percent, and eight industries had average productivity gains of less than 1 percent during the 1974-1978 period.

Changes in the Industrial Distribution of Hours Worked

Since 1948, the major shifts in hours worked have occurred primarily in low-productivity industries (see Table 37). The share of hours worked has decreased substantially in agriculture and risen substantially in services. Except for finance, insurance, and real estate, there has been relatively little increase in the share of hours worked in the high-productivity industries.

The proportion of hours worked in manufacturing declined from 29.0 percent in 1948-1965 to 27.0 percent in 1974-1978. Within manufacturing, the largest changes in the share of hours worked have been declines in the food, textile, apparel, lumber, leather, primary metals, and transportation equipment industries; and increases in the chemicals, rubber and plastics, fabricated metals, machinery, electrical equipment, and instruments industries (see Table 38).

The contributions to aggregate productivity growth from interindustry shifts of labor are shown in Tables 39 and 40. For the private business sector, the net effect of these shifts has been positive, but has declined over time as the positive gains from movements of labor out of agriculture as well as into finance-insurance-real estate have diminished, and as the negative impacts of a growing service sector have increased. Overall, industrial shifting of employment accounted for 0.474 percentage point of the average productivity growth realized in the 1949-1965 period, 0.301 percentage point in the 1966-1973 period, and 0.151 percentage point in the 1974-1978 period.

Within manufacturing, the shifting of labor among industries produced small net impacts on productivity growth during the 1948-1965 and 1966-1973 periods, as the positive impact of declining shares of labor in the textile, apparel, lumber, and leather industries were offset by less than average growth in hours worked in above-average productivity industries such as tobacco, petroleum and coal, and primary metals. In the 1974-1978 period, the significant positive contribution of 0.203 percentage points per year primarily reflected movement of labor out of textiles and

TABLE 37. AVERAGES OF ANNUAL RATES OF GROWTH IN HOURS WORKED AND DISTRIBUTION OF HOURS WORKED, BY INDUSTRIAL SECTOR

Industry	Average of Annual Growth Rates (percent)			Percentage Distribution		
	1949-1965	1966-1973	1974-1978	1948-1965	1966-1973	1974-1978
Agriculture, Forestry, and Fisheries	-3.8	-2.4	-0.4	12.2	6.3	5.6
Mining	-2.2	0.1	6.8	1.4	1.0	1.2
Construction	1.2	2.5	1.7	6.0	6.5	6.5
Nondurable Goods Manufacturing	0.4	0.6	-0.1	12.6	12.2	11.0
Durable Goods Manufacturing	1.6	1.4	0.7	16.4	17.4	16.0
Transportation	-1.0	0.8	0.9	5.0	4.4	4.1
Communications	1.2	3.6	1.0	1.3	1.5	1.6
Electric, Gas, and Sanitary Services	0.9	2.0	0.9	1.0	1.0	1.0
Wholesale Trade	1.5	2.4	3.1	5.3	6.0	6.7
Retail Trade	0.8	1.6	1.3	18.2	18.1	18.1
Finance, Insurance, and Real Estate	2.8	3.6	3.0	4.2	5.4	6.1
Services	2.3	2.7	3.1	16.3	20.2	22.1
Total	0.5	1.6	1.6	100.0	100.0	100.0

SOURCE: Congressional Budget Office calculations based on data from the Bureau of Labor Statistics.

TABLE 38. AVERAGE OF ANNUAL RATES OF GROWTH IN HOURS WORKED AND DISTRIBUTION OF HOURS WORKED IN MANUFACTURING INDUSTRIES

Industry	Average of Annual Growth Rates (percent)			Percentage Distribution		
	1949-1965	1966-1973	1974-1978	1948-1965	1966-1973	1974-1978
Food and Kindred Products	-0.2	-0.6	-0.3	11.0	9.2	8.8
Tobacco	-0.7	-1.4	-3.3	0.6	0.4	0.3
Textile Mill Products	-1.5	1.0	-2.7	6.4	5.3	4.8
Apparel and Other Textile Products	0.9	0.2	-0.9	6.9	6.6	6.3
Lumber and Wood Products	-1.1	1.4	-0.1	4.5	3.8	3.7
Furniture and Fixtures	1.6	2.0	0.0	2.2	2.4	2.4
Paper and Allied Products	1.8	0.9	-0.2	3.5	3.7	3.6
Printing and Publishing	1.8	1.3	1.1	5.0	5.3	5.6
Chemicals and Allied Products	2.0	1.4	1.9	4.6	5.1	5.4
Petroleum and Coal Products	-1.1	0.4	3.0	1.3	0.9	1.0
Rubber Products	3.2	4.4	1.2	2.3	3.2	3.6
Leather and Leather Products	-0.6	-2.4	-2.9	2.1	1.6	1.3
Stone, Glass, and Clay Products	1.0	1.1	-0.1	3.6	3.5	3.5
Primary Metals	0.8	0.1	-0.9	7.1	6.4	6.2
Fabricated Metals	1.9	2.0	-0.1	7.5	8.2	8.1
Machinery, Except Electrical	2.0	2.3	2.0	9.1	10.3	11.4
Electrical Equipment and Supplies	3.4	2.4	0.6	7.6	9.3	9.4
Motor Vehicles	1.9	1.7	1.0	4.7	4.5	4.7
Transportation Equipment, Except Motor Vehicles	6.0	-0.9	1.1	5.5	5.5	4.7
Instruments and Related Products	3.3	2.9	3.0	2.2	2.7	3.0
Miscellaneous Manufacturing Industries	0.1	0.3	0.2	2.4	2.2	2.2
Total	1.1	1.1	0.3	100.0	100.0	100.0

SOURCE: Congressional Budget Office calculations based on Bureau of Labor Statistics data.