THE PRODUCTIVITY SLOWDOWN: CAUSES AND POLICY RESPONSES

Staff Memorandum

(Background for Statement of
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Subcommittee on Oversight and Investigations,
House Committee on Energy and Commerce)

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CONTENTS

CHAPTER I. INTRODUCTION

Many Americans feel that the U.S. economy performed dismally during the 1970s and that the outlook for the future is not much better. This perception derives from a number of factors. Basic industries, such as automobiles, steel, and rubber, are viewed as inefficient and unable to compete with European and Japanese producers. The United States is thought to be losing its competitive edge in the export of high technology items, a field in which it has traditionally maintained a comparative advantage. It is also felt that national output and income have not increased as fast as inflation and, consequently, the standard of living has declined.

In order to correct these major economic problems, a number of observers want to develop a new industrial policy to stimulate the economy. Some advocate large overall incentives for investment and capital expansion, while others argue for targeting subsidies on selective export industries, similar to the policy presently being followed by the Japanese. Before developing any new industrial policy, however, it is critical to define the economic problem and analyze its causes.

This background memorandum summarizes preliminary CBO analysis on questions surrounding industrial policy. It first defines the problem as declining productivity over the decade of the 1970s, particularly the 1973-1980 period. 1/ It then investigates some of the causes of the productivity slowdown and discusses the outlook for the 1980s. The slowdown appears to be caused by major shifts in relative prices from, for example, oil price shocks, inflation, and regulation. While there are some reasons for optimism regarding an improvement in productivity during the 1980s without the application of specific policies, federal policies could enhance that improvement by helping to stabilize prices, reduce uncertainty for investors and industrial planners, and, perhaps, stimulate capital investment.

1/ A related CBO study emphasizing policies to increase labor productivity is The Productivity Problem: Alternatives for Action, January 1981.

CHAPTER II. DEFINING THE PROBLEM—A PRODUCTIVITY PERSPECTIVE

Little agreement exists about what problems industrial policies ought to address. Dramatic declines in specific industries, increasing competition from abroad, and slowing productivity growth have all been suggested as the proper focus for industrial policies. Before any specific policies can be evaluated in a coherent manner, a closer understanding of the problems they are meant to solve must be developed.

This chapter broadly defines the goal of industrial policies to be facilitating improvements in the productivity of the economy generally. The first section of the chapter examines the overall performance of the economy in providing goods and services during the 1970s, while the second section looks more closely at the role of the much discussed productivity slowdown.

U.S. ECONOMIC PERFORMANCE IN THE 1970s

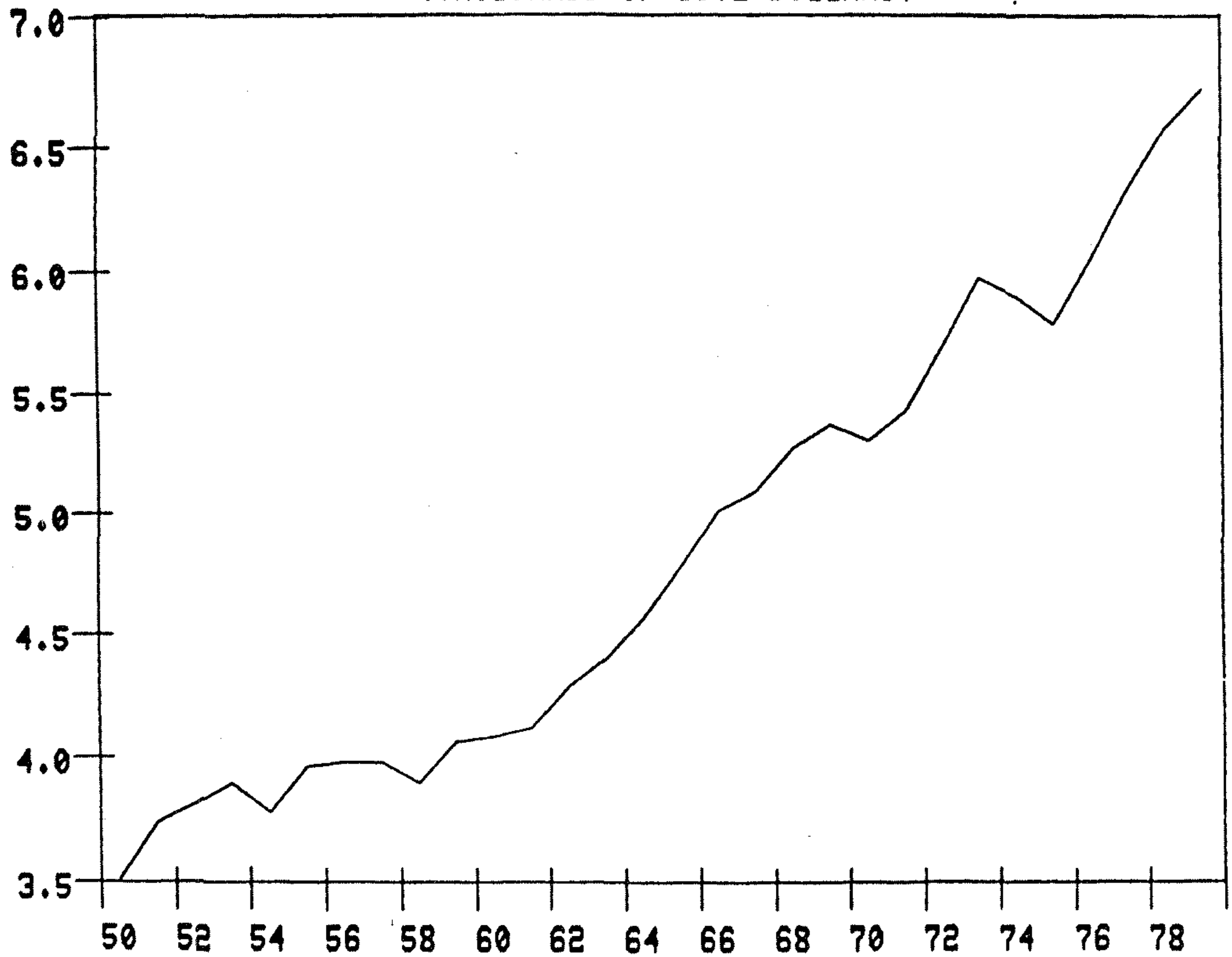
Figure 1 shows real Gross National Product (GNP) per capita for the United States since 1950. 1/ Real GNP per capita is a standard, if incomplete, measure of the economic "standard of living" of a nation. While it does not include many important aspects of the quality of life, such as the benefits gained from nontraded goods and services (for example, work done within the home or outside the law) or noneconomic matters generally, real GNP per capita may be an appropriate measure of the contribution of industry to the economic standard of living.

As can be seen in Figure 1, real GNP per capita grew significantly in the 1970s, from $5,299 per person in 1970 to $6,723 in 1979 (in 1972 dollars). The average growth rate of 2.7 percent a year between 1970 and 1979 was, however, less than the 3.1 percent average in the 1960s, but larger than the average annual growth of 2.3 percent since 1948. One notable aspect of the behavior of this indicator was the significant drop that occured in 1973-1975. While growth over the decade has been sizable, the drop experienced

1/ U.S. Department of Commerce, Bureau of Economic Analysis. Data shows Gross National Product in 1972 dollars, per person, with population defined as total population, including Armed Forces.

FIGURE 1.

REAL GNP PER CAPITA
(THOUSANDS OF 1972 DOLLARS)



SOURCE: U. S. Department of Commerce, Bureau of Economic Analysis (See Appendix Table A-1).

in conjunction with the 1973-1975 recession was of unprecedented absolute magnitude in the postwar period.

International comparisons of output per capita are difficult to make. Varying methods of data collection, definition, and valuation make most comparisons suspect. Available data indicate, however, that the U.S. level of real Gross Domestic Product (GDP) 2/ per capita remains substantially higher than those of its major trading partners (see Figure 2). In 1979, the U.S. level was 46, 24, and 71 percent higher than those of Japan, West Germany, and Great Britain, respectively.

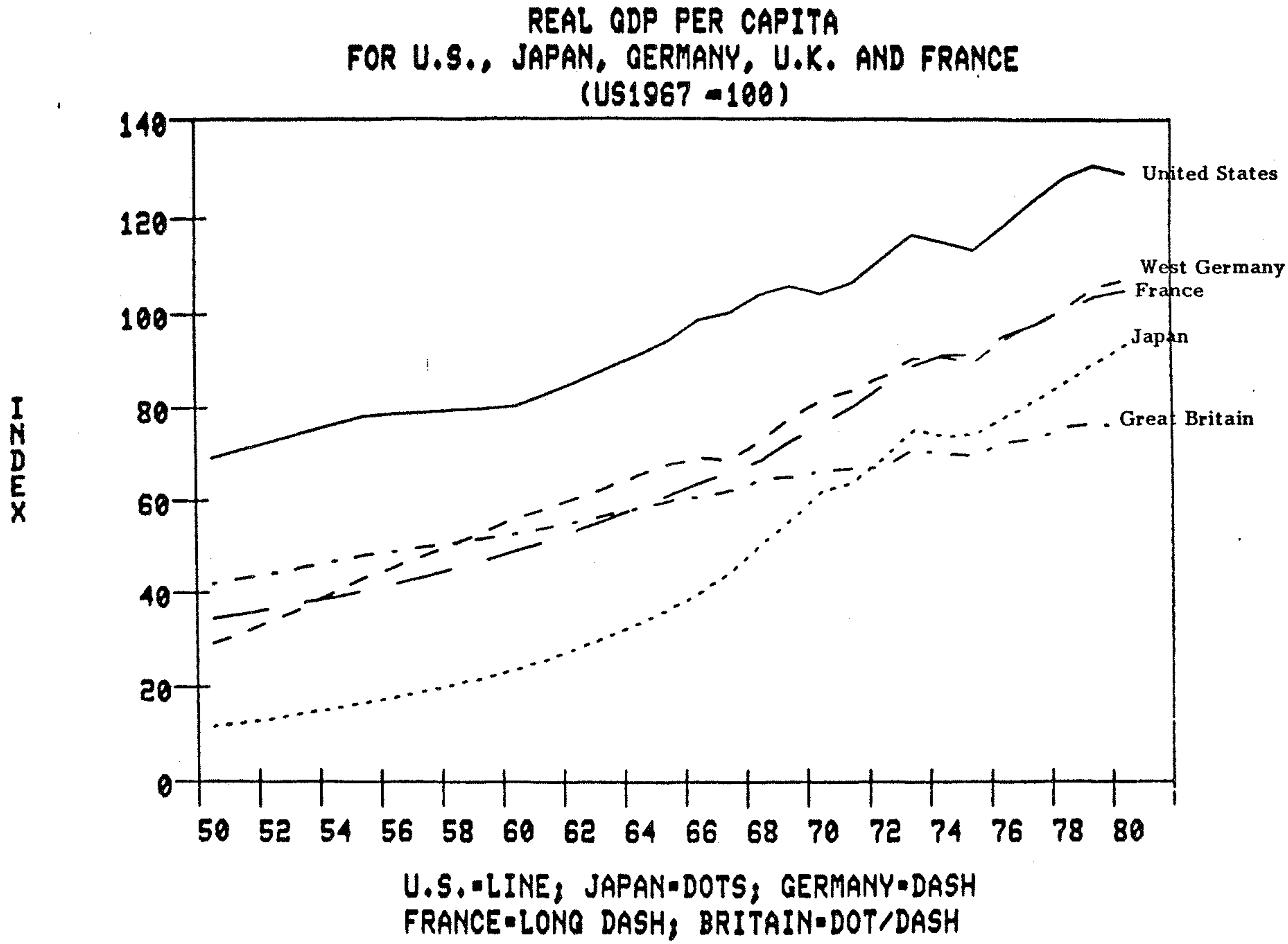
While the U.S. levels are high, other countries have been growing at a faster rate. Indeed, the average annual growth rate of real GDP per capita in the U.S. was second from the bottom of all the countries surveyed in both the 1960s and the 1970s. 3/ The slowing of the growth rate in the 1970s compared to the 1960s was a wide-spread phenomenon; all of the countries shown in Figure 2 grew at a slower rate in the 1970s than in the 1960s. All showed significant slowdowns between 1973-1975 as well.

While the particular rate of growth of output per person is caused by many complicated factors, all of these determinants work in one of two ways: they change either the amount of inputs into the production process per person, or they change the efficiency with which those inputs are used. Production can be seen as the process of combining inputs to produce valued outputs. Increases in the amount of output that can be produced from a given set of inputs can be seen as an increase in the productive efficiency of the process.

2/ U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, unpublished data, May 1981. The GDP is a national income concept based on production within the geographic borders of a country; GNP covers production by and income to citizens of the country regardless of where they may live. The two measures generally track closely. The data are compared on the basis of international price weights.

3/ Only Great Britain was lower. It is important to remember that the same absolute increase will show up as a larger percentage increase for a country starting from a lower base level. For example, real GDP per capita went up by roughly the same absolute amount in Japan and the United States during the 1960s, but the Japanese growth rate was 10 percent per year, while the U.S.'s was only 3 percent.

FIGURE 2.



SOURCE: U.S. Department of Labor, Bureau of Labor Statistics (See Appendix Table A-2).

Thus, increases in output per person result from either working more or working more efficiently. Improving productive efficency--whether through the introduction of a new machine or simply a change in process with existing technology--frequently involves significant transition costs for displaced workers and producers. Such changes, however, result in a permanent gain in the amount produced for the amount put into the process, and thus are a central source of long-term increases in the standard of living.

Much of the past increases in real GNP per capita can be explained by increased inputs per capita, particularly in the 1970s. When the postwar baby boom and increasing numbers of women entered the work force, the number of workers relative to the total population increased significantly (see Figure 3). While only 38.0 percent of the population was employed in 1965, this figure had risen to 44.9 percent by 1979. 4/ These increases automatically increased the level of output per capita. The resulting gains were not increases in productive efficiency, however; they simply represent the product of more work. To determine whether or not the productive efficiency of the economy is growing or declining, it is necessary to examine measures of aggregate productivity.

MEASURES OF AGGREGATE EFFICIENCY

Labor Productivity

The most common measure of the aggregate productivity of the economy is labor productivity, or output per man hour. Output is usually defined as the gross domestic product of the private business sector, while the labor input is measured by the paid hours of those employed in private business, including paid vacation, holidays, and sick leave. U.S. labor productivity can be compared both by its growth rate and with productivity levels in other countries.

Using this measure, productivity growth rates have been declining in the United States in recent years, after reaching an historical peak in the twenty years immediately following World War II (see Table 1). In

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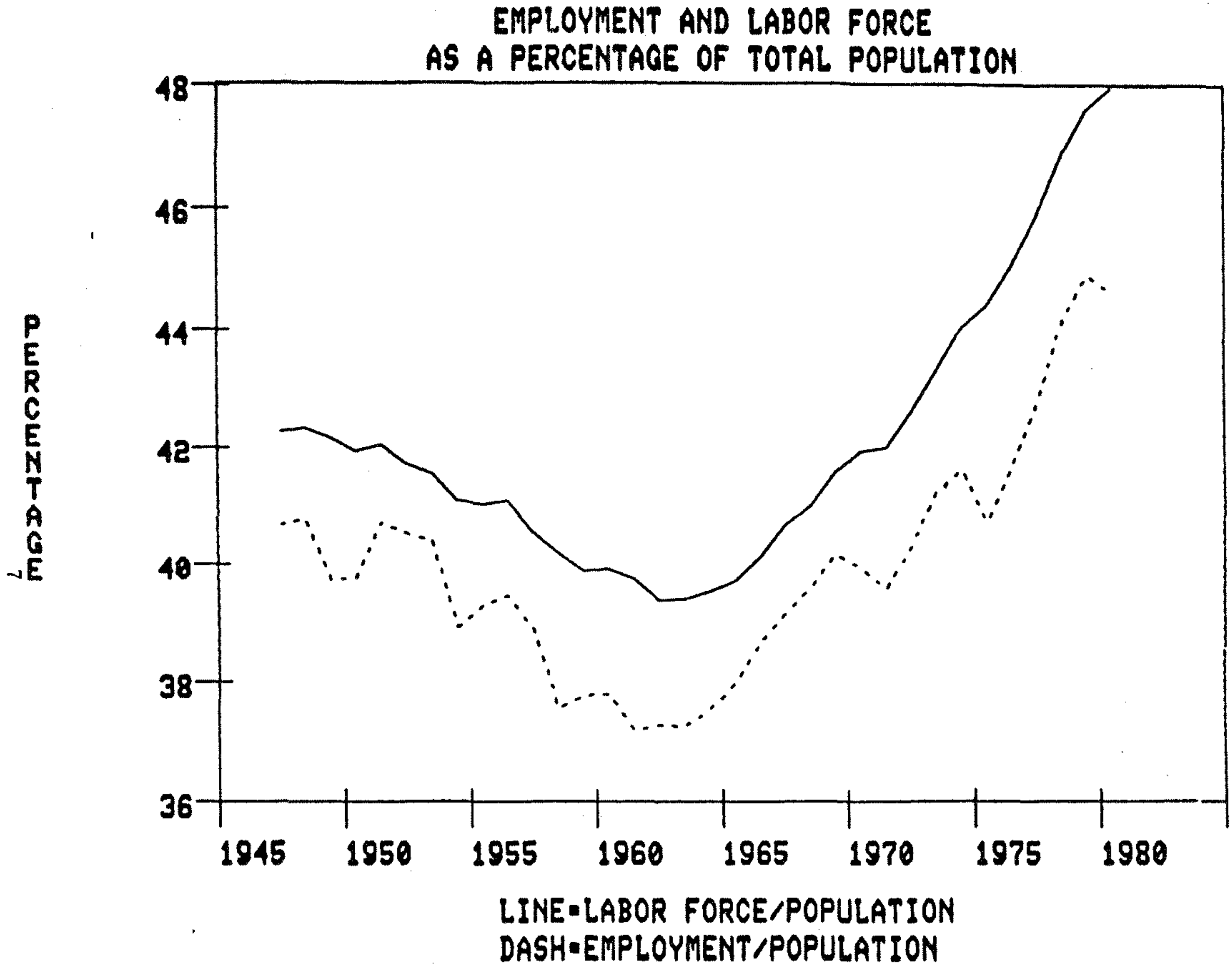
4/ U.S. Department of Commerce, Bureau of the Census and U.S. Department of Labor, Bureau of Labor Statistics. Population is defined as all persons, including Armed Forces; employment as total civilian employment, plus Armed Forces; and labor force as total civilian labor force, plus Armed Forces.

FIGURE 3.



SOURCES: Department of Commerce, Bureau of the Census and Department of Labor, Bureau of Labor Statistics (See Appendix Table A-3).

TABLE 1. AVERAGE ANNUAL RATE OF GROWTH IN LABOR PRODUCTIVITY IN THE PRIVATE BUSINESS SECTOR, PEAK QUARTERS FOR SELECTED PERIODS a/ (In percents)

Period	Growth in Peak Quarter
1948:IV-1953:II	3.83
1953:II-1957:III	2.21
1957:III-1960:I	3.50
1960:I-1969:III	2.75
1969:III-1973:IV	2.74
1973:IV-1980:I	0.64

a/ The quarters chosen were all peak quarters in the business cycle, as defined by the National Bureau of Economic Research. For data, see Appendix Table A-4.

conjunction with the 1973-1975 downturn and again in 1979 and 1980, the level of output per hour dropped, turning the growth rates negative. 5/

Most other industrialized countries have experienced similar declines in their rates of labor productivity growth. 6/ While Japan's output per man hour grew at an average annual rate of over 9 percent a year between 1960 and 1973, it grew at less than 4.0 percent a year from 1973 to 1978.

5/ U.S. Department of Labor, Bureau of Labor Statistics. For data, see Appendix Table A-4.

6/ John W. Kendrick, Sources of Growth in Real Product and Productivity in Eight Countries, New York Stock Exchange, Office of Economic Research, as cited in U.S. Economic Performance in a Global Perspective, New York Stock Exchange (February 1981), pp. 18-19.

Germany's growth rate was more steady, yet still fell from an average annual rate of 5.8 percent between 1960 and 1973 to 4.2 percent between 1973 and 1978.

U.S. levels of output per hour still appear to be higher than those of all of the country's major trading partners. According to the Bureau of Labor Statistics, in 1980 the output per employed person in Japan was 68 percent of that for the United States, while Germany's was 89 percent, Great Britain's 61 percent, and Canada's 92 percent. 7/

Labor productivity may, however, be a misleading measure of productive efficiency, particularly in times of dramatic changes in the relative prices of basic inputs into the production process. The efficiency of the production process is the efficiency with which it uses all inputs, not simply current labor hours. Thus, if a firm's labor factor productivity sky-rocketed, but its capital and energy factor productivity dropped correspondingly, no net improvement in efficiency would necessarily result—that is, no more could be got out for what was put into the process. The same is true in the aggregate: increases in labor productivity do not always result in improvements in the total efficiency of U.S. production. In other words, the problem with labor productivity is that a substitution of capital for labor hours will always result in an improvement in labor productivity, but only sometimes in a true gain in productive efficiency.

This becomes particularly important in times of changes in the relative costs of basic inputs. When energy prices rose, for example, it might have become less expensive to produce some things using more labor and less capital. If the real cost of capital rose compared to labor, a similar substitution towards labor might prove efficient. Finally, the dramatic increase in the size of the labor force could have resulted in the comparative price of labor falling.

If such changes made it more efficient to substitute labor for other inputs, the measured decline in labor productivity might not represent a true decline in productive efficiency. In order to determine whether or not such a decline has occurred, it is necessary to consider a broader measure of productive efficiency.

7/ U.S. Department of Labor, Bureau of Labor Statistics, unpublished data, May 1981.

Total Factor Productivity

Total Factor Productivity (TFP) measures, also known as multi-input productivity ratios, attempt to measure changes in output per unit input, regardless of whether that input is labor or capital. In other words, by combining various partial productivity ratios, TFP measures attempt to avoid the problem of mistaking substitutions between inputs for changes in efficiency per se.

TFP measures are subject to large problems in measurement, both practical and theoretical. 8/ Nearly all attempts to measure aggregate TFP, however, have shown similar results for the economy since 1966—a declining growth rate. Figure 4 presents the American Productivity Center's estimates of TFP for the private domestic business economy since 1948. 9/

As can be seen, the total factor productivity growth in the 1970s was slower and more erratic than in the 1960s. It was also well below the longer-term rates of growth. According to these estimates, the U.S. growth rate between 1966 and 1980 was 0.9 percent a year, as opposed to a 1948-1966 average of nearly triple that, 2.6 percent a year. Table 2 shows the average annual rates of change between business cycle peaks since 1948. The decline appears to have begun in the late 1960s and accelerated during the early 1970s.

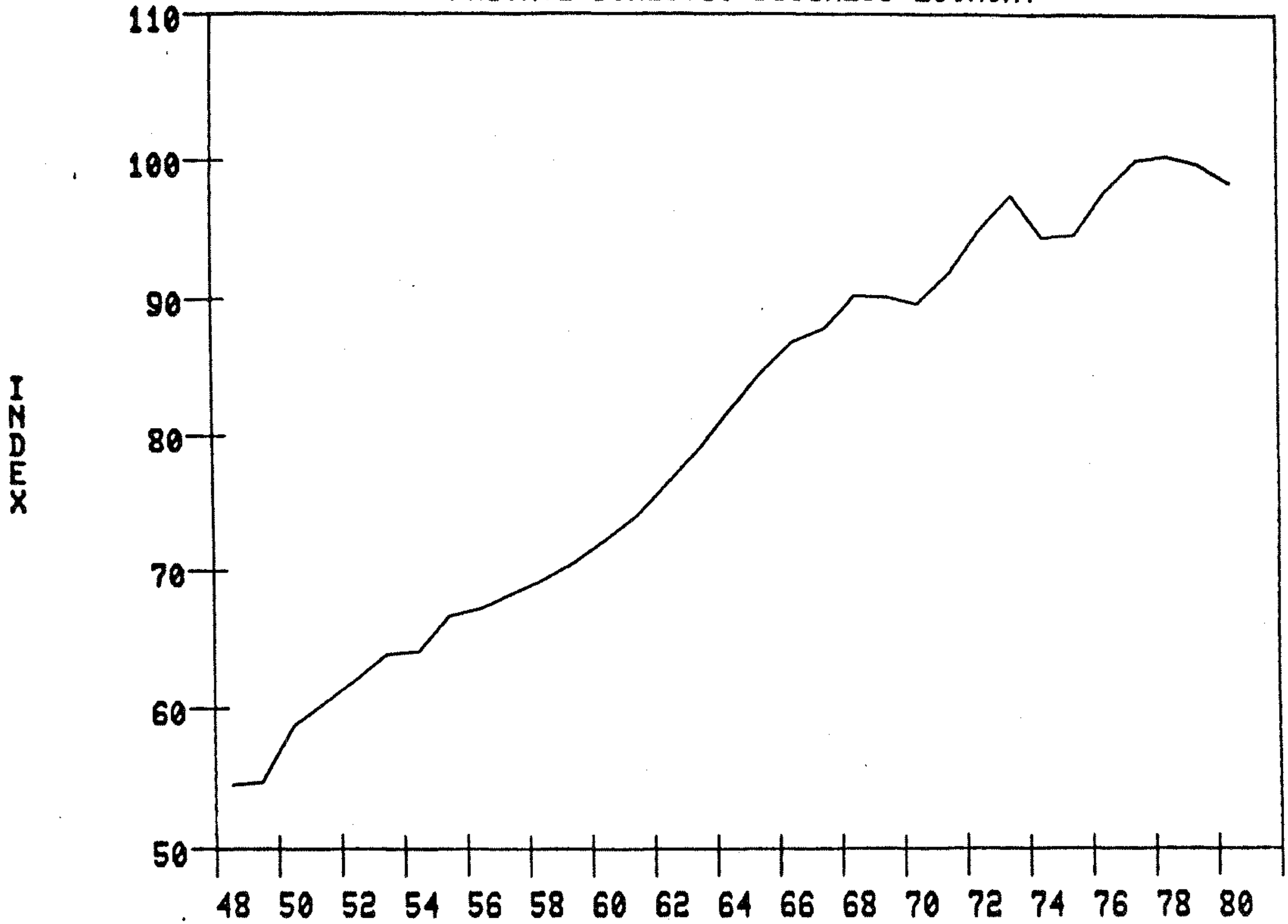
The total private domestic business economy can be divided into three sectors: manufacturing, farming, and all else—nonfarm, nonmanufacturing. Figure 5 shows the total factor productivity measures for each of these sectors. Manufacturing appears to have behaved more erratically than the overall indicator shown in Figure 4. This, in large part, reflects the greater cyclicality of manufacturing productivity. The improvements in nonfarm, nonmanufacturing appear to have slowed to minimal levels after 1966, while farming did not slow until 1970.

8/ For more thorough discussions of the theory and measurement of total factor productivity, see National Academy of Sciences, National Research Council Panel to Review Productivity Statistics, Measurement and Interpretation of Productivity (1979); and M. Ishaq Nadiri, "Some Approaches to the Theory and Measurement of Total Factor Productivity," Journal of Economic Literature (December 1970).

9/ American Productivity Center, Houston, Texas, 1981.

FIGURE 4.

TOTAL FACTOR PRODUCTIVITY
PRIVATE DOMESTIC BUSINESS ECONOMY



SOURCE: American Productivity Center, Houston, Texas (See Appendix Table A-5).

TABLE 2. AVERAGE ANNUAL RATE OF GROWTH IN TOTAL FACTOR PRODUCTIVITY IN THE PRIVATE BUSINESS SECTOR, PEAK QUARTERS FOR SELECTED PERIODS a/ (In percents)

Period	Growth in Peak Quarter
1948:IV-1953:II	3.40
1953:II-1957:III	1.44
1957:III-1960:I	2.94
1960:I-1969:III	2.19
1969:III-1973:IV	1.81
1973:IV-1980:I	0.39

a/ The quarters chosen were all peak quarters in the business cycle, as defined by the National Bureau of Economic Research. For data, see Appendix Table A-4.

This U.S. drop in productivity growth in the past decade has been mirrored throughout the industrialized world, although to varying degrees. Recent estimates suggest that, between the periods 1960-1973 and 1973-1979, Japan's total factor productivity growth rate dropped from 6.1 percent to 1.3 percent, Germany's from 3.2 percent to 1.9 percent, and Britain's from 2.1 to -0.3 percent while the U.S. rate dropped from 2.1 to 0.6 percent. 10/

Thus, total factor productivity increases are the source of all improvement in the standard of living that result from efficiency gains. While changes in the production process--be they the result of technological innovation, improved allocation of resources, or economies of scale--may involve difficult social adjustments, the improved economic standard of

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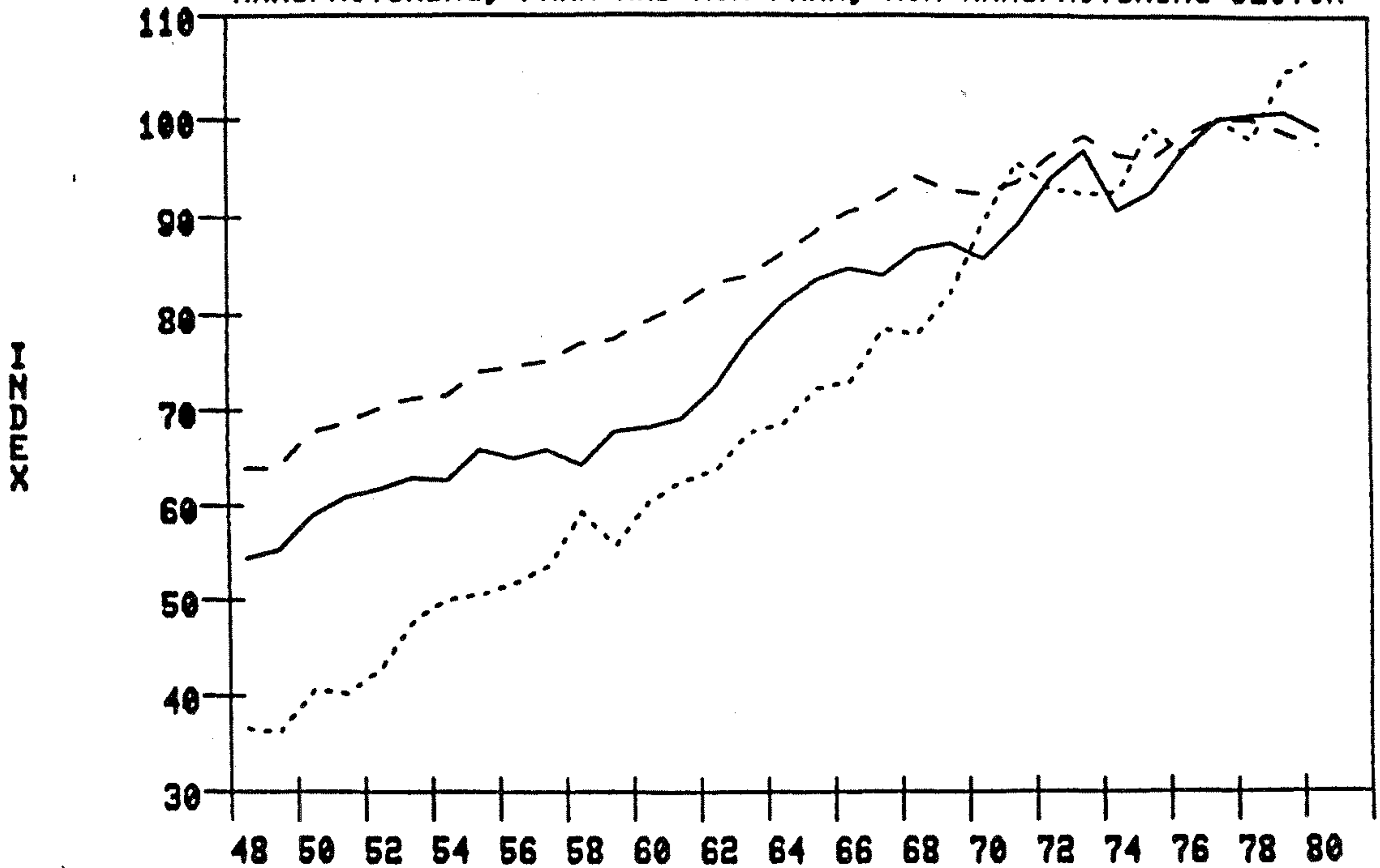
10/ Kendrick, Sources of Growth in U.S. Economic Performance in a Global Perspective, p. 19.

TOTAL FACTOR PRODUCTIVITY
MANUFACTURING, FARM AND NON-FARM, NON-MANUFACTURING SECTOR



LINE=MANUFACTURING SECTOR
SHORT DASH=FARM SECTOR
LONG DASH=NON-FARM, NON-MANUFACTURING SECTOR

SOURCE: American Productivity Center, Houston, Texas (See Appendix Table A-5).

living now enjoyed in the United States is in large part a result of such process changes. Thus, the broadest and most encompassing goal of any industrial policy must be to facilitate such an increase in productive efficiency. From this viewpoint, the decline in efficiency growth during the 1970s is "the problem" on which industrial policies should focus.

CHAPTER III. CAUSES OF THE U.S. PRODUCTIVITY SLOWDOWN

To achieve productivity growth, output must increase faster than inputs--that is, efficiency must increase. Because economic efficiency is an important determinant of the welfare of a nation, the slowing in U.S. productivity growth is a matter of serious concern. This chapter offers an explanation for the slowdown: extraordinary changes in relative prices, increasing regulation, and rising inflation diminished the fruitfulness of existing production methods and retarded the adoption of new technologies.

PRODUCTIVITY GROWTH: HOW IT HAPPENS, WHY IT SLOWS

Productivity growth arises from improvements in production processes. For a process change to succeed in increasing efficiency, a new method to conduct a production process with fewer inputs must be recognized, the change must be implemented, and the expected improvement realized. If productivity growth slows down, it is logical to look for causes in factors that might have reduced the generation of new ideas, the rate of implementation of these ideas, or their realization. Many analysts, including some who have testified before this Subcommittee, have cited diminished spending for research and development and a slower pace of technological change as reasons for the productivity slowdown. This paper, however, for reasons that will become clear, emphasizes the importance of the realization of productivity improvements and the vital role of predictable relative prices in achieving these realizations. Large changes in relative prices not only reduce the likelihood of success of new innovations, but also reduce productivity growth by diminishing the efficiency of existing processes.

Firms usually attempt to maximize profits. To do so, they must find the most efficient, cost-minimizing method of producing. The selection of the cost-minimizing production method requires assumptions about the future prices of inputs, output, and the level of demand. Once the firm selects a process, the freedom to switch to another process is restricted somewhat because specialized capital equipment—equipment useful in one process but less useful in another—is frequently required. Capital inputs are sometimes described in this context as having the consistency of putty-clay. Before the production method is selected, capital can be shaped into any form, like putty. After the investment is put in place, its form can be modified only at a substantial cost, as if it were hardened clay.

Several examples may provide a glimpse of a few of the connections between relative price stability and productivity.

Changes in Input Prices. Suppose an industry has adopted least-cost production methods that are highly energy intensive, and, quite unexpectedly, energy prices quadruple. The cost of production using this method will increase sharply which will cause the profit-maximizing level of output to decline. Therefore, the specialized capital goods will be used less intensively than planned for maximum efficiency. Productivity (as measured by the ratio of outputs to inputs) will also decline because output has fallen while at least one input--capital goods--has not changed.

Changes in Output Prices. Suppose that because of an increase in foreign production of a good, the price of the domestically produced good falls relative to the cost of production. The profit-maximizing level of output for domestic firms will fall. Thus, the specialized capital equipment will be used less intensively than planned and productivity will decline.

Changes in Waste Disposal Costs. Suppose that, because of the depletion of clean air and water, large fines are suddenly imposed on those who discharge waste products into the air or waterways. If the fines are sufficiently high, it will pay firms to devote resources to alternative methods of waste disposal. The diversion of inputs from production to waste disposal will reduce output, and lower productivity.

These examples are intended to provide, in a highly simplified way, a notion of some of the means by which sharp changes in relative prices can reduce productivity growth by frustrating the realization of business plans. With these in mind, consider now the magnitude and diversity of actual changes in relative prices in recent years.

RELATIVE PRICE CHANGES IN THE 1970s

The 1970s were times of extraordinary movement in the prices of some goods and services, especially oil. During 1973-1974, following decades of declining real costs, oil prices quadrupled. In 1979-1980, they doubled again.

A sharp reduction in the price of labor relative to machinery, equipment, and fuels also occurred. From 1955 to 1972, labor compensation per hour in the nonfarm business sector increased 121 percent. Over the same period, prices for machinery and fuels increased 53 percent and 26 percent, respectively. Thus the cost of labor was increasing relative to machinery and fuels. From 1972 to 1980, however, labor cost, restrained by a surge in labor supply, rose only 78 percent, or slightly less than the increase in the price of machinery and equipment (81 percent). Both lagged significantly behind the 244 percent jump in fuel prices. Compared to energy, labor became cheaper.

Unexpected changes in relative prices are harmful to productivity in at least three ways. First, as explained above by example, changes in input and output prices tend to reduce the utilization rate of specialized capital goods below the designed, maximum efficiency rate. In time, production processes will be modified to accommodate the new prices, but meanwhile, because of the inflexible or clay-like properties of the capital stock, productivity will fall. Second, relative price changes cause shifts in the composition of demand and create mismatches between demand and productive capacity. Higher gasoline prices, for example, increased the demand for small, fuel efficient cars and reduced the demand for large vehicles with low gas mileage. Increases in the production of some goods above planned levels and reductions in the output of others below planned production often result in declines in efficiency and productivity again because of lags in the adjustment of production processes. Third, if entrepreneurs believe that the future structure of relative prices has become more difficult to foresee, they will attach greater uncertainty to the projected benefits from innovation. Heightened uncertainty restrains investment in new methods and creates a preference for short-lived assets whose value is less exposed to loss from future relative price changes, but which may be less efficient than long-lived assets.

Much of the experience of recent years is consistent with this view of the relationship between relative price stability and productivity. First, the timing of the productivity slowdown coincided with a two-step increase in the dispersion of relative prices. As shown in Figure 6, the relationship between prices seems to have become less stable and more unpredictable during 1966-1973. As shown by the standard deviation of price change (see Figure 7), 1973-1980 appears to be a period of even greater price instability. As detailed in Chapter II, productivity growth slowed in 1966-1973 and declined further in 1973-1980.

Second, the substitution of relatively less expensive inputs for more costly ones has been gradually taking place. Since 1973, energy input per dollar of real GNP has decreased about 20 percent. The average annual rate of growth in electricity consumption has slowed from 9.1 percent in 1966-1973 to 3.7 percent in 1973-1979. In 1973, compact cars accounted for 43 percent of auto sales in the United States; by 1980 the small car share was above 60 percent. Moreover, as discussed in Chapter II, growth in the use of labor accelerated sharply after 1966. These substitutions involve departures from the input mix assumed when the capital stock was put in place and, hence, have tended to reduce efficiency.

FIGURE 6

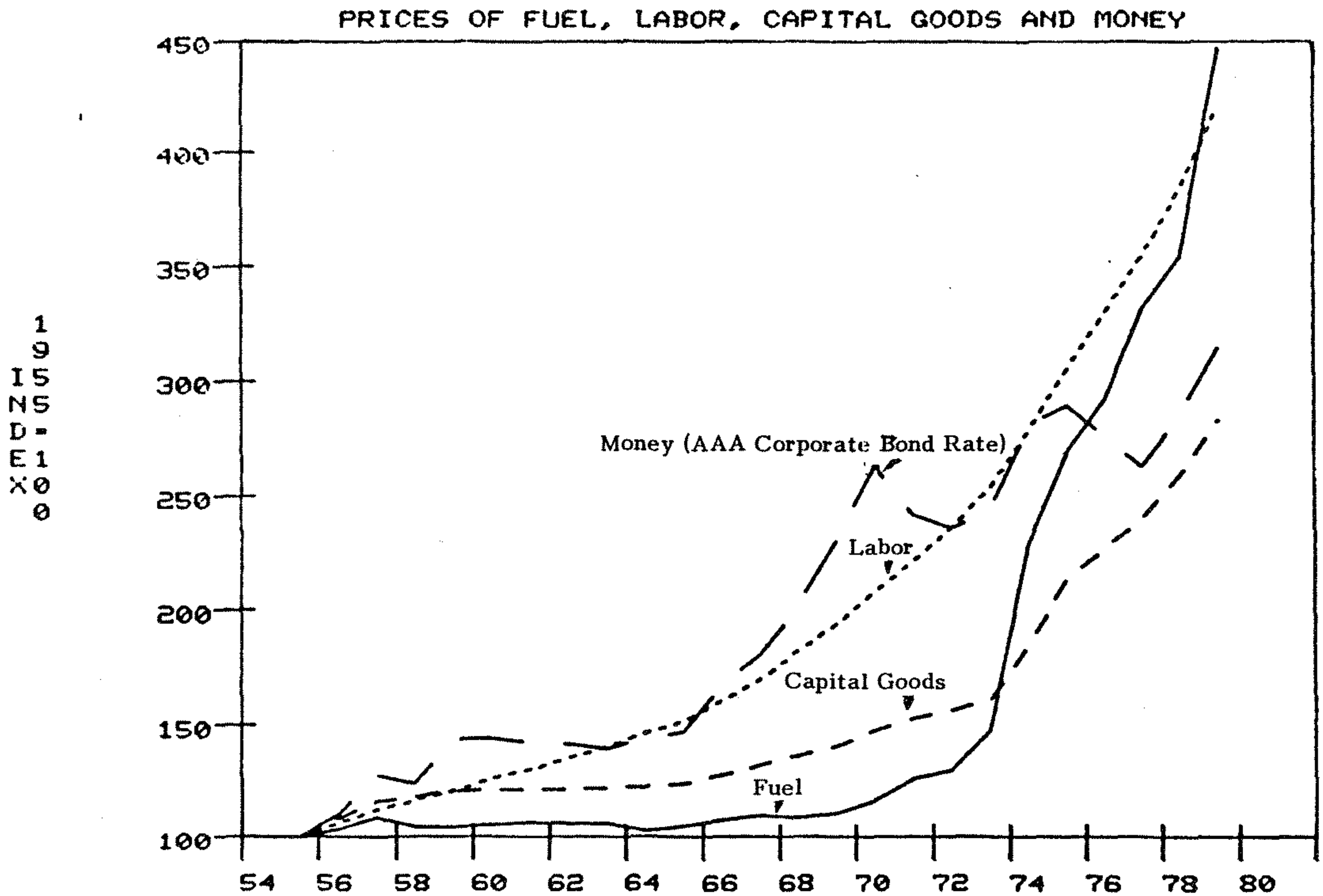
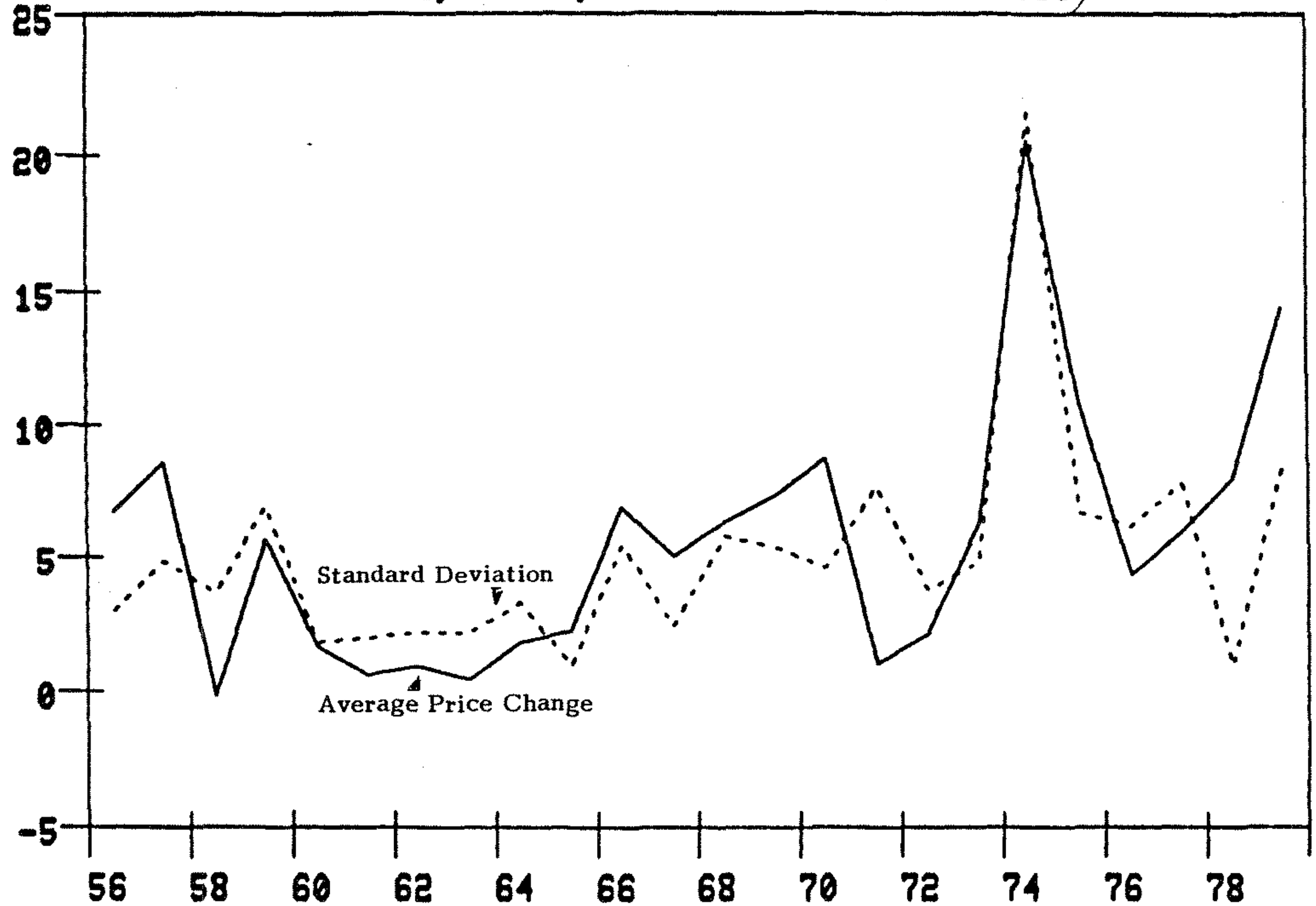

PRICES OF FUEL, LABOR, CAPITAL GOODS AND MONEY
INDEX 1955=100
450
400
350
300
250
200
150
100
54
56
58
60
62
64
66
68
70
72
74
76
78
80
Money (AAA Corporate Bond Rate)
Labor
Capital Goods
Fuel

FIGURE 7

AVERAGE PRICE CHANGE AND STANDARD DEVIATIONS
FOR FOUR PRICE INDICES
(FUEL, LABOR, MONEY AND CAPITAL GOODS)



Third, a moderation in overall investment and a shift toward investment in shorter-lived capital assets has been evident in recent years. For example, the rate of growth in business fixed investment (in 1972 dollars) has slowed from an annual rate of 5.9 percent for 1955-1966 to 4.6 percent for 1966-1973 to 3.8 percent for 1973-1980. Further, from the early 1960s to the late 1970s, the proportion of nonresidential fixed investment made up of equipment (as opposed to longer-lived structures) rose from approximately 56 percent to approximately 70 percent. 1/

CHANGES IN REGULATION AND PRODUCTIVITY GROWTH

The effect of a new, unanticipated regulation that impinges on a productive process is very similar to that of a relative price change. When a production method was conceived and implemented, it might, for example, have been recognized that the process consumed substantial quantities of clean air or water or exposed workers to health and safety risks. However, clean air and water and might have been so plentiful and enough workers might have been willing to accept on-the-job risk to render the process both privately and socially efficient.

As time passed, however, clean air and water became scarcer through depletion, as also happened to oil. Social decisions were made to restrict the amount of on-the-job risk that a worker can assume. The depletion of oil was signaled by higher oil prices. The depletion of clean air and water and the preference for worker safety were signaled by regulations and restrictions enforced by fines and other penalties. A process that was cost minimizing when waste disposal had a price to the firm of zero may not be efficient or profitable when substantial costs must be incurred to restrict the emission of wastes. The cost of production and price will increase, and the output demanded will decline, reducing productivity. The firm will try to substitute other inputs for the now scarcer and more costly air and water. Over time, the firm will change its production process and acquire a less polluting capital stock, if means can be found to operate profitably under the regulatory restraint. Otherwise, production will be terminated.

1/ Joint Committee on Taxation, Analysis of Proposals for Depreciation and Investment Tax Credit Revisions, Part I, Overview, (May 6, 1981) p. 17.

There is a difference, however, between the welfare effects of regulation and market changes in relative prices. The difference arises from the mismeasurement of the value of nontraded output. Dirty air and water are economic "bads." Getting rid of them are economic "goods" and ought to be counted in output. Yet, conventional productivity measures do not pick up the increase in output of such nontraded goods. The imposition of binding regulation, like an increase in the relative price of oil, not only will reduce productivity but also will introduce a downward bias into measures of productivity, because of the failure to count all output.

The 1969-1972 period was one of intense regulatory proliferation in the United States, with new legislation concerning air emissions, discharges into waterways, noise pollution, and occupational safety. The industries most severely affected—mining, paper, chemicals, refining, and primary metals—have suffered the sharpest decelerations in productivity growth since 1973. 2/ In mining, for example, productivity declined at an annual average rate of 3.2 percent per year during 1973-1978, after growing at an annual rate of 2.8 percent during 1948-1965 and at 1.6 percent during 1965-1973. 3/

Some regulations, especially those concerning air pollution, retard productivity growth through the bias against new sources of pollution. That is, more stringent rules are imposed on new plants or substantial modifications of old ones than on existing facilities. The purpose is to minimize the impact of regulation on existing processes, jobs, and the value of capital. The policy may succeed on this score, but it also provides an incentive for firms to extend the life of older, more technologically-primitive facilities.

INFLATION

Inflation slows down the technological advance of an economy because it tends to reduce investment and to roll back and reverse previously

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2/ Robert W. Crandall, "Regulation and Productivity Growth," The Decline in Productivity Growth, Federal Reserve Bank of Boston, (June 1980), pp. 93-111.

3/ Jack Beebe and Jane Haltmaier, "An Intersectoral Analysis of the Secular Productivity Slowdown," Economic Review, Federal Reserve Bank of San Francisco, (Fall 1980), pp. 7-28.

successful innovation. It does so in at least four ways: by adding instability to the relative price structure, by raising the cost of capital, by triggering more restrictive macroeconomic policies, and, in conjunction with the tax system, by distorting the composition of investment.

Inflation and Relative Prices

A strong positive relationship exists between inflation and relative price changes. 4/ Beginning around 1966, when the present inflationary trend began and well before the oil and agricultural price shocks of the 1970s, the relationship between individual prices became less stable and more unpredictable. During inflation, all prices do not rise at the same rate. The relationship between prices--that is, relative prices--will thus fluctuate over time. One reason this occurs is that prices have differing degrees of short-run flexibility; prices that are set according to long-term contracts must increase in step like fashion, while other prices can be changed more frequently without substantial cost (gasoline at the pump, for example). At higher rates of inflation, the dispersion of prices increases. This association is apparent from Figures 6 to 8. Such frequent changes in the relative price structure may frustrate business plans as effectively as the relative price shocks discussed above.

Inflation and the Cost of Financing Investment

Market interest rates increase with inflation. If, with stable prices, an interest rate is 5 percent per year, then a 10 percent inflation rate will tend to increase the interest rate to 15 percent (5 percent real interest and 10 percent compensation to the lender for purchasing power loss). Over the long periods for which bonds are issued, the outlook for inflation will be clouded by uncertainty. With a stable price regime, this uncertainty is reflected partly in higher interest rates for long-term bonds than for short-

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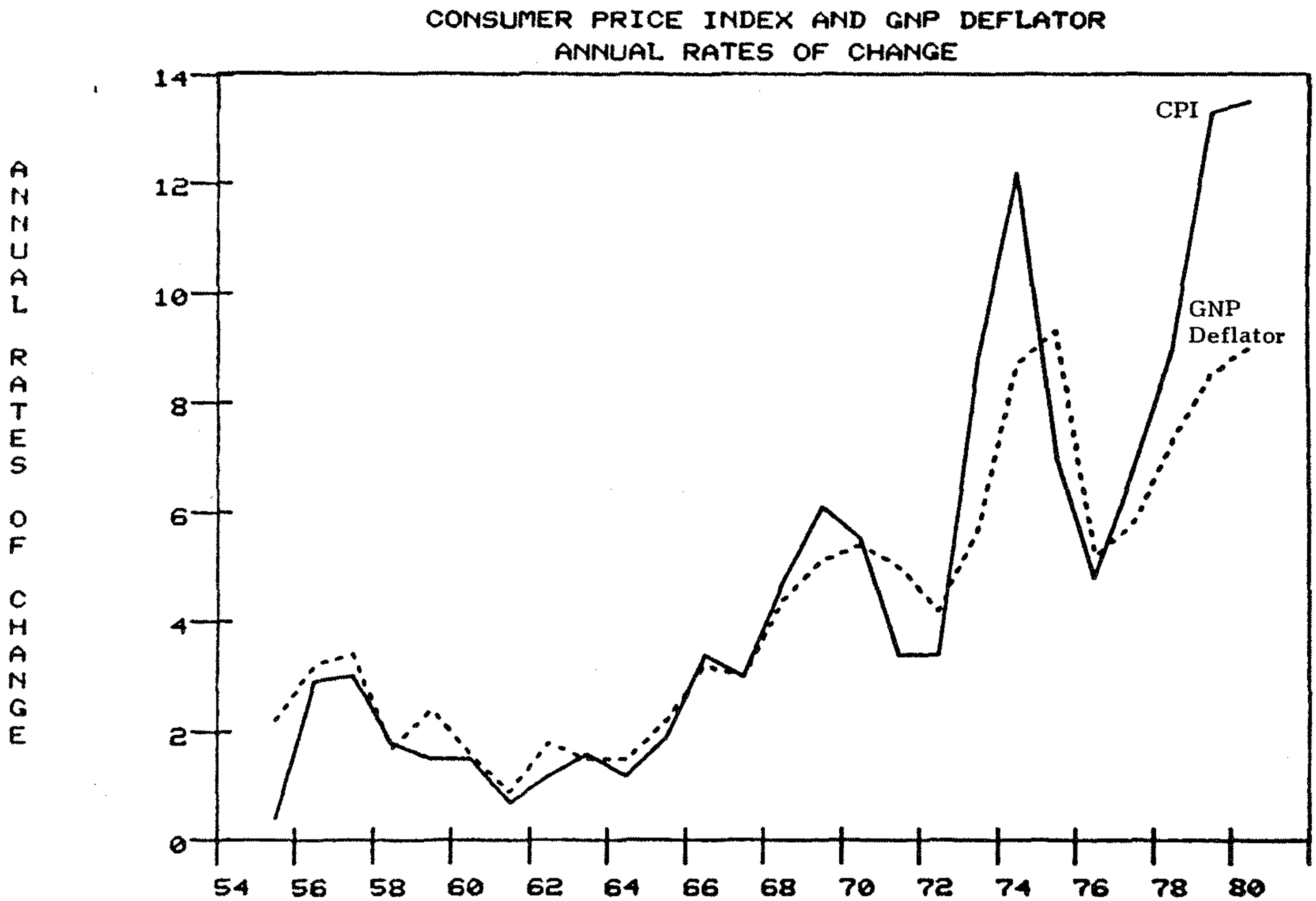
4/ D. R. Vining, Jr. and T. C. Elwertowski, "The Relationship Between Relative Prices and the General Price Level," American Economic Review (September 1976) pp. 699-708; and Alex Cukierman, "The Relationship Between Relative Prices and the General Price Level: A Suggested Interpretation," American Economic Review (June 1979), pp. 444-447.

FIGURE 8



CONSUMER PRICE INDEX AND GNP DEFLATOR
ANNUAL RATES OF CHANGE
ANNUAL RATES OF CHANGE
CPI
GNP Deflator
0
2
4
6
8
10
12
14
54
56
58
60
62
64
66
68
70
72
74
76
78
80

term loans. High and variable rates of inflation, however, can increase this uncertainty to the point that it becomes debilitating. With increased uncertainty about the long-term inflation rate, lenders will be unwilling to commit themselves to loans for 20 years or more at a fixed interest rate without an inflation risk premium. Firms similarly will be reluctant to borrow long-term at the high interest rates caused by inflation for fear that inflation--but not their debt service cost--will come down. This market stand-off has prompted the issue of callable bonds, redeemable at the option of the borrower, but these often command higher interest rates than non-callable bonds.

As a consequence, firms tend to defer projects that require long-term external financing during times when inflation drives up interest rates. As shown in Figure 9, they also tend to borrow a larger portion of funds in the short-term market where the potential losses from interest rate fluctuations are smaller. But short-term borrowing is usually regarded as unsuitable financing for long-term investment because the interest cost of the project will change each time the short-term loan is refinanced.

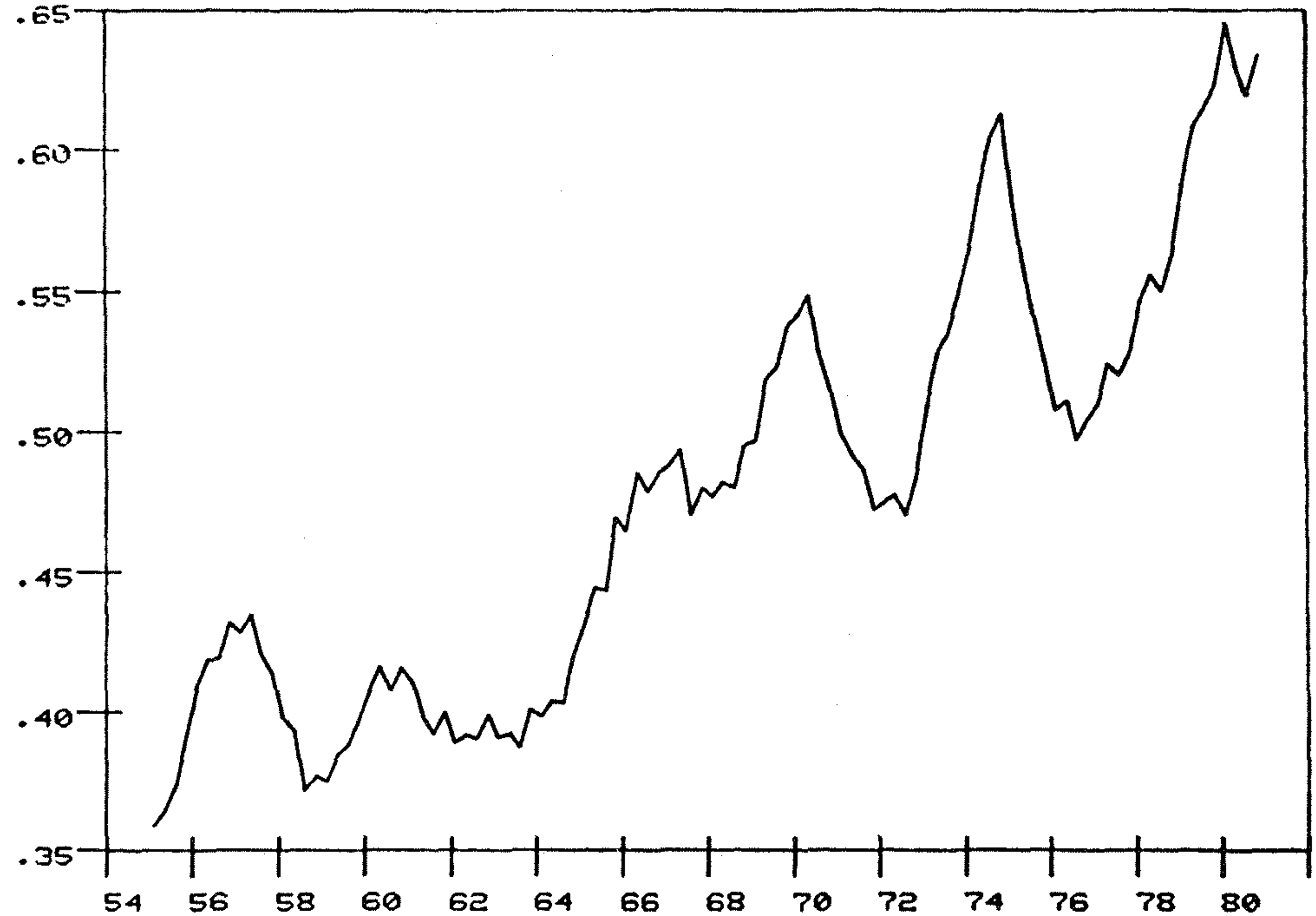
Inflation and Restrictive Macroeconomic Policies

The rising tide of inflation in the United States has severely limited the durability and strength of economic expansions. Given the widely shared desire for a return to price stability, the Federal Reserve has, with few lapses, resisted strong upswings in economic activity in an attempt to bring down gradually the rate of inflation. Consequently, the 1970s were years of slow demand growth. Actual sales were frequently below producers' expectations. The proportion of manufacturers reporting their capacity high relative to need rose from an average of 4.5 percent for 1963-1966 to 5.0 percent for 1966-1973 to 7.3 percent for 1973-1980. Over the same periods, the proportion who rated their capacity as too low dropped from 47.7 percent to 46.2 percent to 39.2 percent. When sales are weak and capacity utilization low relative to planned levels, firms tend to defer investment and, with it, changes in production technology, leading to lower productivity growth.

Moreover, there is a close and direct link between sales (relative to the firm's expectations) and current productivity. If a firm's sales drop five percent below expectations one quarter, the firm is unlikely to discharge immediately five percent of its work force and sell off five percent of its plant and equipment. Rather, at least for some time, the firm will hold onto its work force and factories in case the sales slump is temporary. One reason is that it is likely to be even more costly to reacquire the inputs later

FIGURE 9

DEBT STRUCTURE:
RATIO OF SHORT-TERM TO LONG-TERM DEBT



than to maintain them now. In general, the higher the degree of specialization of labor and capital to the particular procedures and methods of the firm, the greater will be the relative appeal of "hording" labor and capital inputs.

Blue collar production workers tend to be less specialized to the firm than white collar workers and, hence, more subject to lay offs. Moreover, the amount of white collar work to be done, for example, sales effort, compliance with regulation, accounting, and data processing services, may not decline at all, even if the firm's sales drop sharply. Machines and factories are the most specialized inputs and are usually the "last fired." Thus, sales growth below expectations usually leads to the following sequence of input adjustments: first, complete hoarding of labor and capital as the firm waits for more information on how long the slowing will last; second, reductions in the blue collar work force; third, cut backs in white collar employees; and finally, sales of business capital. When output declines faster than input, productivity must decline.

This description squares with developments in the U.S. manufacturing sector in the 1970s. 5/ Comparing the periods 1958-1965 and 1973-1977, average annual output growth dropped from 5.4 percent to 1.0 percent. Labor hours in manufacturing were reduced at an annual rate of 0.7 percent a year in the second period versus a 2.2 percent annual increase in the first. But the 0.7 percent reduction in labor was composed of a 1.5 percent cutback in blue collar hours worked and a 0.5 percent annual increase in white collar hours. Capital inputs also continued to increase in the second period at an average annual rate of 1.8 percent, compared to a 2.4 percent rate of increase in the earlier period. Consequently, total productivity growth in manufacturing declined from 1.5 percent per year in 1958-1965 to 0.3 percent in 1973-1977.

Inflation and Taxes on Investment Income

Inflation affects business investment by effectively changing the tax rates on various forms of investment income. One way this happens is through the tax on "depreciation" profits.

Because business plant and equipment is used up in the production process, the depreciation of capital goods is a cost of production and may be

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5/ This paragraph reports estimates from Ernst R. Berndt, "Energy Price Increases and the Productivity Slowdown in United States Manufacturing," The Decline in Productivity Growth, Federal Reserve Bank of Boston, (June 1980), pp. 60-89.

deducted from business income for tax purposes. The amount of depreciation permitted is based on the original cost of equipment and its estimated service life. During inflation, the replacement cost of capital goods exceeds its purchase price and, hence, the value of capital stock consumed by the production process is understated. This gives rise to illusory "depreciation profits" which are subjected to ordinary income tax rates. Thus, inflation increases the real tax rate on business income. The more capital-intensive the production process and the longer the useful life of the capital equipment, the greater the "inflation-tax." This further biases investment decisions toward short-lived assets and away from long-term capital goods.

In addition, the taxation of interest income is especially harsh during periods of inflation. As discussed in connection with interest rates on bonds, interest rates increase directly with inflation. Consider a taxpayer in the 40 percent marginal tax-bracket who, with stable prices, earns a pretax interest rate of 4 percent per year. His after-tax yield is 2.4 percent. Consider the same taxpayer who earns a 14 percent interest rate (pretax) with 10 percent inflation. His after-tax yield is 8.4 percent. However, inflation has eroded the value of his capital by 10 percent per year. His real after-tax yield is minus 1.6 percent per year. Inflation changes the income tax on interest income into a tax on the capital that generates the income.

Moreover, not all forms of investment income are exposed to heavy income taxation by inflation. In general, because interest payments are tax deductible, debt-financed investments are taxed at relatively low effective rates. For individuals, owner-occupied housing, the price of which has increased faster than the overall price level, is the prime example. Interest paid on home mortgages is tax deductible even though part of the interest is to compensate for the changed value of the dollar. In addition, capital gains taxes on owner-occupied houses are much lower than on other assets and, in most cases, can be avoided altogether by sequential reinvestment until retirement. Similarly, business investment financed chiefly with debt, principally structures, is also favored by the effect of inflation on interest rates, coupled with the deductibility of interest payments. Productivity is slowed by the interaction of inflation and the tax code because of the composition of investment is likely to be distorted and biased away from that which would be consistent with maximum efficiency.

SUMMING UP

The U.S. productivity growth slowdown reflects a decline in the rate of advance in process efficiency. This paper argues that this retardation can be attributed to three major causes: large changes in relative prices, increases in regulatory restrictions, and inflation—especially in conjunction with the tax code. These factors slowed productivity either by reducing the efficiency of existing processes (unanticipated changes in relative prices, sales, and regulation) or by dampening the pace and distorting the composition of investment in new specialized capital goods (uncertainty over future relative price changes, high and varying rates of taxation on investment income, slow growth in sales, some regulations).

PRODUCTIVITY AT THE INDUSTRY LEVEL

The explanation for the aggregate productivity slowdown is also consistent with the experience of particular U.S. industries. Consider, for example, motor vehicles, iron and steel, rubber and textiles. Together these industries constitute a significant part of U.S. manufacturing. During 1973-1979, they accounted for 16 percent of manufacturing investment in plant and equipment (down from 20.8 percent in 1955-1966) and 16.3 percent of manufacturing profits (down from 24 percent in 1955-1966). In addition, as may be seen in Table 3, they all experienced a decline in productivity growth after 1965, though one (textiles) appears to have recovered.

TABLE 3. AVERAGE ANNUAL RATES OF CHANGE, MULTIPLE-INPUT PRODUCTIVITY, SELECTED MANUFACTURING INDUSTRIES AND PERIODS, (In percents)

Industry	1948-1965	1965-1973	1973-1979
Manufacturing	2.6	1.9	0.7
Motor Vehicles a/	3.4	2.3	0.4
Iron and Steel b/	4.2 c/	0.6	-1.3
Rubber	2.3	2.0	-0.3
Textiles	3.9	3.0	3.6

SOURCE: American Productivity Center, Houston, Texas, (1981).

a/ Total factor productivity estimate for "transportation equipment."
b/ Preliminary.
c/ For 1958-1965 period.

One of the most striking results to emerge from these industries is the extreme sensitivity of productivity to variations in sales. As was explained earlier, when relative price changes, inflation or restrictive macroeconomic policies reduce output below planned levels, productivity growth declines. The decline in sales resulting from the economic contractions of 1969-1970, 1973-1975, and 1979-1980 clearly had a significant effect on the productivity of these industries. Productivity growth for motor vehicles, for example, was 2.8 percent for 1973-1978, but only 0.4 percent for 1973-1979; the recession dominated drop in sales of 1979 clearly was a major factor in explaining its slowdown. Conversely, the industry in which sales were least affected by the three economic contractions--textiles--also had the highest post-1965 productivity growth.

Motor Vehicles 6/

The dramatic current problems of the U.S. automobile industry did not fully surface until 1979 and 1980. 7/ During these two years, the domestic auto industry accounted for a smaller share of a shrinking market. Total automobile sales were 21 percent lower in 1980 than in 1979; sales of domestically produced cars dropped by 41 percent over the same period. Unemployment among the "big three"—Chrylser, Ford, and General Motors—ran as high as 300,000 during 1980; estimates of unemployment among auto suppliers and distributers ran as high as 1,000,000. Losses in 1980 rose to 13 percent of the net worth of the companies, as capacity utilization dropped to 67 percent from its 1978 level of 95 percent.

The decline in new car sales appears to have been caused primarily by the recent economic downturn, high fuel prices, and further shifts in consumer demand toward smaller vehicles. In addition to this overall decline in sales, however, the domestic industry has been severely affected

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6/ For a more complete discussion, see Congressional Budget Office, Current Problems of the U.S. Automobile Industry and Policies to Address Them, Staff Working paper (July 1980).

7/ In fact, the auto industry's performance was quite strong prior to 1978. For example, profits as a share of equity exceeded the average for manufacturing during 1969-1978 and unit labor costs have risen less than the manufacturing average during 1966-1978. See Beatrice N. Vaccara and Patrick H. MacAuley, "Evaluating the Economic Performance of U.S. Manufacturing Industries," Industrial Economics Review (Summer 1980), pp. 6-19.

by losing a share of the market to imports. The domestic industry has traditionally accounted for approximately 83 percent of the total U.S. market; in 1980 domestic producers accounted for only 74 percent of the market. This shift towards imports has primarily resulted from the increased demand for small cars. The dramatic increase in the price of gasoline, particularly in the aftermath of the 1979 OPEC price hikes and the decontrol of domestic oil prices, caused small cars to rise from 37 percent of the market in 1970 to over 60 percent in 1980. While domestic producers have held their share in this segment of the market, the domestic share of subcompact cars has traditionally been low compared to other segments. The long lead times necessary to switch from production of large cars has left the automobile producers with an inappropriate capital stock.

The outlook for the domestic industry is mixed. On the one hand, total sales will recover somewhat from their current depressed levels, and the massive retooling effort currently being undertaken by the industry will lead to an increased ability to produce small cars. On the other hand, overall demand will probably grow more slowly in the 1980s than in the 1970s, largely because of slower growth in population. Further, increased automation and foreign sourcing of component parts of domestic automobiles appear likely to keep the domestic automobile labor force smaller than in 1978.

Thus, the problems of the automobile industry appear to be consistent with the overall hypothesis earlier advanced. The primary reasons for its decline are (a) a decline in the level of output induced by macroeconomic policies, and (b) dramatic shifts in relative prices changing the desired output mix and rendering the existing capital stock inefficient.

Iron and Steel 8/

Whereas the auto industry's difficulties are recent and to some extent temporary, the steel industry appears to be in the midst of a long-term decline. There is no danger that the U.S. will lose the capacity to produce steel within the foreseeable future, but the level of steel produced by domestic mills will probably decline at an average rate of perhaps 2 percent annually for the next two decades. Also, the market share of the smaller, regional "mini-mill" producers is likely to increase substantially at the expense of the large, "big-eight" integrated companies.

Some indications of the state of the U.S. steel industry are evident in the 2 percent per year decline in the real value of output in the industry during 1966-1978. Employment is now about 100,000 lower than in 1974. During 1969-1978, profits as a share of equity averaged 8.6 percent compared with an all manufacturing average of 12.4 percent. The stock of plant and equipment is being replaced more slowly than in most other manufacturing industries.

The causes of the long-term decline in the importance of the steel industry include a shift in the composition of U.S. output away from heavy users of steel, including durable manufacturers, toward nondurable manufacturers and services and the continued growth of foreign steel-making capacity, which has restrained steel prices and profits. The economic turbulence of the late 1960s and 1970s, which had a significantly adverse effect on steel, added another problem to these underlying difficulties. For example, the production of iron and steel is one of the most energy-intensive manufacturing processes. The number of Btu's consumed per dollar of output in steel is about four times higher than in manufacturing in general. The surge in energy prices in the 1970s, therefore, sharply increased the cost of steel and reduced sales.

In addition, because the auto industry is a principal user of steel, the drop in demand for cars further magnified the effects of rising energy cost on steel production. Emission regulations have also had an especially severe impact on the industry. Estimated pollution abatement expenditures exceeded 20 percent of total investment for iron and steel during 1975-1977.

In the future, the U.S. steel industry will continue to adjust to declining demand for basic steel. A large proportion of new capacity is now and will be of the energy-efficient, continuous casting type. This will permit the integrated firms to survive as producers of competitively priced, specialty products, such as those used in petroleum exploration and recovery. In the intermediate term, some increase in steel production may be expected to follow the adoption of tax incentives for investment, a rebound in auto sales, and the projected increase in defense spending. As long as governments in the rest of the world are determined to produce a substantial volume of steel and to sell it here more cheaply than American mills can produce it, however, there is little reason for the United States to increase the flow of its scarce resources into this industry.

Rubber

The rubber industry is another whose plans, profitability, and productivity have been adversely affected by unexpected changes in relative prices and a concomitant (perhaps induced) change in tastes. Higher gasoline prices reduced the demand for tires from the auto industry and also slowed sales of replacement tires. At the same time, the U.S. market shifted toward longer-lasting, fuel-saving radial tires. As a result, capacity utilization in the rubber industry has trended downward from above 90 percent in 1968 to about 70 percent in 1980. The average annual rate of growth in real output dropped from 8.6 percent in 1965-1973 to 1.7 percent in 1973-1978.

The disruptive effect of these events on the industry is evident in its profitability performance. During 1969-1978, profits as a percent of equity averaged 10.5 percent, less than the 12.4 percent rate for all manufacturing. Moreover, the latest downturn severely reduced profits: earnings to net worth for the industry slumped to 6.4 percent in 1978 and 4.6 percent in 1980.

The rubber industry, like autos and steel, is adjusting to unequivocal market signals that fewer tires and associated rubber products will be demanded in the future than had been expected and that a larger portion of total sales will be radial tires. Resources are thus being released for use elsewhere and some tire plants are being converted to radial production. Much of this conversion seems complete, as investment growth in the industry has declined from an average annual rate of 21 percent in 1966-1973 to 6 percent in 1973-1979.

Textiles

The textile industry has been the scene of a major conflict between the U.S. policy objectives of promoting economic efficiency at home and economic development abroad, on the one hand, and of preserving domestic jobs and avoiding economic disruption on the other. Beginning in the 1950s, cotton textiles from Asia, and especially Japan, began to enter the United States in quantity. In time, Taiwan, Hong-Kong, Korea, the Philippines, and several South American countries joined Japan as major exporters to this country of not only cotton fabrics, but also wool, synthetic fibers, and apparel. Low-income countries were able to compete successfully with an established U.S. industry because many textile processes were labor-intensive rather than capital-intensive. Since most developing countries are rich in labor and poor in capital, they were naturally drawn to textiles as an efficient use of resources.

The subsequent adjustment of the U.S. textile industry to the rise of successful competitors abroad is probably illustrative of the adjustment path to be expected in other industries as they too are overtaken by the development of foreign producers. Real output in the domestic industry has risen about 2.5 times since 1957. This has been accomplished, however, with no increase in hours worked but with a 38 percent increase in capital. American textiles have survived by moving increasingly into capital-intensive processes. Profits in textiles have remained below average, nonetheless. During 1969-1978, profits as a percent of equity were 7.6 percent. In 1979, this after-tax earnings rate rose to 9.3 percent before dropping back to 6.6 percent in 1980.

The industry has also received some protection from foreign competition. The Multifiber Arrangement, agreed to by the United States and other textile producing nations initially in 1961 under the auspices of the General Agreement on Tariffs and Trade, has permitted this country to negotiate bilateral restrictions on textile trade. Unfortunately, it is almost impossible to quantify the protection and efficiency losses which these numerous and detailed restrictions have conferred and imposed.

CHAPTER IV. THE PRODUCTIVITY OUTLOOK AND POLICY IMPLICATIONS

Productivity growth is expected to increase during the 1980s, even without changes in policy. Indeed, although some policy measures could prove helpful, the government's ability to increase efficiency growth is severely limited. A real danger exists, however, that some policies, adopted with the intention to raise productivity, could have the opposite effect. This perverse outcome is likely to result from attempts to block ongoing adjustments to changes in relative prices and to subsidize inefficient producers.

OUTLOOK

Productivity growth in the 1980s should be higher than in the 1970s because the relative price structure should be more stable, the negative effects of regulation should be reduced, and inflation is projected to slow down.

Relative Price Stability. Most energy analysts agree that the worst of the oil price shocks is over. The deregulation of gasoline prices and the increasing flexibility of those energy prices still subject to regulation suggest that the chances of additional, discrete jumps in fuel and other energy prices have been reduced. The labor force bulge of the 1970s will not recur in the 1980s. During the last decade, the 16 to 24-year-old segment of the civilian labor force grew at the extraordinary annual rate of 4.8 percent. During the 1980s, the size of this age group will decline. Even if work participation rates by women and older persons continue to increase, rapid growth in entry-level employment is extremely unlikely. The relative price structure, therefore, should encounter fewer autonomous shocks in the years ahead than in the years just past. Price stability should increase the frequency of successful productive innovation and reduce the number of cases in which existing methods are rendered inefficient by relative price changes. In addition, the passage of time will permit an adjustment of the capital stock to the relative price disturbances of recent years.

Regulation. In a similar manner, time will permit production methods to adjust fully to existing regulatory restraints which, in combination with a slower pace of new regulation, should lead to faster productivity growth.

Inflation. As the rate of inflation slows, so will the instability of the price structure arising from general inflation. The distorting effects of taxes on capital composition will be reduced. Interest rates and the range of uncertainty about future rates and the cost of financing will decline. But perhaps the most beneficial aspect of a slowdown in inflation will be the increased prospects for sustained, steady, foreseeable growth in sales and production. A slowdown in inflation will contribute to a recovery in productivity growth essentially by permitting an increase in the rate of realization of production plans.

POLICY IMPLICATIONS

Policies to Reduce Uncertainty. If the analysis presented here is correct--that is, efficiency is best served by permitting the realization of business plans, then one major policy implication is that productivity growth would be enhanced by reducing those elements of uncertainty over which government has some control. A policy goal, therefore, should be to reduce the frequency of surprises, especially in policy itself. To the extent that regulatory and macroeconomic policies, tax, interest, and inflation rates, and relative prices, can be made more predictable, business will be able to plan better and efficiency will increase.

One policy consistent with the goal of increasing certainty would be to make tax rates relatively independent of inflation. Also when government policies can moderate price structure instability, for example, by its arrangements with OPEC, they should be used.

Counterproductive Policies. A second implication of the analysis is that a variety of possible policies give the appearance of promoting prosperity but would, in fact, reduce efficiency below its potential. Policies aimed at blocking changes in comparative productive efficiency among firms, regions, or countries fall into this category.

If the U.S. imposed severe restrictions on imports of steel, cars, textiles, rubber, and chemicals, for example, domestic profits, sales, and investment in these industries would probably rise significantly. U.S. economic efficiency, would decline, however. American citizens would have fewer goods and services to consume. Economic efficiency means squeezing the maximum welfare-producing output from limited resources. To achieve this, a country should: (1) purchase goods and services wherever the cost is lowest because lower cost implies that fewer resources are required to produce them; and (2) devote its productive resources to those uses in which they are most valuable and efficient. When a country follows these rules, some goods will almost always be obtained more efficiently by trade. By producing and exchanging goods with others, each country is able to have more of the things it values most.

A baseless fear unfortunately continues to reduce the gains potentially available from trade: namely, that foreigners will, by means fair or foul, be able to sell everything cheaper than the home country. It is assumed that the home country will become impoverished and defenseless. To appreciate the impossibility that foreigners might sell everything to the home country and buy nothing from it, imagine that this began to happen. Suppose, for example, that all foreign governments agreed to pay half the cost of goods exported to the United States and levied a 100 percent tariff on imports from America. Initially, U.S. imports would rise and U.S. exports fall. As U.S. residents increased their purchases abroad and sold less to foreigners, the dollar price of foreign currencies would rise. The dollar would, accordingly, depreciate in value on the foreign exchange markets. A depreciating dollar raises the dollar price of foreign goods and lowers the price of U.S. goods to foreigners. In fact, with a 50 percent dollar devaluation, foreign goods, despite the foreign subsidy and tariff, would have exactly the same dollar price and U.S. goods the same foreign currency price as before these actions were taken. As countries attempt to export more, exchange rate adjustments limit the rise in exports and increase imports.

No country wants to "export everything and import nothing," even if it could. If it succeeded in doing so, it would have "nothing." Countries wish to export so that they can import. A U.S. policy of free and unrestricted trade is consistent with maximum economic efficiency even though it requires continuous and costly reallocations of resources among uses. The alternative to these reallocations is to attempt to freeze the present U.S. economic structure and deny American citizens the benefits of rising efficiency at home and abroad.

The United States has actively promoted and encouraged economic growth in the less-developed countries (LDCs). It should, therefore, welcome the advances in productivity recently achieved by these countries. Not only are there compelling humanitarian reasons for assisting these developments, but there is also a sound economic, self-interest reason for U.S. support: more productive countries make better trading partners. As the economic pie to be produced and shared through trade gets bigger, each party will receive a larger piece. As the rest of the world increases its capacity and willingness to suppy some goods at relatively low cost, the U.S. must permit resources formerly employed domestically in these industries to move into more productive uses. To resist this reallocation is to promote economic inefficiency.

Resource Adjustment Policies. When, for whatever reason, the productivity of a process increases at a particular place or in a particular industry, efficiency requires an increase in resources used in the high productivity place or industry and a decline in resource use elsewhere. If policy attempts to resist this resource shift, for example, by a tax on the more productive process and a subsidy to the less productive, efficiency will be impaired. Put another way, to succeed in achieving efficiency growth in the large, failure in the small is often necessary.

Efficiency requires that speeding rather than resisting the resource shift be the objective of policy. In the absence of some enhanced incentives to adjust, the reallocation of resources can take a long time to complete. While the transition lasts, real output is foregone as long as resources are unemployed or not allocated to their most productive uses. Such incentives could include policies to assist in the retraining or relocation of displaced workers, or policies to speed the transition of capital from less to more productive uses.

Investment Policies. Much of the attention concerning industrial policy has been focused on using policy tools to increase the overall level of investment. Proposals range from various revisions of the depreciation rules in the tax system to a revival of the reconstruction development finance corporation. As was seen in Chapters II and III, this emphasis is well founded; capital formation is a critical link in the productivity growth process.

The overall question of investment is complex; a few broad conclusions can, however, be drawn from the analysis presented above. First, even in the absence of a coordinated policy to increase productive investment directly, such investment will probably rise in the coming years. The projected outlook for more stable relative price changes, regulatory policies, and lower inflation, discussed earlier in this chapter, is likely to result in increased investment as well as a shift back towards longer-lived, more productive assets. Similarly, the positive policies to decrease uncertainty (mentioned in the preceding section) would also result in increased investment.

The question arises, however, whether the investment stimulated will be large enough or of the right kind. Determining the answer to these questions analytically is very difficult; generally, the decision about the optimal size and composition of investment and capital stock is best left to the market. Stimulative investment policies to improve productive efficiency ought to be used when governmental policy or some other form of "market failure" has resulted in distortions in investment decisions.

In other words, the most efficient "regulator" of investment composition and levels is generally the market. It is important to remember that more investment does not always increase the overall efficiency of the production process. As was seen in Chapter III, excess capital investment reduces a firm's ability to adjust to changed circumstances. If individual firms and investors are encouraged through government policy to invest in the face of uncertainty, a less than optimal capital stock may result. Similarly, government policies to change the composition of investment frequently come at the cost of aggregate efficiency. For example, housing incentives, while perhaps effectively pursuing a general social goal, may have reduced the overall efficiency of the production process by altering the composition of investment.

From the analysis in Chapter III, one area in which government policy appears to have retarded and distorted directly the level and composition of investment can be identified: the tax code. Policies to reduce the negative effect of the interaction between inflation and taxes on investment may thus be warranted, while still maintaining the primary role of the market in making the consumption-investment trade-off.

The general effect of the U.S. income tax on investment is a subject on which there is little theoretical or empirical agreement among economists. Whether the optimal rate of taxation on capital income is zero (a consumption tax) or some higher figure is not clear. However, it is clear that the effects of inflation on the tax code have impeded productive investment by causing anomolous fluctuations in tax rates over time and across different types of investment.

Recent studies suggest that these distortions have been severe. A study by Dale Jorgenson, for example, estimates that the average effective tax rates for equipment and structures varied from 42 percent in 1970 to 17 percent in 1976 to 25 percent in 1980. 1/ A similar analysis, by the Joint Committee on Taxation, using different assumptions, estimates that average effective tax rates for equity-financed new equipment vary from 4 percent for 6-year-lived assets to 36 percent for 35-year-lived assets; from 4 percent for the carpet and dyeing industry to 34 percent for gas utilities. 2/ These estimates do not take into account the effect of nominal interest deductability on debt-financed investment; a taxpayer who finances through debt faces much lower effective tax rates.

1/ D.W. Jorgenson and M.A. Sullivan, "Inflation and Capital Recovery in the United States," 1981, as cited in Joint Committee on Taxation, Analysis of Proposals for Depreciation, p. 17.

2/ Joint Committee on Taxation, Analysis of Proposals for Depreciation, pp. 18-22.

Two criteria are thus crucial when evaluating proposals to mitigate the adverse effects of inflation on the tax code. First, the proposal should insulate the effective rate of taxation on investment from inflation. Simultaneously, it ought not introduce distortions in effective tax rates across different types of assets.

Finally, although a factor that did not show up as a cause for the observed productivity slowdown, could, however, become an impediment to its recovery. The sectoral shift in profits towards energy producers could result in a "market failure" in the future, if those profits are not invested in the optimal manner because of institutional rigidities. Changes in the financial markets from regulatory and international developments could also result in situations in which investment policies are needed.

APPENDIX

TABLE A-1. U.S. REAL GROSS NATIONAL PRODUCT (GNP) PER CAPITA (In 1972 dollars)

Calendar Year	GNP per Capita	Annual Percent Change
1947	3,250	--
1948	3,327	2.4
1949	3,286	-1.2
1950	3,512	6.9
1951	3,741	6.5
1952	3,813	1.9
1953	3,893	2.1
1954	3,779	-2.9
1955	3,962	4.9
1956	3,976	0.3
1957	3,976	0.0
1958	3,893	-2.1
1959	4,058	0.5
1960	4,080	0.5
1961	4,119	0.9
1962	4,290	4.2
1963	4,399	2.5
1964	4,567	3.8
1965	4,783	4.7
1966	5,010	4.8
1967	5,090	1.6
1968	5,272	3.6
1969	5,366	1.8
1970	5,299	-1.3
1971	5,421	2.3
1972	5,678	4.8
1973	5,965	5.0
1974	5,890	-1.3
1975	5,778	-1.9
1976	6,044	4.6
1977	6,325	4.6
1978	6,570	3.9
1979	6,723	2.3

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

TABLE A-2. INDEX OF REAL GROSS DOMESTIC PRODUCT (GDP) PER CAPITA a/ (Index: United States 1967=100)

Calendar Year	United States	Japan	Britain	Germany	France
1950	69.3	11.5	41.9	29.0	34.4
1951	71.0	12.4	43.1	31.5	35.5
1952	72.7	13.3	44.3	34.2	36.7
1953	74.5	14.3	45.6	37.0	37.9
1954	76.3	15.4	46.9	40.2	39.2
1955	78.2	16.6	48.2	43.6	40.5
1956	78.6	17.8	49.1	45.9	42.1
1957	79.0	19.2	50.0	48.3	43.8
1958	79.4	20.6	50.9	50.8	45.5
1959	79.8	22.2	51.8	53.5	47.4
1960	80.2	23.8	52.8	56.3	49.2
1961	82.7	26.0	54.1	58.4	51.4
1962	85.4	28.3	55.5	60.6	53.7
1963	88.2	30.8	56.9	62.9	56.0
1964	91.0	33.6	58.3	65.3	58.5
1965	93.9	36.6	59.8	67.8	61.0
1966	98.4	40.1	60.7	68.9	63.7
1967	100.0	44.7	62.0	68.6	66.2
1968	103.6	50.5	64.2	72.7	68.5
1969	105.4	55.9	64.9	77.6	72.6
1970	104.1	61.8	66.2	81.4	76.2
1971	106.4	63.7	66.7	83.4	80.0
1972	111.4	69.0	67.1	86.2	84.4
1973	116.6	74.9	70.8	90.2	88.7
1974	114.9	73.7	69.9	90.5	91.0
1975	113.1	73.7	69.4	89.3	90.8
1976	118.2	77.7	72.2	94.3	95.1
1977	123.6	81.1	72.9	97.4	97.4
1978	128.2	85.0	75.5	100.8	100.5
1979	130.7	89.3	76.5	105.3	103.3
1980	129.2	93.2	75.2	107.1	104.8

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, unpublished data (May 1981).

a/ The GDP is a national income concept based on production with the geographic borders of a country; GNP covers production by and incomes to citizens of a country regardless of where they may live. The two measures generally track closely.

TABLE A-3. EMPLOYMENT AND LABOR FORCE AS A PERCENT OF TOTAL POPULATION a/

Calendar Year	Employment	Labor Force
1947	40.7	42.3
1948	40.8	42.3
1949	39.7	42.2
1950	39.8	41.9
1951	40.7	42.0
1952	40.5	41.7
1953	40.4	41.6
1954	38.9	41.1
1955	39.3	41.0
1956	39.5	41.1
1957	38.9	40.5
1958	37.6	40.2
1959	37.8	39.9
1960	37.8	39.9
1961	37.2	39.8
1962	37.3	39.4
1963	37.3	39.4
1964	37.5	39.5
1965	38.0	39.7
1966	38.7	40.1
1967	39.2	40.7
1968	39.6	41.0
1969	40.2	41.6
1970	39.9	41.9
1971	39.6	42.0
1972	40.3	42.6
1973	41.2	43.3
1974	41.6	44.0
1975	40.7	44.4
1976	41.7	45.0
1977	42.7	45.9
1978	44.1	46.9
1979	44.9	47.6
1980	44.6	47.9

SOURCES: Population figures from U.S. Department of Commerce, Bureau of the Census; employment and labor force statistics from U.S Department of Labor, Bureau of Labor Statistics.

a/ Population is all persons, including Armed Forces; Employment is civilian employment, plus Armed Forces; labor force, is civilian labor force, plus Armed Forces.

TABLE A-4. LABOR PRODUCTIVITY—OUTPUT PER HOUR, INDEX OF PRIVATE BUSINESS SECTOR AND ANNUAL PERCENT CHANGE (Index: 1967=1.00)

Calendar Year	Output per Hour Index	Annual Percent Change
1947	0.538	--
1948	0.559	3.9
1949	0.568	1.6
1950	0.612	7.8
1951	0.630	2.9
1952	0.648	2.9
1953	0.668	3.1
1954	0.678	1.6
1955	0.706	4.1
1956	0.716	1.3
1957	0.735	2.7
1958	0.754	2.6
1959	0.778	3.2
1960	0.790	1.6
1961	0.815	3.1
1962	0.851	4.4
1963	0.883	3.8
1964	0.917	3.8
1965	0.951	3.7
1966	0.980	3.0
1967	1.001	2.1
1968	1.033	3.3
1969	1.035	0.2
1970	1.044	0.8
1971	1.079	3.4
1972	1.114	3.3
1973	1.137	2.0
1974	1.102	-3.1
1975	1.126	2.2
1976	1.167	3.6
1977	1.188	1.8
1978	1.193	0.4
1979	1.182	-0.9
1980	1.176	-0.5

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

TABLE A-5. U.S. TOTAL FACTOR PRODUCTIVITY, INDEXES OF PRIVATE DOMESTIC BUSINESS ECONOMY, MANUFACTURING, FARM, AND NONFARM, NONMANUFACTURING SECTORS (Index: 1977=100)

Calendar Year	Private Domestic Business Economy	Percent Change	Manuf.	Percent Change	Farm	Percent Change	Nonfarm, Nonmanufacturing	Percent change
1948	54.5	--	54.4	--	36.6	--	63.9	--
1949	54.7	0.4	55.4	1.8	36.2	-1.1	64.0	0.2
1950	58.8	7.5	59.0	6.5	40.6	12.2	67.8	5.9
1951	60.4	2.7	60.9	3.2	40.2	-1.0	68.7	1.3
1952	62.1	2.8	61.7	1.3	42.8	6.5	70.2	2.2
1953	63.9	2.9	62.9	1.9	47.9	11.9	71.3	1.6
1954	64.1	0.3	62.6	-0.5	50.1	4.6	71.6	0.4
1955	66.7	4.1	65.9	5.3	50.6	1.0	74.0	3.4
1956	67.2	0.7	65.0	-1.4	51.8	2.4	74.5	0.7
1957	68.3	1.6	65.8	1.2	53.6	3.5	75.1	0.8
1958	69.3	1.5	64.2	-2.4	59.2	10.4	76.9	2.4
1959	70.6	1.9	67.7	5.5	55.7	-5.9	77.3	0.5
1960	72.3	2.4	68.2	0.7	60.3	8.3	79.3	2.6
1961	74.0	2.4	69.1	1.3	62.5	3.6	81.0	2.1
1962	76.5	3.4	72.4	4.8	63.6	1.8	83.1	2.6
1963	78.9	3.1	77.2	6.6	67.6	6.3	83.8	0.8
1964	81.9	3.8	80.9	4.8	68.5	1.3	86.2	2.9
1965	84.6	3.3	83.5	3.2	72.2	5.4	88.5	2.7
1966	86.8	2.6	84.7	1.4	72.9	1.0	90.5	2.3
1967	87.8	1.2	83.9	-0.9	78.4	7.5	91.9	1.5
1968	90.2	2.7	86.6	3.2	77.8	-0.8	94.1	2.4
1969	90.1	-0.1	87.3	0.8	82.0	5.4	92.8	-1.4
1970	89.6	-0.6	85.7	-1.8	89.5	9.1	92.3	-0.5
1971	91.8	2.5	89.2	4.1	95.7	6.9	93.6	1.4
1972	94.9	3.4	93.9	5.3	92.8	-3.0	96.2	2.8
1973	97.4	2.6	96.8	3.1	92.4	-0.4	98.2	2.1
1974	94.3	-3.2	90.6	-6.4	92.6	0.2	96.4	-1.8
1975	94.5	0.2	92.5	2.1	99.2	7.1	95.8	-0.6
1976	97.7	3.4	96.9	4.8	96.6	-2.6	98.3	2.6
1977	100.0	2.4	100.0	3.2	100.0	3.5	100.0	1.7
1978	100.2	0.2	100.5	0.5	98.0	-2.0	100.0	0.0
1979	99.7	-0.5	100.8	0.3	104.7	6.8	98.7	-1.3
1980	98.3	-1.4	99.0	-1.8	106.1	1.3	97.5	-1.2

SOURCE: American Productivity Center, Houston, Texas