

American Productivity Growth: Perspectives on the Slowdown

Productivity growth in the United States has slowed dramatically in the past decade. Since the late 1960's productivity in the private economy has risen only about half as rapidly as it did during the two decades following World War II. Slower productivity growth means a slower growth of real incomes and at the same time contributes to inflation. Why has productivity fared so badly? This article examines American productivity growth in historical perspective and evaluates some of the explanations for the slowdown. In part, the slowdown reflects the end of a period when many workers were leaving relatively low-productivity farm jobs. Even in the nonfarm sector, however, there has been a marked productivity slowdown. This nonfarm slowdown, it is found, reflects to a surprising extent productivity problems in a few nonmanufacturing industries. In the manufacturing sector, however, there has been little change in the pace of productivity advance.

A brief historical perspective

Productivity, defined as output per employee hour, has increased tremendously in the private economy during the twentieth century (Chart 1). Workers today are four and one-half times as productive as they were seventy years ago. Basically this increase has reflected technological advance, the accumulation of capital, and an increasingly skilled work force. Productivity growth was particularly rapid and steady after World War II; the average rate of growth was 3.2 percent per year during 1948-67, compared with 1.9 percent during 1909-48. Starting in the late 1960's, however, productivity began to grow at a slower pace, increasing at an annual average of only 1.7 percent during the 1967-78 interval. Thus output per employee hour in recent years has fallen farther and farther below what it would have

been had the rapid 1948-67 productivity trend continued (Chart 1).

The ill effects of this slowdown in productivity growth during the past decade have been twofold. First, the growth of real incomes has been slowed. Second, inflation has been aggravated. If money wages continue to rise at past rates while productivity growth falls behind, then unit labor costs will increase more rapidly. Some of this rise in cost will be passed along to the consumer in the form of higher prices.

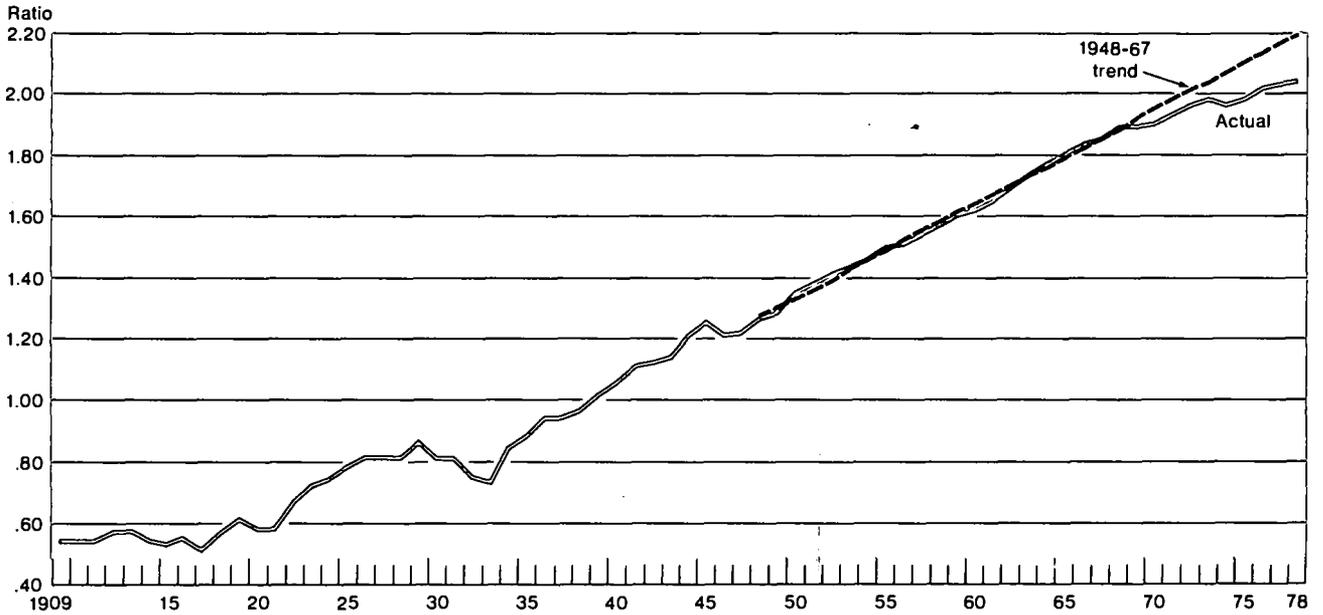
The shrinking farm sector. Because productivity historically has been considerably lower on farms, the shift of workers from farming to the nonfarm economy contributed greatly to productivity growth. From 1909 to 1937, the level of productivity on farms was much lower than in the nonfarm economy and was growing very slowly. During this period the relative size of the farm sector declined only very gradually, from 29 percent of private-economy employment to 26 percent. Between 1937 and 1967, however, the relative size of the farm sector fell to only 6 percent of private employment. At the same time, farm productivity grew very rapidly. Since 1967, the shift from farming has moderated considerably, with farming accounting for 4 percent of private employment today; the growth of farm productivity has also slowed.¹

In part, therefore, the current productivity slowdown reflects the fact that the movement of a substantial

¹ Other industrialized nations have also experienced major shifts away from farming, but in many (Japan, Germany, France, and Italy, for example) low-productivity agriculture still takes a significantly larger fraction of total employment than in the United States. Shifts from farming, therefore, may remain an important source of productivity growth in those economies.

Chart 1

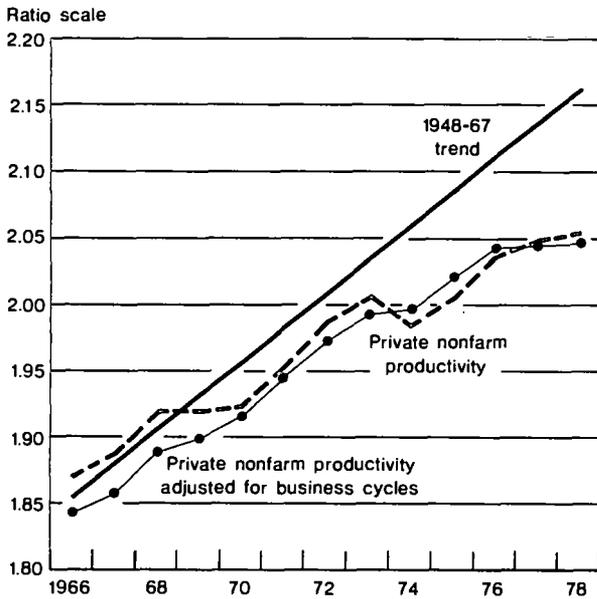
Output per Employee Hour, United States Private Economy



Source: United States Department of Labor, Bureau of Labor Statistics.

Chart 2

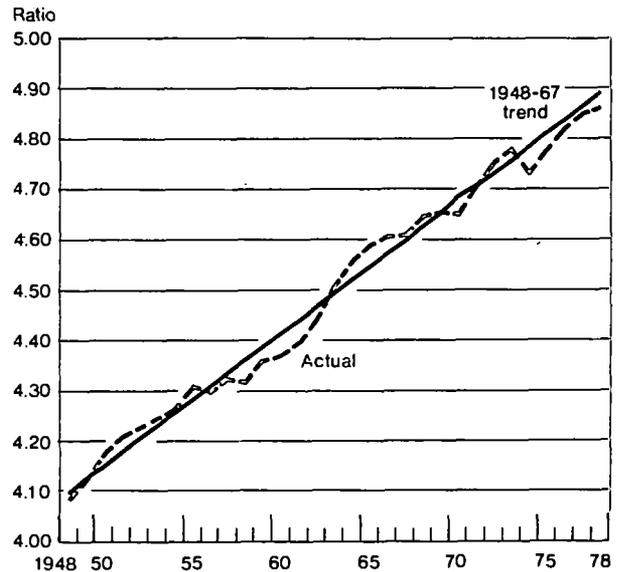
The Recent Nonfarm Productivity Slowdown



Source: United States Department of Labor, Bureau of Labor Statistics.

Chart 3

United States Manufacturing Output per Employee Hour



Source: United States Department of Labor, Bureau of Labor Statistics.

fraction of the work force from the lower productivity farm sector to the higher productivity nonfarm economy was virtually completed by the late 1960's. The end of this shift from farms would have made total private productivity growth slow even if there had been no change in the rate of productivity growth within the nonfarm economy, where most private employment is today. In fact, private nonfarm productivity growth has also slowed. But this nonfarm slowdown has been somewhat less dramatic than that in the total private economy, where productivity had previously been boosted by the shift from farms. During 1948-67, when total private productivity rose at a 3.2 percent annual rate, private nonfarm productivity grew at a 2.7 percent pace. Since 1967, however, the total and the nonfarm private productivity growth rates have been about equal, since the farm sector has become such a small part of the total.

Productivity and fluctuations in business activity. Productivity is sensitive to cyclical changes in economic activity. The growth of output per employee hour has generally been faster in economic expansions and slower in contractions. Productivity dropped sharply in 1929-33 during the Great Depression and in the 1945 recession, but during 1948-67 the relative mildness and shortness of recessions kept annual productivity on an upward trend, although some quarters showed declines. The recession in 1974-75 was severe enough to create a sharp year-to-year drop in output per employee hour, the first such drop since 1945.

The main reason why changes in business activity affect productivity is that, given hiring and training costs, many firms are reluctant to lay off workers when sales drop if they believe the decline is temporary. But these workers are not fully utilized, although they remain on the payroll. This is especially true of most administrative and supervisory employees, whose widespread dismissal would normally occur only during a permanent cutback in the size of the firm. Another factor slowing productivity growth during an economic contraction is the postponement of capital investment projects, along with the technological advances they embody.

The economic contraction during the mid-1970's cannot explain the current productivity slowdown, however. This becomes apparent when private nonfarm productivity is compared with a private nonfarm productivity measure which has been adjusted to eliminate the effects of fluctuations in business activity (Chart 2).² In

² Business-cycle effects were removed from nonfarm private productivity using a regression equation which included changes in adult male unemployment rates and various time trend terms.

the adjusted measure, the productivity drop associated with the 1974-75 recession has been removed. By 1978, however, adjusted productivity was above the unadjusted measure, and both had fallen far short of the 1948-67 private nonfarm trend.

An industry profile of the adjusted nonfarm slowdown

The lag in nonfarm private productivity growth has been largely concentrated in a few industries. During the late 1960's and early 1970's, productivity growth began to slow, especially in mining and in construction. Since the slow growth in these areas was partly offset by unusually strong performances in other industries, however, the productivity slowdown for the whole private nonfarm economy remained relatively moderate during 1967-73. After 1973, however, the slowdowns in construction and mining persisted while productivity growth, adjusted for business cycles, also began to lag in some new areas, most notably public utilities. Moreover, productivity growth in other industries was no longer particularly strong and did not offset the few "problem" areas after 1973. Thus, the overall slowdown suddenly became much more pronounced in 1973-78. For 1967-78 as a whole, however, only in certain industries has productivity growth fallen significantly below its earlier trend (Table 1).

An individual industry's contribution to the overall slowdown basically depends on the size of the industry and how much its productivity has slowed. The larger an industry's share of employment, the more important are fluctuations in its output per employee hour for the overall nonfarm average. But even a moderate-sized industry can have a substantial role if its productivity falls off sharply.³

Three fourths of the adjusted nonfarm slowdown during 1967-78 is accounted for by the poor showing of three industries—construction, mining, and retail trade (Table 1). Construction alone accounts for nearly half of the overall slowdown. While construction represents only about 7 percent of nonfarm private employment, output per employee hour there actually dropped 2.4 percent per year for the 1967-78 period. Mining provides less than 2 percent of private nonfarm employment, but it also has had an actual productivity decline in recent years. In retail trade, productivity has continued to rise but at a slower pace. Its large contribution to the overall slowdown reflects its large share of employee hours, about 18 percent.

In contrast to the roles played by these few nonman-

³ Each industry's contribution to the total slowdown is calculated as the product of its own slowdown times its share of total employee hours. Summing these contributions gives the total slowdown as a weighted average of the industry slowdowns (with each industry's weight equaling its share of total employee hours).

Table 1

The Industry Profile of the Productivity Slowdown

In percent

Industries	Trend growth rates of output per employee hour adjusted for business cycles*		Changes in rates of growth 1967-78 minus 1948-67	Contributions to the change in nonfarm productivity growth, 1967-78 minus 1948-67
	1948-67	1967-78		
Mining	4.1	-1.1	-5.2	-.07
Construction	2.7	-2.4	-5.1	-.33
Manufacturing	2.6	2.6	0.0	00
Transportation	2.8	2.6	-0.2	-.01
Communications	5.4	5.9	0.5	.01
Public utilities	5.9	2.2	-3.7	-.04
Wholesale trade	3.0	2.7	-0.3	-.02
Retail trade	2.4	1.8	-0.6	-.11
Finance, insurance, real estate	2.1	0.9	-1.1	-.06
Services	1.6	1.4	-0.2	-.04
Total nonfarm private	2.5	1.8	-0.7	-.68
Total nonfarm private, adjusted for inter-industry shifts in employment	2.4	1.8		

* Estimated trend coefficients are from industry regression equations in which changes in industry unemployment rates were controlled.

ufacturing industries is the lack of any contribution by manufacturing to the overall slowdown. Manufacturing productivity is particularly vulnerable to business conditions, and its growth has been characterized by wide cyclical swings around a steady upward trend (Chart 3). With or without adjustment for business cycles, however, no noticeable shortfall of manufacturing productivity from its 1948-67 trend has developed.

Has a shift in the distribution of employment among industries contributed to the slowdown within the private nonfarm economy? For example, a large shift of workers into the lower productivity services sector could help slow aggregate productivity growth above and beyond any productivity slowdowns in individual industries. To see if this has been the case, aggregate nonfarm private productivity growth was adjusted to eliminate the effects of interindustry employment shifts (Table 1).⁴ There is, however, little difference between

⁴ A slowdown in productivity growth can be approximately divided into three parts: the effect of individual industry slowdowns, holding employment shares constant; the effect of faster shifts of employment into low-productivity industries; and the effect of employment shifts into industries where productivity growth is slow. To eliminate all the effects of shifts of employment among industries, constant 1967-78 average employee-hour share weights were used to recalculate 1948-67 total nonfarm productivity growth as a weighted average of the industry growth rates.

these estimates and those that are not adjusted for interindustry shifts. It is true that employment in services has grown more rapidly in the past decade. But there have been offsetting shifts into such areas as communications and finance, where the level of productivity is above average.

Explanations for the slowdown

Lagging capital investment. How much output workers can produce depends in part on their machinery and equipment and on the characteristics of their plant or office. It is usually true that more fixed capital raises productivity. Furthermore, technological advances are often embodied in new equipment. The rate of productivity growth of an industry, therefore, depends in part on the rate of accumulation of capital per employee hour.

A slow growth rate of capital per employee hour may have been partly responsible for the productivity problems in construction and in mining (Table 2). Capital per employee hour in these two industries scarcely grew at all during 1967-73, which coincides with the start of their productivity slowdowns.⁵ In mining, this lag in investment relative to employment

⁵ Capital stock data by industry are not yet available beyond 1974 from the Bureau of Labor Statistics.

growth may in part reflect increases in Federal health and safety regulations, which are frequently cited as an important source of mining productivity problems.⁶ Increases in the number of employees directly involved in worker health and safety protection could account for slower growth of both output per employee hour and capital per employee hour.

For the nonfarm private economy as a whole, capital investment has clearly slowed relative to employment growth in the past decade. During 1948-67 capital per employee hour grew at a 2.3 percent annual rate, but the pace during 1967-78 was only 1.7 percent annually.⁷ This slowdown has been especially pronounced most recently; in 1978 capital per employee hour fell 1.3 percent. Moreover, other developments may have reduced the ability of the capital stock to enhance productivity. Of the total business outlays for new plant and equipment since 1973, roughly 5 percent went for pollution control equipment.⁸ The sharp rise in energy prices also may have reduced the usefulness of some of the capital stock. In short, the lagging growth of productive capital per employee hour has very likely been one important factor contributing to the productivity slowdown.

Energy problems. Shortages and higher prices of energy may have reduced output per employee hour in the United States in several ways. One is by precipitating or deepening the 1974-75 recession, but this business-cycle effect would have only been temporary.

Another, longer lasting way in which energy problems may have affected productivity is by shifting demand away from products that require a particularly large amount of high-priced energy to make and toward other products. The costs of adjusting to such a change may show up in the form of lower productivity growth. A prime example is the shift in demand away from electrical power as a result of oil price hikes. The rise in electricity prices has caused the growth of demand for the output of utilities to slow markedly since 1973, leading to the underutilization of power-generating capacity.⁹ There has been a somewhat

⁶ See Edward F. Denison, "Effects of Selected Changes in the Institutional and Human Environment upon Output per Unit of Input", *Survey of Current Business* (January 1978).

⁷ Nonfarm business capital stock figures are presented in J.R. Norsworthy and Michael J. Harper, "The Role of Capital Formation in the Recent Productivity Slowdown", Bureau of Labor Statistics Working Paper 87, Office of Productivity and Technology (January 1979).

⁸ See G. L. Rutledge, F. J. Dreiling, and B. C. Dunlap, "Capital Expenditures by Business for Pollution Abatement, 1973-77 and Planned 1978", *Survey of Current Business* (June 1978).

⁹ Capacity utilization in fossil fuel power generation, the largest utility, fell to 81.6 percent in 1974 from 90.0 percent the year before. Rather than recovering with the rest of the economy, it continued to fall to 73.9 percent in 1978.

slower growth of employment in utilities since 1973, but this adjustment of the work force to the lower demand for output has not been complete. Thus, the growth of output per employee hour in utilities has slowed markedly.

Higher energy prices may also have reduced productivity growth by inducing firms to substitute more labor-intensive production methods for energy-intensive techniques. If the same output can be produced using more labor and less energy or energy-consuming capital equipment, some firms may find it cost effective to make this shift when energy prices rise. For example, one possible interpretation of the recent lag in the growth of capital per employee hour is that firms have resisted investing in equipment requiring costly energy to operate. A shift toward more labor-intensive production methods reduces the average output per employee hour.

Pollution abatement and control costs. It is frequently suggested that government environmental regulations have played a role in retarding recent productivity growth. For example, discouraging the use of coal has helped keep utilities more reliant on expensive oil, thereby increasing the price of electrical power. The lack of demand for coal, in turn, has not helped productivity in mining. The sharp 1973-77 fall in mining productivity coincides with a fall in bituminous coal mine utilization from 88.1 percent down to 80.7 percent of capacity.

Another way in which environmental regulations may

Table 2

Growth of Net Capital Stock per Employee Hour

Annual growth rates; in percent

Industries	1948-67	1967-73
Mining	6.2	0.6
Construction	5.5	0.0
Manufacturing	2.5	2.9
Transportation	2.1	1.2
Communications	5.3	3.6
Public utilities	3.7	5.1
Wholesale and retail	5.5	3.6
Finance, insurance, real estate	1.7	4.8
Services	3.8	3.2

Source: Industry capital stock and employment estimates are from the Bureau of Labor Statistics.

have reduced productivity growth is by causing business to spend on equipment related to these regulations rather than on productivity-enhancing capital. Edward Denison concluded in a recent study that during 1967-78 government-mandated pollution abatement efforts resulted in a total cumulative reduction in productivity of 1.2 percent, most of which occurred in the more recent years.¹⁰ Denison's calculations are based on the observation that business expenditures for pollution control have increased dramatically and that the "output" which these antipollution operations yield (*i.e.*, a cleaner environment) is not included in the standard measures of national income. If these business outlays had instead gone to set up or expand operations which produce output included in the national income, then measured output per employee hour would be higher today. In effect, Denison assumes that expenditures for pollution control crowd out other productive business spending dollar for dollar.

The validity of Denison's assumption of dollar-for-dollar crowding out is questionable, however. Many of the pollution-control costs are associated with capital equipment used for pollution abatement. During 1974-75 these costs were increasing very rapidly, yet the use of other, output-producing capital equipment was far below capacity, particularly in manufacturing and utilities where antipollution outlays were especially great. Taken at face value, Denison's estimates account for only a modest fraction of the total productivity slowdown, but they probably overstate the effect.

Environmental regulations may also affect productivity by reducing the profitability of certain types of capital investments. If an operation would require heavy pollution-control outlays to remain in compliance with the law, the return on the revenue-producing part of the operation must be sufficient to justify these added costs. Environmental regulations, therefore, may have retarded somewhat the growth of capital per employee hour in recent years.

Changing work force composition. The recent labor force entry of many young people of the baby boom generation and the increasing participation of women have led many observers to argue that the influx of relatively inexperienced or unskilled workers has retarded productivity growth (Table 3). The proportion of adult males in the work force was already declining in the early 1960's, but the pace of this shift accelerated in 1967-78. At first, the shift mostly reflected a rising proportion of young workers. During 1973-78, however, adult women substantially increased their

¹⁰ Edward F. Denison, "Pollution Abatement Programs: Estimates of Their Effect upon Output per Unit of Input, 1975-78", *Survey of Current Business* (August 1979).

Table 3

Average Annual Change in Employment Shares in the United States Economy

Changes in percentage shares

Group	1948-67	1967-73	1973-78
Males, 20 years of age and over	-.42	-.46	-.51
Females, 20 years of age and over38	.31	.53
Teenagers04	.15	-.02
Total00	.00	.00

Source: Bureau of Labor Statistics.

fraction of employment, while the share of teenagers leveled off. The demographic changes in the work force have been generally widespread throughout the economy, although the shifts toward younger workers have been slightly more pronounced in mining, construction, and retail trade, areas in which much of the productivity slowdown has been concentrated.

These changes may have affected productivity growth in several ways. One is simply by reducing the average quality of employee hours; the new workers lack the experience and skills acquired on the job to make them fully productive. This also diverts some of the time and effort of both old and new workers to the task of training the newcomers. Such training represents an important "investment", which, even though it is not included in current measures of output, should boost productivity in the future. Finally, it is largely because of the entry of the baby boom generation and the increasing participation of women that the labor force has grown more rapidly in recent years, rising an average of 2.4 percent annually during 1967-78 compared with its 1.3 percent annual rate of increase during 1948-67. Such a large increase in the availability of workers, even after taking quality changes into account, may have reduced employers' needs to invest in new labor-saving (*i.e.*, productivity-enhancing) plant and equipment to meet demands for output.

The construction productivity decline

The currently popular hypotheses cited above do not seem to explain adequately the 2 percent average annual *drop* in construction productivity since 1967. This represents a reversal from its *positive* growth in excess of 2 percent per year during 1948-67. This dramatic turnabout in construction accounts for a large part of the aggregate productivity slowdown

during the last decade. Construction employment and the use of construction materials have continued to grow at roughly their earlier rates of increase. It is particularly puzzling, therefore, that, despite this continued growth of labor and materials, construction industry output has actually fallen slightly during 1967-78 after rising at over 4 percent annually during 1948-67.

It is true that the rate of capital formation was especially slow, and the average age of the work force in construction dropped during 1967-73. But, even though the growth of the capital stock slowed, it at least kept pace with the increase in employment during 1967-73. These developments may help explain why the growth of construction productivity has slowed, but they do not seem to account for why it has declined so dramatically.

One possibility is that bad data have overstated the extent of the construction productivity reversal, but it remains unclear how important a factor this has been. A recent Commerce Department study concluded that, while the construction productivity data are far from perfect, it is still not apparent why any of the procedures used to construct the data would have generated a spurious sudden change from positive productivity growth to productivity decline.¹¹ On the other hand, separate survey evidence is collected by the Labor Department on the manpower requirements for various types of construction, and these surveys consistently have shown that the employee hours required for given amounts of construction have diminished in the past decade. This seems to contradict the usual data showing that construction productivity has actually declined, although other, technical differences in the two sources of data may help account for their different findings.¹²

Conclusion

The slowdown in United States productivity growth during the past decade defies simple explanation. A number of interrelated developments have probably

affected productivity growth. Capital investment has lagged significantly relative to the growth of employment. Other factors, such as the completion of the farm-to-nonfarm shift, energy problems, government regulatory practices, and changes in the work force may have affected productivity growth directly or through their effects on capital investment. Even taken as a group, however, these developments do not seem to provide a sufficient explanation for the whole slowdown. The sharp reversal in construction productivity, for example, has been a major factor depressing the overall average rate of productivity growth since the late 1960's. Yet why this turnabout in construction has occurred, or indeed to what extent it merely reflects bad data, is still largely a mystery. It is also somewhat puzzling that productivity growth has held up so well in the manufacturing sector. Why have the factors retarding productivity growth elsewhere in the economy not affected manufacturing similarly? Or, if they have, what offsetting positive developments have kept manufacturing productivity growth on course?

Although our understanding of the productivity slowdown is still far from complete, it is safe to assume that the basic ingredients needed to improve future productivity have not changed. An increasingly skilled work force is, of course, one key item for advancing productivity, and the aging of today's relatively young, inexperienced workers should provide a more capable labor force in coming years. Important challenges remain, however, especially the need to insure an adequate growth of innovative, productive capital investment. One barrier to investment that should be overcome is the decreased profitability of capital resulting from the interaction of the tax system with high inflation. As discussed elsewhere in this issue, the shift in the composition of investment toward shorter lived assets is also in part a product of taxes and inflation and, to the extent this is so, this shift may have further retarded productivity. It is also essential that government regulatory practices be made reasonably efficient, although this in itself will not eliminate some of the basic economic trade-offs involved in protecting the environment or the health and safety of workers. Improving our productivity growth may prove difficult, but it is of fundamental importance for achieving a rising real standard of living, along with reasonable price stability.

Paul Bennett

¹¹ H. Kemble Stokes, Jr., "An Examination of the Productivity Decline in the Construction Industry", Office of the Chief Economist, United States Department of Commerce (March 1979).

¹² The Labor Department surveys of manpower requirements do not cover all categories of construction activity, and the output concept used in them includes the costs of materials and supplies, which have been increasing relatively rapidly.