Remarks by

Alan Greenspan

Chairman, Board of Governors of the Federal Reserve System

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I am pleased to have the opportunity to be with you this evening and to take this occasion to step back from the day-to-day concerns of monetary and regulatory issues and consider a number of the longer-run forces that have been shaping the U.S. economy. In particular, I want to focus on some broad considerations that I believe to be important in assessing the prospects for sustained economic growth and rising standards of living, and the opportunities which beckon us all. But first I would like to address some of the longer-term concerns of many Americans.

Somewhat surprisingly, despite the unambiguous evidence of recent economic improvement, there continues to be deep-rooted foreboding among a number of American families that current and future generations will not live as well as previous ones. In a recent Los Angeles Times poll, for example, nearly half of the respondents indicated that they expected that the next generation of Americans would face a worse standard of living than we have now. Similarly, in a recent NBC/Wall Street Journal poll, more than two-thirds did not feel confident that life for their children's generation will be better than it was for them.

Such expectations are not only surprising but clearly too pessimistic because they imply that productivity—that is, output per worker—may actually fall over the coming years. Such an event is highly unlikely, short of a dismantling of part of our physical capital facilities. How then can one explain these professed longer-term fears?

The most likely cause is the clear evidence that the distribution of family income has become more dispersed in recent years, which means that a significant part of our population is lagging behind the improved standards of living of the majority of our families. It is doubtless these lagging elements of our society which are expressing long-term concerns, or those who fear they will fall into
that group. The increased income dispersion of recent years is a reversal of the
trend toward more equal distribution that characterized the first two decades after
World War II in our nation. The variation in the distribution of family income in the
United States, overall, since 1947 has not been dramatic, and some have argued that
the 1960s was an aberration and that current distributions are closer to historical
norms. Nonetheless, in the early postwar era, gains in real income (i.e., income
adjusted for inflation) were fastest for low-income families, in the more recent
period, not only has the entire distribution been rising slowly, but gains for low and
middle income families have lagged.

The United States does not appear to be alone in having experienced
sluggish gains in real earnings and some widening in the dispersion of income in
recent years. The phenomenon has evidently occurred in other industrialized
countries, such as Canada, Germany, Sweden, and Australia. This would suggest that,
in seeking to discover the factors underlying this development, we should be examining
global, fundamental forces.

From the U.S. experience, it is obvious that education and skill is an
important aspect of the story. In the past decade in particular, those individuals
with less formal education and skill realized significantly lesser gains in real
income than those who had more education and were more highly skilled. This explains
why a significant part of our work force has experienced a decline in real earnings
and a retardation of living standards even as underlying levels of average real income
for the nation as a whole were still rising.

These developments in wages and income, while a bit disturbing, should
not be too surprising when one considers the profound changes in technology that have
affected production and labor markets over the past several decades.
More specifically, we have experienced a pronounced rise in that part of the value of economic output that is conceptual rather than physical. The form of the output and the means of production have become increasingly less physical or tangible. The weight of our gross domestic product today measured in tons is only slightly higher than several decades ago. The huge rise in the real value of output since then is the result much more of ideas than of the exploitation and fabrication of physical resources. Because the accretion of knowledge is, with rare exceptions, irreversible, this trend almost surely will continue into the twenty-first century.

The changes in what we usually view as physical product have been dramatic. The purpose of production, of course, has remained the same—that is, to serve human needs and values. But output of comparable utility now generally has less bulk and weighs less. Our radios used to be activated by large vacuum tubes, today we have pocket-sized transistors to perform the same function. Thin fiber optics have replaced huge tonnages of copper wire. Advances in architecture and engineering, as well as the development of lighter but stronger materials, now give us the same working space but in buildings with significantly less concrete, glass, and steel tonnage than was required in an earlier era. The process is interactive. The development of the insights that brought us central heating enabled lighter-weight apparel fabrics to displace the heavier cloths of the past. The breakthroughs in medical research that have revolutionized health care are only the beginning of a long and growing list of almost wholly conceptual elements in our economic output.

The increasing substitution of concepts for physical effort in the creation of economic value also has affected how we produce that economic output. The use, for example of computer-assisted design systems, machine tools, and inventory control systems. Offices are now routinely outfitted with high-speed information-processing technology. Even the physical quantity of goods consumed in
creating economic services has changed. Financial transactions, which were historically buttressed with reams of paper, have been progressively reduced to electronic signals, although the rise in the volume of activity has kept the use of paper growing.

Economic value has always reflected relative locations. Coal in London was always of more value than coal at Newcastle. The quintessential production of value in the United States at the turn of the twentieth century was the combining of vast quantities of iron ore from the Mesabi range with the coals of western Pennsylvania to make steel in the Pittsburgh district.

The comparable value creation at the turn of the twenty-first century will surely be the transmission of information and ideas, generally over complex telecommunication networks, where their new location will have added to economic value in the same manner that ore moved from the Mesabi did a century earlier or coals from Newcastle centuries before that.

Hence, as one might expect, the downsizing of economic product has also affected world trade. International trade in, say, construction gravel or scrap metal is limited by weight or bulk. High-value computer components, in contrast, are major and increasing factors in world trade. Obviously, the less the bulk and the lower the weight, the easier goods are to move, particularly, the easier they are to move across national boundaries. Thus, we should not be surprised to find that, after we adjust for average price changes, pounds shipped per real dollar of both exports and imports have declined roughly 3 to 5 percent per year since 1970. The downsizing of our imports is, of course, a reflection of the extent to which conceptualization is also dominating the economies of our trading partners.

The growing contribution of intellectual products to output has largely been reflected in the explosive growth in information-gathering and processing.
techniques, which have greatly extended our analytical capabilities and have had enormous consequences for virtually all facets of our economic lives. For instance, the proportion of workers directly using a computer at work jumped from one-fourth to one-third in just the five years from 1984 to 1989 and has doubtless increased further since then. More broadly, over the past decade, the growth in demand for workers who can efficiently absorb information and perform analytical tasks apparently outstripped the growth in supply. In the statistics on wages and labor market experience, we saw a rise over that period in the monetary returns to those individuals with higher levels of education and skill training.

This shift is not simply a change in the composition of production and employment away from goods-producing industries and toward the service sector. Neither is it a consequence of changes in the demand for our goods in world markets. Indeed, the relatively strong growth in demand for workers with conceptual skills compared with the demand for those with physical skills has been occurring in all types of industries, even manufacturing. A half century ago, for example, to move heavy coils of steel strip around a plant often required a good deal of human brawn. Today, instructions transmitted through a computer keyboard will accomplish the same task.

The ease and speed of technology transfer across national boundaries, as well as among domestic industries, has been another important aspect of the changing economic environment. Producers in other industrialized countries, by maintaining rapid rates of capital formation and having the flexibility to innovate quickly, have been able to capitalize on knowledge developed by themselves and others. As a result, they now compete successfully with U.S. firms in high-technology products. And among the developing countries, advances in automation have allowed producers to equip their
low-wage work forces with modern machinery and to become highly competitive in many areas, including consumer electronics, steel, and textiles.

In this environment, America's prospects for economic growth will greatly depend on our capacity to develop and to apply new technology. Admittedly, our ability to retain control over new ideas and products has become more difficult because of the rapid international diffusion of technology. But we have not fallen behind in converting scientific and technological breakthroughs into viable products.

Crucial to this end is the incentive to risk-taking which has always been at the root of our economic success. Indeed, risk-taking is a necessary condition for wealth creation. In a market economy, competition and innovation interact, those firms that are slow to innovate or to anticipate the demands of the consumer are soon left behind. The dynamics of the American economy are truly impressive. Capitalist market economies such as ours are driven by what Professor Joseph Schumpeter, a number of decades ago, called "creative destruction." By this he meant the continuous obsolescence and abandonment of goods and services, replaced by newer ways of doing things, newer products, and novel engineering and architectural insights. The result has been an economy of continuous retirement of factories and equipment and a reshuffling of workers to new and different activities. Indeed, what is not fully understood about the American economy is the extent to which it "churns" as new activities and new jobs continuously displace older ones. Indeed, it is nothing short of startling to realize that in the United States approximately 300,000 workers a week lose their jobs or are laid off, matched normally by a somewhat higher figure of newly created job openings.

Such job turnover is facilitated by the extraordinary large number of new small businesses that come into existence every week and month, offset by a comparable number of establishments that fail, down-size through mergers, or are otherwise
abandoned Market economies in that sense are continuously renewing themselves. Innovation, risk taking, and competition are the driving forces that propel standards of living progressively higher.

The pace of churning differs by industry, but it is present in all. At one extreme, firms in the most high-tech areas must remain constantly on the cutting edge, as products and knowledge become rapidly obsolete. Many products that were at technology's leading edge, say five years ago, are virtually unsalable in today's markets. In high-tech fields, leadership can shift rapidly. In some markets where American firms were losing share just a few years ago, we have regained considerable dominance. In one case, U.S. firms have seized a commanding lead in just four years in the new market for notebook computers, and accounted for almost 70 percent of U.S. sales in 1993, nearly four times the figure for Japanese firms.

More generally, it appears that the pace of dynamism has been accelerating. As one indication, the average economic life expectancy of new capital equipment has been falling. The average life of equipment purchased in 1982, for example, was 16-1/2 years. By 1993, that figure has declined to 14-1/2 years, a drop more than twice as large as that over the preceding decade. In addition, telecommunications technology is obviously quickening the decision-making process in both financial and product markets.

In such a rapidly changing marketplace, the agile survive by being flexible. One aspect of this flexibility has been the spread of "just-in-time" inventory controls at manufacturing firms. Partly as a result of innovations in inventory control techniques, the variability of inventories relative to total output appears to be on a downtrend.

In this dynamic environment, the attainment of rising living standards in the future for all our people depends critically on our ability to increase
productivity growth, and that will require greater amounts of investment—in human capital and in research and development, as well as in the more tangible plant and equipment.

Regarding human capital, workers who are better educated and are equipped with the skills to deal with complex problems or processes generally can adapt more readily to the changing demands of the economy. They can switch jobs more easily, and they tend to spend less time unemployed. In coming years, we should see some increment to the growth rate of productivity simply from the aging of the work force and the accompanying shift to a mix of workers with more years of experience. But, with conceptual advances likely to continue, an increasing proportion of workers will need to be equipped with the ability to apply new ideas and processes in their work.

To some extent, the diffusion of the resultant technological advances throughout various types of economic activity should be speeded by the development of ever more user-friendly applications.

We probably all have had some experience with the diffusion of technology and with its effect on our productivity. I can recall when routine statistical analysis, arguably of economic value, required the programming effort of a trained technician and the use of a considerable amount of computation time. Indeed, I remember a generation ago devoting hours in the development of a detailed Fortran code that would then be fed into the huge mainframe computer next door. Today, thanks to the development of high-level applications software and the increased power of computers, similar calculations are done daily in a manner of minutes on desktop PCs by students with only a marginal understanding of the complex process they are initiating.

The economic value of expanding user-friendly applications is manifested in the extraordinary rise in the stock market values of software firms over the past
Such applications enhance the marginal productivity of lesser skilled workers, enabling them to produce, and be paid for, increasingly higher value-added products. Part, but only part, of this higher value added has accrued to the producers of software, and the expected future increases have become embodied in their current equity prices.

Despite the pronounced advances in computer technology, it is becoming increasingly evident that human intelligence, no matter how unskilled, can accomplish tasks and make judgments that no computer can replicate. Thus, the possibilities of producing higher value products from lesser skilled people raises the intriguing possibility of a significant slowing or even a reversal of the income dispersion of recent decades.

In addition to enhanced human capital, we must be willing to maintain a high level of business investment in order to outfit our productive facilities with the most up-to-date technology and machinery. But here, too, until recently the trends have not been favorable for the United States. During the 1980s and early 1990s, investment net of depreciation—that is, the portion of investment spending that actually adds to the nation’s capital stock—declined noticeably as a share of net national product. But fortunately the effect that this decline had on our productive capacity has recently begun to be offset by increased productivity of certain types of short-lived equipment such as computers, that is, the quality of investment has apparently been adequate recently to demonstrably speed the growth of productivity.

To be sure, the productivity payoff from increased investment in computers and related technologies has been slow in coming. But as Professor Paul David, an economic historian at Stanford University, has pointed out, the same thing could have been said at the turn of the century with regard to the electric dynamo.
It was not until some forty years after the first central electric power stations began operating in New York that more than half of the nation's factories had been electrified. The delayed productivity payoff from computers has been shorter than that, but the message from our experience with the dynamo is instructive. To paraphrase Professor David, the diffusion of technology is a complex, dynamic process, but ultimately it can lead to the successful transformation of an entire range of productive activities in a way that will render them palpably more efficient.

In closing, I would like to note that I was brought up in an age when Americans could seemingly do anything we put our minds to. Even during difficult times, American attitudes have traditionally been characterized by a buoyancy that seems to be lacking at the moment.

Many of the challenges that we face today have evolved from the rapid changes in the economy of recent years—intensified international competition, spreading deregulation, technological advances, and financial innovations. All such changes in the structure of the economy naturally create frictions and human stress, at least temporarily. As those frictions dissipate, however, I have no doubt that the economy will emerge healthier. And, if we are able to boost our investment in people, ideas, processes, and machines, the economy can operate more effectively as it adapts to change. This would create an even greater payoff of a broadly based rise in living standards over the longer run. I trust that as such trends become increasingly evident, the current fears of the future among a significant segment of our population will fade and the optimism that has characterized Americans through the generations will again become predominant.