

## Alan Greenspan: Technological innovation and the US economy

Remarks by Mr Alan Greenspan, Chairman of the Board of Governors of the US Federal Reserve System, before the White House Conference on the New Economy, Washington, D.C., held on 5 April 2000.

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It has become increasingly difficult to deny that something profoundly different from the typical postwar business cycle has emerged in recent years. Not only has the expansion reached record length, but it has done so with far stronger-than-expected economic growth. Most remarkably, inflation has remained subdued in the face of labor markets tighter than any we have experienced in a generation.

While there are various competing explanations for an economy that is in many respects without precedent in our annals, the most compelling appears to be the extraordinary surge in technological innovation that developed through the latter decades of the last century. In the early 1990s, with little advance notice, those innovations began to offer sharply higher prospective returns on investment than had prevailed in earlier decades.

The first sign of the shift was the sharp rise in capital investment orders, especially for high-tech equipment, in 1993. This was unusual for a cyclical expansion because it occurred a full two years after the trough of the 1991 recession.

By 1995, the investment boom had gathered momentum, suggesting that earlier expectations of elevated profitability had not been disappointed. In that year, with inflation falling, domestic operating profit margins started to rise, indicating that increases in unit costs were slowing. These developments signaled that productivity growth was probably beginning to move higher, even though official data, hobbled by statistical problems, failed to provide any confirmation. Now, five years later, there can be little doubt that not only has productivity growth picked up from its rather tepid pace during the preceding quarter century but that the growth rate has continued to rise, with scant evidence that it is about to crest.

The acceleration of productivity stemming from the investment boom has held cost increases in check. Despite the surge in demand, unit labor costs over the past year have barely budged, and pricing power has remained well contained. Apparently, firms hesitate to raise prices for fear that their competitors will be able to wrest market share from them by employing new investments to produce at lower costs.

Indeed, the increasing availability of labor-saving equipment and software, at declining relative prices and with improving delivery lead times, is arguably at the root of the loss of business pricing power in recent years. To be sure, marked increases in available global capacity and the deregulation of key industries have removed bottlenecks and increased the competitive supply response of many economies, especially ours, and these developments have been influential in suppressing price increases.

It would be an exaggeration to imply that, whenever a potential cost increase emerges on the horizon, a capital investment is available to quell it. Yet the veritable explosion of spending on high-tech equipment and software, which has raised the growth of the capital stock dramatically over the past five years, could hardly have occurred without a large increase in the pool of profitable projects available to business planners.

As our experience over the past century and more attests, such surges in prospective investment profitability carry with them consequences for interest rates, which ultimately are part of the process that balances saving and investment in a non-inflationary economy. In these circumstances, rising credit demand is almost always reflected in an increase in corporate borrowing costs and that has, indeed, been our recent experience, especially in longer-dated debt issues. Real interest rates on corporate bonds have risen more than a percentage point in the past couple of years. Home mortgage rates have risen comparably. The Federal Reserve has responded in a similar manner, by gradually

raising the federal funds rate over the past year. Certainly, to have done otherwise - to have held the federal funds rate at last year's level even as credit demands and market interest rates rose - would have required an inappropriately inflationary expansion of liquidity. It is difficult to imagine product price levels remaining tame over the longer haul had there been such an expansion of liquidity. In the event, of course, inflation has remained largely contained.

To be sure, the tripling of crude oil prices has left its mark on "headline" inflation rates and inflicted considerable pain on some sectors of our economy. However, there is little evidence, at least to date, to suggest that oil price increases have started to embed themselves more broadly in the underlying cost structure of American business - that is, beyond the direct effects of the higher energy costs themselves. Nevertheless, despite the very recent declines in the price of oil, there are risks here that need to be monitored closely.

Given the persistent strength of private credit demands, market interest rates would have risen even more were it not for the emergence of a sizable unified budget surplus following a long period of chronic deficits. More recently, the Administration and the Congress have wisely chosen to wall off the surplus in the social security trust fund and to allow it to pay down Treasury debt held by the public. This action will surely contribute to sustaining the rapid private capital formation we have experienced in recent years.

I see no reason that productivity growth cannot remain elevated, or even increase further, to the undeniable benefit of American businesses and workers.

Achieving this outcome, however, requires that imbalances do not arise to drive the expansion off course. Only a balanced prosperity can continue indefinitely; one that is not will eventually falter. A change in market interest rates is an important element of the balancing mechanism of a market economy. Some misalignments have arisen over the course of the expansion. Owing largely to the increased rate of return on capital and a sizable wealth effect, overall demand for goods and services for the past four years has been growing noticeably in excess of the enhanced growth in potential supply, defined as the sum of the growth in the working-age population and productivity. An increasing share of the goods and services required to meet this extra demand has been supplied by net imports, with the remainder the result of an increase in domestic production achieved by drawing down the pool of those we count as officially unemployed and those otherwise available for work.

Short of a significant opening up of our borders to more immigration, an increase in employment beyond the growth of the working-age population is limited to what remains of our shrinking pool of available workers. Although the sum of the unemployed and those not in the labor force but who nonetheless are available for work is still about ten million, the level has been falling steadily. This year, the figure has been lower as a percentage of the population than at any time in the history of this series, which goes back to 1970. Should the pool of available workers continue to shrink, there is a point at which this safety valve for excess demand will effectively close, even in the face of accelerating productivity. We do not know where that point is, but presumably it would occur well before a full depletion of the pool of potential workers. When we reach that point, short of a repeal of the law of supply and demand, the scarcity of labor will almost surely induce a rise in hourly compensation gains that increasingly outpaces an even faster productivity growth - a condition that would cause unit costs to accelerate over time.

Moreover, we do not know how long net imports and US external debt can rise before foreign investors become reluctant to continue to add to their portfolios of claims against the United States. At that point, the safety valve of net imports could narrow or close.

It is conceivable that these two buffers can continue to absorb an excess growth of demand over potential supply for quite a while longer. However, the significant uncertainties surrounding these new economic forces counsel prudence. We need to be careful to keep inflationary pressures contained: The evidence that inflation inhibits economic growth and job creation is too credible to ignore. Consequently, maintaining an environment of low and stable inflation provides the greatest opportunity for the dramatic increases in structural productivity to show through fully into higher standards of living. In that regard, readings from financial markets, despite their recent upheavals,

suggest that participants perceive the most likely outcome to be a gradual adjustment to more balanced non-inflationary growth.

As I have argued previously, a substantial part of the excess growth of demand over potential supply owes to a wealth effect, induced by the rising asset prices that have accompanied the run-up in potential rates of return on new and existing capital. The rise in stock prices, as well as in the capital gains on homes, has created a marked increase in purchasing power without providing an equivalent and immediate expansion in the supply of goods and services. That expansion in supply will occur only over time.

The persuasive evidence that the wealth effect is contributing to the risk of imbalances in our economy, however, does not imply that the most straightforward way to restore balance in financial and product markets is for monetary policy to target asset price levels. Leaving aside the deeper question of whether asset price targeting is an appropriate governmental function, there is little, if any, evidence that monetary policy aimed at achieving that goal would be successful.

The risks of investing in equities come primarily from uncertainty about future earnings and about the rates at which those future earnings should be discounted, and much less from changes in overnight interest rates, the principal tool of the central bank. Consequently, even if we were to foster somewhat larger movements in short-term rates to address changes in stock prices, I doubt that investors' perceptions of equity risks would be much affected and thus that equity prices would be meaningfully influenced. In short, monetary policy should focus on the broader economy and on pending inflationary or deflationary imbalances. Should changes in asset prices foster economic imbalances, as they appear to have done in recent years, it is the latter we need address, not asset prices.

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In the economy overall, one result of the more-rapid pace of information technology innovation has been a visible acceleration of the process of "creative destruction", a shifting of capital from failing technologies into those technologies at the cutting edge. The process of capital reallocation across the economy has been assisted by a significant unbundling of risks in capital markets made possible by the development of innovative financial products, many of which themselves owe their viability to advances in information technology.

There are few, if any, indications in the marketplace that the reallocation process, pushed forward by financial markets, is slowing.

While growth in companies' projected earnings has been revised up almost continuously across many sectors of the economy in recent years, the gap in expected profit growth between technology firms and others has persistently widened. As a result, security analysts' projected five-year growth of earnings for technology companies now stands nearly double that for the remaining S&P 500 firms.

To the extent that there is an element of prescience in these expectations, it would reinforce the notion that technology synergies are still expanding and that expectations of productivity growth are still rising. There are many who argue, of course, that it is not prescience but wishful thinking. History will judge.

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Before this revolution in information availability, most 20th-century business decision-making had been hampered by pervasive uncertainty. Owing to the paucity of timely knowledge of customers' needs and of the location of inventories and materials flowing throughout complex production systems, businesses required substantial programmed redundancies to function effectively.

Doubling up on materials and people was essential as backup to the inevitable misjudgments of the real-time state of play in a company. Decisions were made from information that was hours, days, or even weeks old. Accordingly, production planning required costly inventory safety stocks and backup teams of people to respond to the unanticipated and the misjudged.

Clearly, the remarkable surge in the availability of more timely information in recent years has enabled business management to remove large swaths of inventory safety stocks and worker redundancies. That means fewer goods and worker hours are absorbed by activities that, while perceived as necessary insurance to sustain valued output, in the end produce nothing of value.

These developments emphasize the essence of information technology - the expansion of knowledge and its obverse, the reduction of uncertainty. As a consequence, risk premiums that were associated with many forms of business activities have declined.

In short, information technology raises output per hour in the total economy principally by reducing hours worked on activities needed to guard productive processes against the unknown and the unanticipated. Narrowing the uncertainties reduces the number of hours required to maintain any given level of production readiness. Because knowledge is essentially irreversible, much, if not most, of the recent gains in productivity appear permanent.

Expanding e-commerce is expected to significantly augment this trend. Already major efforts have been announced in the auto industry to move purchasing operations to the internet. Similar developments are planned or are in operation in many other industries as well. It appears to be only a matter of time before the internet becomes a prime venue for the trillions of dollars of business-to-business commerce conducted every year.

Not all technologies, information or otherwise, however, increase productivity - that is, output per hour - by reducing the inputs necessary to produce existing or related products. Some new technologies bring about new goods and services with above-average value added per workhour. The dramatic advances in biotechnology, for example, are significantly increasing a broad range of productivity-expanding efforts in areas from agriculture to medicine.

Indeed, in our dynamic labor markets, the resources made redundant by better information are being drawn to the newer activities and newer products, many never before contemplated. The recent biotech innovations are most especially of this type, particularly the remarkable breadth of medical and pharmacological product development.

One less welcome by-product of rapid economic and technological change that needs to be addressed is the insecurity felt by many workers. This stems, I suspect, from fear of job skill obsolescence. Despite the tightest labor markets in a generation, for example, more workers currently report in a prominent survey that they are fearful of losing their jobs than was reported in 1991, at the bottom of the last recession. The marked movement of capital from failing technologies to those at the cutting edge has quickened the pace at which job skills become obsolete. The completion of high school used to equip the average worker with sufficient knowledge and skills to last a lifetime. That is no longer true, as evidenced by community colleges being inundated with workers returning to school to acquire new skills and by on-the-job training being expanded and upgraded by a large proportion of American business.

It is not enough to create a job market that has enabled those with few skills to finally be able to grasp the first rung of the ladder to achievement. More generally, we must ensure that our whole population receives an education that will allow full and continuing participation in this dynamic period of American economic history.

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In summary, we appear to be in the midst of a period of rapid innovation that is bringing with it substantial and lasting benefits to our economy.

But policymakers must be alert to the full range of possible outcomes. In the end, I do not believe we can go far wrong if we maintain a consistent, vigilant, non-inflationary monetary policy focused on achieving maximum sustainable economic growth, a fiscal policy that produces substantial saving to accommodate investment in productive capital, a trade policy that fosters international competition through broadened market access, and an education policy that ensures that all Americans can acquire the skills needed to participate in what may well be the most productive economy ever.