

Alan S. Blinder

The Internet and the New Economy

The generally superior macroeconomic performance of recent years—especially the more favorable combination of low inflation, low unemployment, and the apparent acceleration of productivity growth—is commonly attributed to the effects of information technology (IT) in general, and of the Internet in particular. This paper examines the evidence for and against the following four propositions:

- Productivity growth in the U.S. economy has speeded up.
- Advances in IT are the driving force behind this acceleration in productivity.
- Because of faster productivity growth, the U.S. economy can now sustain a higher growth rate without suffering from higher inflation.
- The Federal Reserve should therefore pursue a looser monetary policy than it would with slower productivity growth.

In brief, are we in a New Economy?

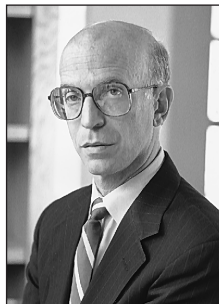
It is impossible to make a definitive judgement until sufficient time passes to gain some historical perspective, but some evidence points to a recent acceleration of productivity growth—and therefore, of sustainable Gross Domestic Product (GDP) growth—at about the time the Internet was diffusing rapidly through the economy. At minimum, that's an interesting coincidence.

Why the Fascination With Productivity?

Why are economists preoccupied with a concept as abstract as “productivity?” Don't real people care about more concrete things like jobs and wages? The answer is yes—and no.

To be sure, the growth rate of labor productivity is the primary determinant of how fast real wages can and will grow in the long run. The nation's output is divided into labor compensation and profits (in reality, there are other pieces, but these are the two that matter for present purposes). If real wages grow faster than productivity, the profit rate will get squeezed. In a capitalist system, neither that pattern, nor one where real wages grow more slowly than productivity, causing the profit rate to rise, can go on indefinitely.

In the long run, productivity growth and real wage growth must correspond. Since most people receive the lion's share of their incomes from wages and salaries, the growth of real wages is the principal deter-



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How Information Technology Has

minant of how fast standards of living will rise. Productivity is no abstract number. In the long run, it is the name of the game.

Adding the growth rate of hours of work to the growth rate of output per hour demonstrates how rapidly our economy's capacity to supply goods and services—often called the trend growth rate—is increasing. For example, with annual productivity growth of 2.5 percent and labor force growth of 1 percent, the economy's trend growth rate would be 3.5 percent per annum.

The central job of monetary and fiscal policy is to manage the demand for goods and services so as to keep it in line with the economy's capacity to supply. If demand, measured by real GDP, falls short of capacity (which is sometimes called "potential" GDP), the economy develops what is politely called "slack," and what is less delicately called unemployment. If demand exceeds supply, the economy is said to "overheat," leading to higher inflation. The trend growth rate, then, essentially sets the economy's long-run "speed limit"—3.5 percent in the above example. This number is among the most important pieces of information the Federal Reserve must know (or, rather, must estimate) in order to conduct monetary policy. Productivity growth is the crucial ingredient.

How To Boost Productivity Growth

To raise labor's productivity, a society can do one or more of these three things:

1. Improve the quality of its workforce through education and training.
2. Equip its workers with more and better capital.
3. Improve the technology, so that given inputs produce more output. This, of course, is where information technology comes in, and it is where I will focus.

Studies dating back to the 1950s have consistently shown that technology is the primary driver of productivity gains. Starting in about 1973, the technology-based part of productivity growth (economists call it "total factor productivity," or TFP) slowed dramatically, from about 1.9 percent between 1948 and 1973, to only 0.2 percent from 1973 to 1997, the last year for which government statistics are available. The numbers reveal a striking coincidence: the productivity slowdown begins almost exactly at the time the personal computer was invented!

No one quite knows why productivity growth slowed down so much, although many partial explanations—higher energy costs, lagging investment, and deterioration in the skills of the average worker—have been offered, and no one blames the computer. Since there is no widely accepted theory for why growth suddenly slowed, it should not be surprising to find it speeding up again. Perhaps that is happening now.

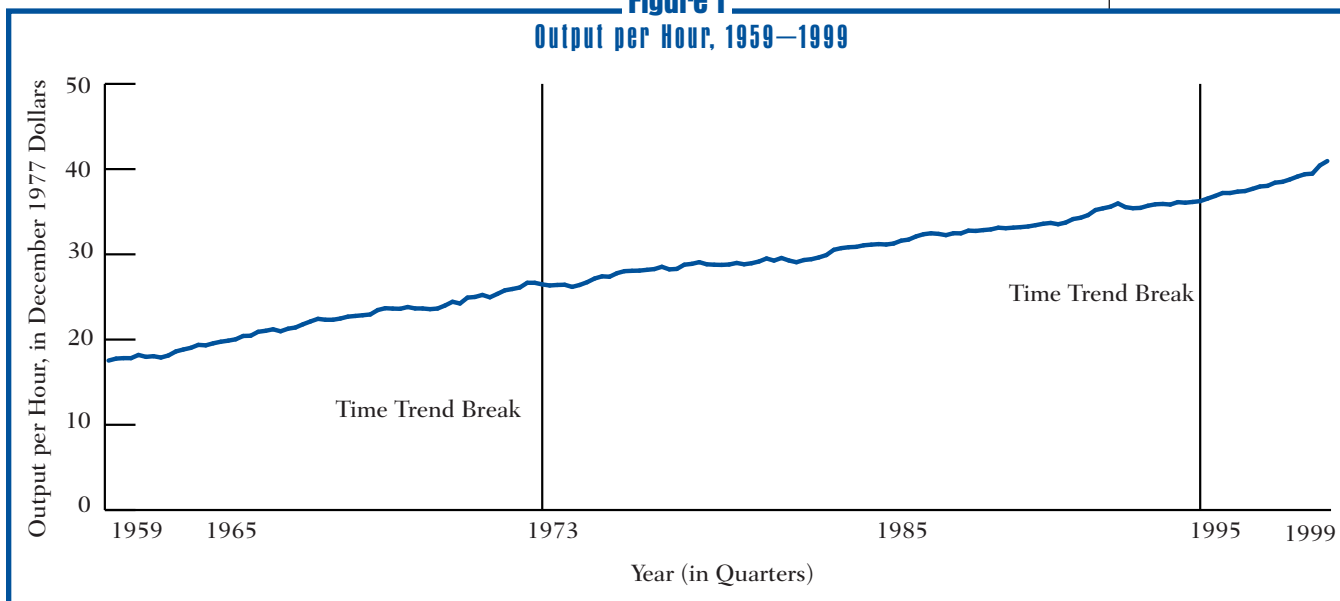
Affected American Productivity

Information Technology and Productivity

These days, when people think of “high tech” they typically think of computers and the Internet. But history reminds us of two things. First, even today there are other important sources of

Figure 1

Output per Hour, 1959–1999



technological improvement. Biotechnology, for example, is beginning to deliver on its promise. Even old-line industries like steelmaking, automobile assembly, and textiles have registered notable technological gains in the last 10 to 15 years (aided, of course, by computers). Important as it is, information technology is not the whole show.

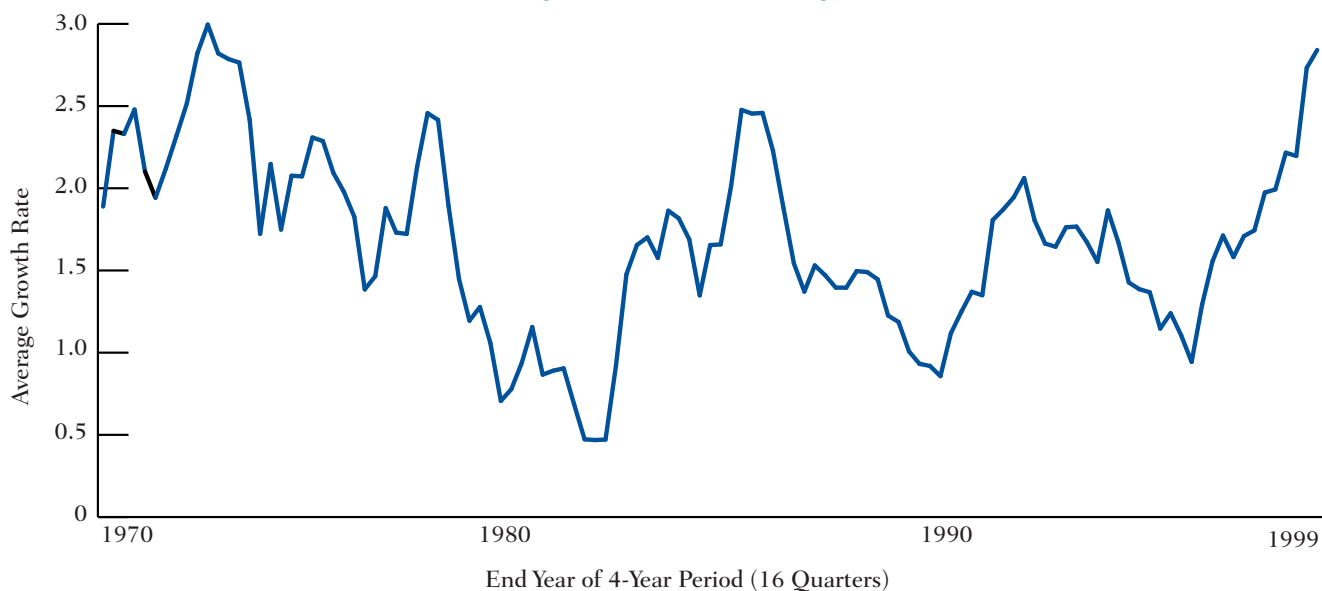
Second, better information technology is nothing new—it has been improving for centuries. The Internet can be seen as the latest step along a path that began with movable type, and progressed through other forms of technology, including the typewriter, the telephone, radio, television, photocopying, and fax machines. In 1866, for example, the laying of transatlantic cable reduced the time it took to send a message from New York to London from about a week to a few minutes. No modern technological innovation has, or likely will, come close to such a gain!

Let's return to the post-1973 productivity slowdown mentioned earlier, and to the question of whether productivity growth has speeded up recently. Figure 1 displays the productivity data from 1959 through 1999, and shows a downward deflection of the productivity trend where the first vertical line is drawn (in 1973). Productivity growth averaged 2.94 percent per annum before mid-1973, but only 1.41 percent after that. Thus, the conventional view among econo-

mists for years has been that productivity growth mysteriously slowed down around 1973. No convincing explanation has ever been offered.

Figure 2

Four-Year Average Growth of Productivity, 1970–1999



As computers improved and became ubiquitous in the 1970s and 1980s, economists waited to see the wonders of computing influence national productivity, but it did not happen. This surprising phenomenon came to be called “the computer paradox” after Robert Solow’s famous 1987 quip: “We see the computer age everywhere except in the productivity statistics.”

Cause for Optimism

There is a reason for optimism lately. For example, in the four years ending in the fourth quarter of 1996, productivity growth averaged 0.9 percent per annum; but in the four years ending in the third quarter of 1999, it averaged 2.7 percent per annum—triple the rate of the previous four-year period.

It is not evident in figure 1 that the productivity trend line has turned upward. A statistical test suggests a notable upward deflection of about 1 percentage point, but figure 2 shows that we have experienced comparable events before. It displays average (annualized) productivity gains over overlapping four-year periods starting in the fourth quarter of 1970. The last number (2.73 percent) is indeed a big one, and the rise since 1996 looks impressive.

Similar surges in productivity can also be found in 1990–1992, 1983–1986, and 1977–1978. But they all followed recessions, when businesses expand output rapidly without hiring many new workers. And the surges were all subsequently reversed. Only one of these events (1983–1986) was as big as what we have witnessed recently. Although we cannot yet confidently

assert the beginning of a new, higher trend, the recent data lend support to that conclusion, especially since the recent productivity surge is not part of the “bounceback” from a recession.

Suppose productivity really has accelerated. Is the Internet the main factor behind this phenomenon? During the time of the “computer paradox,” American businesses invested in ever more powerful and cheaper computers for two decades with no apparent productivity gains. But now we may finally be seeing some dividends on these investments. What changed?

One possible answer, which will be received with cheers and nods by industry enthusiasts, is the Internet. One theory is that all these high-speed computers required greater interconnectivity before they could really boost productivity on a national scale—and the Net has now provided the missing link. This “Internet hypothesis” is plausible, and while history may ultimately prove it, we must wait some years in order to gain historical perspective.

There are at least two competing explanations of the recent productivity data, only one of which contradicts the Internet hypothesis:

1. *The Diffusion Hypothesis:* Paul David of Stanford University reminded us that several decades passed before the technology of the electric dynamo diffused enough to significantly raise industrial productivity. But once the new technology spread and people learned how to use it, things really took off. David suggested nearly a decade ago that such diffusion delays might explain the computer paradox, and Federal Reserve Board Chairman Alan Greenspan has endorsed this hypothesis on several occasions. The diffusion hypothesis does not necessarily contradict the Internet hypothesis—interconnectivity may have been the vehicle through which diffusion finally took place.

2. *The Concentration Hypothesis:* Robert Gordon of Northwestern University has argued that the entire acceleration of productivity growth—which he estimates to be about 0.6 percent per year once measurement changes and cyclical influences are accounted for—can be traced to the computer manufacturing industry. This one industry, while just a small piece of the overall economy, has produced a genuine productivity miracle since about 1995. If Gordon is correct, all the computer-using industries together, which comprise virtually the entire U.S. economy, have displayed no net productivity acceleration at all. That appears to be bad news for the Internet hypothesis, which emphasizes the gains from using computers, not in manufacturing them. But even Gordon’s hypothesis is consistent with a New Economy view of the productivity acceleration. After all, what’s more “New Economy” than the computer industry?

Finally, let us ask an important conceptual question: How would improvements in information technology be expected to boost productivity, and how central should the Internet be to achieving these gains? The basic idea is that advances in information technology make more information available faster and cheaper, and that better, more timely information leads to better business decisions. That all rings true, but let’s try to be more specific.

One way in which computerization has revolutionized business practices is by creating improved inventory control. When businesses can control their inventories more tightly, they save interest and storage costs and may also reduce incidents of depleting stock. The Internet also clearly improves communication between buyers and sellers up and down the business food chain. But with a few prominent exceptions, inventory costs are not a major share of total costs for most businesses, and so potential savings are limited.

The application of Internet technology that has received the most public attention is, of course, merchandising to consumers. Names like Amazon.com, eBay and eToys are among the marquee Web sites of the New Economy. Electronic commerce was essentially zero until 1995, and even in the first quarter of 1998, e-commerce totaled only \$16.5 billion, according to the Center for Research on Electronic Commerce at the University of Texas. In the first quarter of 1999, however, the Center estimates that e-commerce reached \$37.5 billion. E-commerce is currently growing at a mind-boggling rate.

Retailing over the Internet may offer many benefits to consumers, such as easier comparison shopping, removal of travel costs and 24-hour availability. But such gains will never be counted in GDP, and so will never appear in the productivity statistics. Gains are recorded only to the extent that Internet sales reduce firms' costs. Given the heavy start-up costs, advertising budgets, and well-publicized losses of online retailers, it is not clear that such savings have, in fact, been realized.

The Internet may offer the greatest productivity benefits in the harder-to-measure sphere of business-to-business commerce, where many companies claim that putting their supply chains online has led, or will lead, to major cost savings. If these claims—which come from industrial giants like IBM, Ford, and General Motors—are correct, such savings would be captured in the productivity statistics. For example, if Internet technology enables firms to produce the same volume of output with fewer purchasing agents and middle managers, productivity will rise.

Implications for Policy

The presence of the Internet and information technology raises two distinct but related questions that are central to the formulation of monetary policy:

- Has the economy's sustainable growth rate—the so-called speed limit—been raised? And might it go even higher?
- Has the lowest unemployment rate consistent with stable inflation—the so-called NAIRU (Non-Accelerating Inflation Rate of Unemployment)—been reduced? And if so, how far?

The speed limit: As noted earlier in this paper, an acceleration in the rate of technological progress would obviously boost the economy's long-run growth rate. Until recently, there was no evidence that any lasting acceleration had in fact occurred. Now there is real evidence that the economy's sustainable growth rate has moved up, but it takes a long time to recognize a change in a long-term trend! For years after the 1973 productivity slowdown, for example, economists,

policymakers, business executives, and workers continued to base decisions on what we now realize was an excessively optimistic estimate of the productivity trend. As one concrete example of the large errors that can be made when perceptions lag behind reality, it has been argued that the Federal Reserve pursued a highly inflationary monetary policy in the 1970s largely because it overestimated the productivity trend.

What might happen if the productivity growth trend falls, but neither labor nor management recognizes that for a while? If wage agreements continue to be based on an assumed productivity trend of, say, 3 percent, but actual productivity growth falls to 1 percent, then unit labor costs will rise 2 percent faster than either labor or management expected. The overestimate of productivity growth will lead first to excessive real wage agreements (relative to productivity) and then to higher costs and inflation. Firms will react by reducing employment and raising prices at the same time. This scenario helps explain the stagflation of the 1970s.

Now turn the logic around. If productivity growth speeds up, but people do not know it, wage agreements will come in too low (relative to productivity), thereby lowering business costs. Employment should also expand since labor gets cheaper (again, relative to productivity). This scenario may explain part of the fabulous macroeconomic performance of the late 1990s: an unrecognized productivity acceleration led to both higher employment and lower inflation.

The NAIRU: It is a bit harder to understand why improvements in information technology should reduce the NAIRU permanently. Electronic bulletin boards and other informational devices might reduce the frictions involved in matching workers to jobs. More generally, advances in information technology make it possible to shift some economic activities to locations where labor is more readily available; e.g., programmers can be hired in Bombay rather than in Palo Alto. But it is hard to believe that such effects could be quantitatively large on an economy-wide basis.

Consider, however, two believable scenarios that might produce a transitory decline in the NAIRU. One is the misperception scenario just described. If actual productivity grows faster than perceived productivity, the economy will experience a surprisingly favorable combination of stable inflation and low unemployment. In the data, it will appear as if the NAIRU has declined. But as perceptions adjust to the new, faster pace of productivity gains, the apparent NAIRU should return to normal. Similarly, if the Internet intensifies price competition, it could depress inflation, but only for a period of time. Could such a return to normalcy be in store for the United States?

This analysis points to the following tentative conclusions for monetary policymakers:

- The current revolution in information technology may indeed have accelerated the nation's productivity growth. If so, the Fed should allow the economy to grow faster than it would with a lower productivity trend. Chairman Greenspan has explicitly acknowledged this point, and the Fed seems to have behaved accordingly.

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- However, actual economic growth has clearly exceeded any reasonable estimate of the new higher “speed limit” for several years now. We know this because the unemployment rate has been tracking down steadily—a sure sign of above-trend growth.
- Although the U.S. economy has not suffered any increase in inflation despite an unemployment rate below 4.5 percent for more than a year now, an unrecognized acceleration of productivity may have reduced the NAIRU only temporarily. If so, the apparent NAIRU will return to a more normal value as perceptions catch on to the new reality.

Conclusion

In sum, we have a tantalizing fact—that productivity accelerated at just about the time the Internet burst on the scene. Whether or not the Internet was the cause of the speedup in productivity growth will be a matter for economic historians to sort out some years from now; there are competing explanations. For now, however, it appears that the economy can sustain a higher growth rate than most people thought plausible just a year or two ago. In that limited respect, at least, we appear to be in a “New Economy.”

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