For **PAFTAD 27**
Canberra, Australia
August 20-22, 2001

What's New in the New Economy?

Richard N. Cooper
Harvard University

The "new economy" has become a buzzword to characterize the American economy, with positive connotations but imprecise meaning. Sometimes it is used to refer only to selected high technology sectors, specifically computers, semiconductors, software, and telecommunications. But usually the term implies significant changes in the US economy as a whole. At its most dramatic, the term suggested that the traditional business cycle has been banished, inflation and unemployment have been brought forever under control, US long-term growth rates have increased significantly, and the high-value stock market was not over-valued and indeed would continue to rise.

More modestly, it suggests that the structure of the US economy has changed fundamentally, with the implication, inter alia, that monetary and fiscal measures affect the economy differently from the way they did in the past. Finally, it suggests that US productivity growth has returned to, or at least toward, the high levels it enjoyed in earlier years, before the slowdown of the mid-1970s.

This paper will discuss the factual bases for conjecturing that the United States might indeed have a "new economy," review the controversies and evidence surrounding that claim, and suggest how the emergence of a "new economy," if indeed there is one, might affect economies elsewhere in the world, including the Asia-Pacific region.

Evidence for a New Economy

Four factors in particular suggested that the US economy might have experienced fundamental changes during the late 1990s. The first was the long period of uninterrupted growth following the recession of 1990-91. GDP passed $10 trillion during 2000 and in that year showed the longest period of growth since adequate data have been available, surpassing the previous long recovery of 1961-1970. Since the historical "business cycle," a period of economic downturn, occurred every three to four years, this long period of growth suggested that perhaps at least the traditional business cycle had been banished. Various reasons, emphasizing especially better management of inventories by business firms, were advanced to explain why this might be so.

The second development was the decline in US unemployment from 7.5 percent in 1992 to 5.6 percent in 1995 -- a normal economic recovery -- followed by continued decline to 4.0 percent in 2000 -- a rate that had not been seen since the

Vietnam boom years of the late 1960s, when it was associated with a significant acceleration of inflation, to 6.2 percent increase in the consumer price index (cpi) in 1969. Yet in the late 1990s, in contrast, inflation remained relatively low and under control, rising to 3.4 percent in 2000 as measured by the cpi, 2.4 percent if food and energy are excluded, and 2.3 percent for the implicit deflator on consumption in the national income accounts. This suggested that an important alleged macroeconomic characteristic of the economy, the so-called non-accelerating inflation rate of unemployment (nairu) might have declined significantly.

A third development was the unexpected increase in productivity growth that occurred in the mid 1990s. That such an increase occurred is not in serious dispute; but controversy surrounds the magnitude of the increase, the scope of the increase, interpretation of the increase, and the durability of the increase. In particular, to what extent, if at all, did it signal a rise in the long-term potential growth of the US economy?

A fourth development was the rise in equity valuations significantly above historical norms -- as related, for instance, to book values or to corporate earnings -- and their persistence despite protests by many stock analysts, economists, and even Federal Reserve chairman Alan Greenspan, who complained as early as December 1996 of the "irrational

exuberance" of the stock market. Again, controversies surrounded interpretation of the high stock valuations, and their durability. (See Table 1 for various economic indicators, 1989-2000.)

Popularization of the "new economy" reached its peak in 1999 and early 2000. Excessive enthusiasm was dampened by a cooling of the stock market in the third quarter of 1999. This was followed by some recovery into early 2000, and then a dramatic 20 percent drop in April in the index of Nasdaq stocks, which was dominated by high tech and especially information technology (IT) stocks. Growth of the economy slowed dramatically in the second half of 2000 and into 2001. Nasdaq stocks continued to tumble, reaching less than 40 percent of their peak value by April 2001. The more representative S&P 500 index fell to 80 percent of its April 2000 peak in April 2001. These declines scotched any notion that stock prices would climb forever, although even in mid-2001 their values exceeded most historical norms. Moreover, by mid-2001 economic recession (= two successive quarters when GDP declines in real terms) was seen by some observers as a live possibility, although a downturn had been avoided with growth of 1.0 percent in the first half of the year, and most forecasters foresaw a recovery in the second half and into 2002. (Industrial production, however, had declined for nine successive months from the third quarter of 2000.)

The decline in growth and the decline in stock prices were seen as desirable corrections by most analysts. Indeed, the Federal Reserve had been trying to engineer a decline from the vigorous growth of the preceding several years, and especially from mid-1999, since five percent or more was considered well above the growth potential of the US economy, unemployment continued to fall, and inflation was an ever-present danger, although not yet evident. The Fed-targeted Federal funds rate (ffr, the rate for bank reserves in the interbank market) was intermittently raised from its recession low of 3 percent in 1993 to 6.5 percent in late 2000, with a brief dip in fall 1998 to help avert a financial crisis. In his July 2000 testimony to Congress, Federal Reserve chairman Alan Greenspan stated "For some time now, the growth of aggregate demand has exceeded the expansion of production potential...It has been clear to us that, with labor markets already quite tight, a continuing disparity between the growth of demand and potential supply would produce disruptive imbalances." Thus the slowdown per se was not an indication that the US economy was performing badly, contrary to what was assumed by financial journalists and others around the world. Nonetheless, it gainsaid the most exuberant claims for a new economy.

Changes in Macroeconomic Structure?

That the US economy should have grown so rapidly, and unemployment fallen so far, without triggering a significant rise in inflation was a surprise to many (most?) analysts. On relationships that had obtained since the late 1960s, a sustained drop in unemployment below five percent should have led to a significant rise in wages and, through wages, to an acceleration of price inflation. This in turn would have led an inflation-fighting Federal Reserve to tighten credit conditions enough to thwart the inflation, thus curtailing growth.

As noted above, the Federal Reserve did tighten credit significantly during the late 1990s, with a brief reversal in fall 1998 to deal with the credit market panic associated with the Russian default on government debt and the near failure of Long-Term Credit Management -- at least as measured by its operational instrumental variable, the Federal funds rate. Moreover, the growth of M1 (= currency, travelers checks, and checkable deposits) -- a measure of monetary policy stance preferred by some economists -- was actually negative in each of the years 1995-97, leading some monetarists to forecast that the Federal Reserve was leading the US economy into recession. However, broader definitions of the money supply, M2 and M3 (which augment M1 by including savings and small time deposits and retail money market funds (M2), plus large time deposits, institutional money market funds, repurchases,

and eurodollars, respectively), both grew robustly, M2 by over five percent annually and M3 by over seven percent annually in 1997-99, leading some critical observers to argue that the Federal Reserve was unwittingly feeding the stock market boom.

In fact, as Chairman Greenspan emphasized in his semi-annual statements to Congress, the Fed was watching the actual and prospective rate of inflation. Monetary policy was nudged tighter (as measured by the Federal funds rate) in order to discourage the acceleration of inflation, after adjusting for special pressures, up or down, arising from food and oil prices. Rapid growth and declining unemployment resulted from this process, rather than being taken in themselves as decisive signals that monetary policy needed to be tightened further.

Fiscal policy, it should be noted, was not actively used following the tax increases of 1993, designed to reduce the large budget deficit that continued from the early 1980s. It has been argued that that fiscal tightening, combined with continued restraint on spending increases, permitted the Federal Reserve to be more relaxed about monetary policy than it would otherwise have been, and in addition facilitated a decline in long-term interest rates, from over 8 percent on the ten-year government bond in 1990 to under 6 percent a decade later, despite rapid economic growth. Indeed, with rapid growth in the economy, the Federal budget moved into

surplus in 1998, the first since 1969. Growing budget surpluses were significantly blunted by a slowdown of the economy as well as by a tax reduction in spring 2001, providing some fiscal stimulus in the second half of that year.

Did the drop in unemployment to four percent without noticeable inflation signify a major change in the structure in the US economy? In particular, a decline in the non-accelerating inflation rate of unemployment (Nairu)? Or a durable shift in the Phillips curve relating inflation to unemployment?

The US Congressional Budget Office has calculated a Nairu for the US economy over the past four decades. It shows very little change, rising slowly from 5.5 percent in 1962 to just over 6 percent in the late 1970s, and slowly falling to 5.5 percent in the late 1990s (reported by Brainard-Perry, 2001, p.62). These movements reflect mainly demographic changes, with many more young people entering the labor force in the late 1970s than before or since. Robert Gordon's (1998, p.321) estimations show modestly greater decline in Nairu, from 6.4 percent in 1988 to 5.7 in 1998 for the GDP deflator.

How can these calculations be reconciled with experience in the late 1990s? Unemployment was under 5.5 percent -- mostly substantially under -- after late 1995, which with a Nairu of 5.5 percent should have generated accelerating

inflation. The cpi did rise from a 2.5 percent increase in 1995 to 3.6 percent in 1996, but then registered increases of only 1.7, 1.6, and 2.7 percent in the following three years. It rose by 3.4 percent in 2000, suggesting some acceleration after 1998. But if food and energy are excluded, on the grounds that their prices are exceptionally volatile and determined largely in world markets, inflation was a full percentage point lower in the last years of the decade, with unemployment around 4 percent, than they were in 1991-93, when unemployment exceeded 6 percent.

Wage settlements conform more closely with the expectation based on Nairu, allowing for lags: compensation per hour in the business sector grew by around two percent in 1994-95, three percent in 1996-97, and five percent in 1998-2000, a clear acceleration. However, much of this increase came from the movement of labor into higher-paying jobs: wage and salary increases, controlling for shifts among occupations and industries, rose only one percentage point between 1994-95 and 1998-2000, from 2.8 percent annually to 3.8 percent (another 0.8 percentage point came from increases in fringe benefit costs). Rich and Rissmiller (2001) report that they can find no significant shift in their equations for estimating aggregate wages over the period 1967-2000. In other words, the structure of the labor market with respect to wage determination does not seem to have changed appreciably -

- at least on one specification for wage determination, which includes growth in labor productivity. They conclude that any shift in the inflation-unemployment trade-off occurred outside the labor market.

Robert Gordon (1998) has emphasized the importance of positive supply shocks, of which he identifies five: improved food and energy prices, a fall in import prices (due in part to appreciation of the dollar), an acceleration in the decline of computer and related prices, a slowdown in the rise of health care costs, and improvements in the measurement of price increases. Allowing for these five factors, however, goes only a little more than half way toward explaining the "shortfall" in inflation in the late 1990s.

One possible reconciliation of the apparent breakdown of inflationary expectations based on conventional Nairu under low unemployment is that productivity growth jumped unexpectedly in the late 1990s, allowing somewhat higher wage settlements with no increase in unit labor costs, thus no inflationary pressures on product prices. Indeed, as Table 1 suggests, productivity growth was notably higher during the period 1996-2000 than it had been earlier. According to this thesis, advanced by CEA (2001, pp.73-74), the increase in productivity growth was unexpected, hence not taken into account in wage bargaining, either by labor or by employers. If the higher productivity increases continue, they will cease

to be unexpected, and wage settlements can be expected gradually to incorporate the higher productivity growth. Thus Nairu was only temporarily reduced by the unexpected growth in productivity; it can be expected to return to its normal, higher level as the new data are incorporated into wage bargaining.

An alternative explanation is that Nairu does not exist, or rather is not stable over time, and hence does not provide a useful parameter either for policy-making or for understanding the performance of the American economy. Brainard and Perry (2001) have examined the determination of US wages and prices over the period 1960-1998, using a variety of statistical techniques (recursive regression, contemporary and backward Kalman filters).[1] They conclude that Nairu is not only not useful; on the (slowly changing) CBO version it would have provided extremely poor policy guidance during most of the period they examined, where policy-makers are assumed to be interested both in keeping inflation low and in maintaining high employment and output.

Concretely, they find (pp.54) that the unemployment rate consistent with maintaining low inflation rises substantially from 1965 to a peak in 1980, and then recedes by 1998 to levels slightly above those in the late 1960s. This is of course a descriptive statistic, and can be interpreted (as Taylor, 2001, points out) as shifts in the Phillips curve over

time, first rightward, then leftward. A key question is to what extent those shifts are endogenous to inflation itself, and to perceptions of policy toward inflation.

A third possibility, suggested by James Stock in his comments on Gordon (1998), is that the Phillips Curve collapsed altogether in the 1990s -- that is, became horizontal. His tests suggest a sharp break in the unemployment-inflation relationship in early 1993, consistent with a flat curve thereafter. Another way of putting it is that unemployment has ceased to be a good measure of tightness of aggregate demand in the economy, due possibly to changes in the labor market, possibly to other changes in the structure of the economy.[2] The Phillips curve after all is an empirical relationship between two endogenous variables, not well grounded in theory, and such empirical relationships can be expected to change over time, or even disappear altogether.

Is one of the attributes of the "new economy" that monetary policy works differently? Boivin and Giannoni (2001) report that output seems to have become less sensitive to ffr, but they find no evidence that firms and households had become less sensitive to changes in interest rates (their analysis, however, extends only through 1995). The Fed has responded more quickly to changing economic conditions in recent years, which arguably has reduced variability of output and inflation, as observed by Taylor (2001). But the shocks were

also notably lower during the 1990s than they were in earlier decades (Mankiw (2001)).

Monetary policy (in the form of changes in the federal funds rate, ffr) is usually assumed to influence the US economy through three channels: lower ffr reduces borrowing rates, thereby stimulating investment and consumption; depreciates the dollar, thereby stimulating net exports; and raises asset values, thereby stimulating consumption and, via Tobin's q (= market value of corporations divided by replacement cost of their assets), investment. Bruce Kasman of Chase Bank has analyzed the Federal Reserve macro model, according to which (as reported in The Economist, 6/30/01, p.70) a one-percentage point reduction in ffr will raise GDP by 0.6 percent after one year and 1.7 percent after two years. The January-May 2001 cut by 2.5 percentage points in ffr should lift share prices by 22 percent within a year, depreciate the (trade-weighted) dollar by 5 percent, and reduce long-term bond rates by 0.75 percentage points. By late July, however, despite an additional 0.25 point ffr reduction in late June, the S&P 500 had fallen by 10 percent, the trade-weighted dollar appreciated by 7 percent, and bond and mortgage yields changed little, since the beginning of the year.

With respect to the exchange rate, perhaps foreigners now expect stock prices to rise following a decline in the ffr,

and therefore buy rather than sell dollars, despite lower short-term yields. That would represent an important change in behavior, particularly if it were symmetric, and would weaken the impact of a given change in the ffr on the economy.

A Wide and Durable Rise in Productivity Growth?

As noted, US growth accelerated in the late 1990s, to over 4 percent a year in 1995-2000, before slumping to below one percent in the first half of 2001. These figures were significantly above the previously assumed potential growth of the US economy of 2-2.5 percent a year. Of course, unemployment fell by 1.4 percentage points during this period, permitting growth higher than potential. Somewhat more than half of the increase in GDP from the early 1990s can be explained by increased inputs of labor and conventional capital. But total factor productivity growth jumped considerably, to three times its average over the period 1973-1995 (see Table 2).

These developments raise several questions. First, are the measurements accurate, or is there possibly a problem of mis-measurement? Second, if the measurements are broadly correct, how can the acceleration in growth be interpreted, and in particular how durable is it likely to be? Third, particularly if it is judged to be durable, what is the explanation for the acceleration? In this section we take up

each of these questions in turn.

Measurement. It is well known that measuring productivity growth in a modern complex economy is a difficult assignment, and with the gradual switch of the labor force from production of goods to production of services the task has become increasingly difficult, because of the difficulties of measuring the real output in many service sectors, e.g. education or health.[3] Indeed, in the education sector the government statisticians do not even try to measure real output; output is measured by inputs, and productivity growth is assumed to be zero. The situation is nearly as bad in several other sectors (including customized software).

Sectors where output is measured primarily or exclusively by input account for 23 percent of US GDP (Landefeld and Fraumeni, 2001, p.29) This measurement problem, incidentally, is directly related to the measurement of price increases in a modern economy, since to calculate real output increases in the value of nominal output are deflated by measured price changes. The Boskin Committee in 1996 reckoned that the US consumer price index exaggerated average price increases by over one percentage point a year -- implying, if correct, that US growth was significantly understated. Since then, the Bureau of Labor Statistics (which is responsible for the cpi) has made a series of adjustments that have lowered the US inflation rate by about 0.45 percentage points a year. (The

relevant figures cited in Tables 1 and 2 involve the new, revised figures, so these measurement issues do not resolve the question; in Jorgenson's (2001) view, however, true (constant quality) price reductions are understated both for some software and for some communications equipment.)

Nordhaus (2001) has produced figures on what he considers "well-measured" GDP, that is, GDP less those sectors where measurement of real output is especially problematic. It includes the goods producing sectors, transportation and utilities, and wholesale and retail trade, together accounting in 1999 for 43 percent of GDP; it excludes construction; finance, insurance, and real estate; other services; and government. Growth in labor productivity in well-measured GDP was both higher and accelerated even more rapidly than that in total GDP, from 2.24 percent annual growth in 1990-95 to 4.65 percent in 1996-98 (Nordhaus, Table 7).

Nordhaus has also identified another, more subtle measurement problem. In measuring sectoral growth consistent deduction needs to be made of inputs into each sector. This is not typically done in the official US figures, which measure sectoral outputs from production (or sales) and sectoral inputs from income earned. The error would be negligible if both output and income were accurately measured, since in a consistent set of accounts total income must equal total output, after appropriate allowance for the necessary

adjustments, e.g. business taxes. But because of errors of measurement total income does not in fact equal total output. In recent years measures of income have exceeded corresponding measures of output.[4] Calculating business sector labor productivity growth consistently using income data also shows even greater acceleration in labor productivity than do the official figures, from 1.26 percent in 1990-95 to 3.16 percent in 1996-98 (Nordhaus, Table 6).

Thus the official measures that provide the factual basis for most quantitative discussions of the "new economy" if anything understate the acceleration of US growth in recent years. (For a discussion of measurement issues by two of the officials responsible for compiling US GDP, see Landefeld and Fraumeni, 2001.)

Scope and Durability. If the change is real, how widespread is it, and how durable is it? These questions arise especially because of the claims by Northwestern economist Robert Gordon (1998, 2000) that the productivity growth has shown extraordinary concentration in just a few sectors, notably semi-conductors, computers, and computer-associated equipment. US prices of these items are measured on an "hedonic" basis -- that is, on the basis of characteristics useful to users, such as computational speed and memory capacity -- and have shown extraordinary declines over the past two decades. The price declines accelerated in

the mid-1990s, e.g. for computers from declines of 16 percent a year in 1990-95 to 32 percent a year in 1995-99 (Jorgenson, p.10). Since total demand has continued to grow, "real" output (= index of total demand deflated by index of price changes) has shown extraordinary growth. While these sectors comprise only a small portion of expenditure in the US economy, the growth has been so great as to affect total growth.

While productivity growth showed some acceleration in other sectors as well, Gordon deemed such acceleration to be barely more than what could be accounted for as the impact of a boom in demand, with output rising more than employment when demand is high. Several analysts have explored Gordon's claim that exceptional productivity growth was concentrated in relatively few sectors. Using just his well-measured output, Nordhaus (2001, Table 11) finds a near doubling of labor productivity between 1990-95 and 1996-98, from 1.60 percent to 3.09 percent, even when the information technology sectors (computers, software, and telecommunications) are excluded. Within manufacturing, the acceleration is heavily concentrated in machinery, both electrical and non-electrical, but wholesale and retail trade also experienced large increases (Nordhaus, pp.43-47).

Kevin Stiroh (2001) found that after 1994 productivity growth by sector was highly correlated with earlier IT

investment in the 61 sectors he examines. In other words, IT-using sectors also experienced high productivity growth, not just IT-producing sectors. Indeed, in comparing 1995-99 with 1987-95, IT-using sectors -- which make up nearly two-thirds of the economy -- accounted for the bulk of the growth in average labor productivity, whereas non-IT-intensive sectors actually showed some slowdown in productivity growth in the second period under comparison (Stiroh, Table 8). On this evidence, the productivity acceleration is intimately linked to information technology, partly in IT-production, but mainly in earlier investment by other sectors in information technology. Oliner and Sichel (2000) also found productivity increases in many IT-using sectors.

With respect to durability, that of course can be tested only after the passage of time. Empirical work cited here ended in 1998 or 1999. Overall productivity growth in 2000 was even greater than that in earlier years; but this slowed markedly (to 2 percent) in the second half of 2000, and still further (to 1.4 percent) in the first half of 2001. That is normal following a decline in demand, since production falls before labor is shed, resulting in a slowdown in recorded labor productivity growth, or even a decline. If demand resumes its earlier growth, this slowdown is transitory; if weak demand continues, firms in the United States gradually shed labor, such that productivity is restored after several

quarters. Thus a test of the durability of the increase in productivity growth will come only when growth in aggregate demand recovers, presumably in 2002.

We now know that some of the extensive late 1990s investment in IT, especially in numerous so-called dot.coms, was quite foolish, made possible by a ready availability of venture capital. Thus not all IT investment has a high payoff, and indeed in mid-2001 there was something of a glut of "used" IT equipment on the market, as failed firms liquidated their recently acquired assets.

It is noteworthy, however, that a number of analysts have raised their estimate of the long-term growth rate for potential output of the US economy. The Council of Economic Advisers (2001, p.78) suggests that average labor productivity in the non-farm business sector will increase by 2.3 percent a year over the period 2000-2008, up from 1.4 percent in the period 1973-1990 and 2.2 percent over the decade of the 1990s. When augmented by the anticipated growth in the labor force, potential GDP is expected to grow by 3.4 percent a year over the next decade (actual GDP may grow by somewhat less because of a rise in unemployment to five percent). Data Resources Inc. (DRI), a highly reputable forecasting firm, has also raised its estimate of potential growth to 3.4 percent a year -- roughly a percentage point higher than it was considered to be in the mid-1990s.

Explanations. Firm explanations for the rise in productivity must await information on how durable the rise proves to be. But it is possible to speculate on why such a rise might have occurred when it did.

It is widely recognized that cheap, widely available computational power, particularly when combined with inexpensive communication, represents a new general purpose technology -- analogous to the historical introduction of steam power, steel, electricity, and plastics and other man-made chemicals. Such new technologies change radically the way economic activity is carried out. But it takes time, perhaps a generation or two, for such new technologies to be fully absorbed by the economic and social structure. Partly this is because the introduction of a new technology involves much new investment, as yet not fully tested. Partly it is because mature human thinking and especially human organizations have high inertial resistance to radically new ways of doing things. Partly it is because new technologies involve taking financial and career risks that are not fully understood, inducing a cautious approach to their introduction.

Significant improvements in computation and in communication date from the early 1970s, followed by a constant stream of innovative products, including the personal computer (which today has computational power in excess of

mainframe computers twenty-five years ago, at a tiny fraction of the cost) and the internet. Robert Solow famously lamented in 1987 that "we see computers everywhere but in the productivity statistics." Computers were already in widespread (but not universal) use, yet they were not fully integrated into use in the important sense that their potentialities were not fully utilized. Realizing the full potential of a new technology involves not merely introducing the new technology physically, but re-organizing the flow of work, and even the output of the enterprise, to take full advantage of the new technology.

Paul David (1990) makes the useful analogy to the introduction of electricity in the late 19th century. Initially electricity was viewed simply as a substitute source of power, replacing steam engines or water wheels, and of illumination, safer than the gas that was widely used in American and European cities. But it was not until the 1920s that electricity was well integrated into the firm, making it much cleaner and quieter as the motive power was distributed to the work place through wires rather than through the belts, pulleys, and gears that had attended single-source steam or water power.

Perhaps an analogous process is taking place with information technology. Investment in the equipment is a necessary but by no means a sufficient condition for full

integration of the new technologies. At first personal computers often simply substituted for typewriters, worsening secretarial efficiency while she mastered the word-processing program, improving secretarial efficiency (e.g. in making text corrections) thereafter. Full integration requires supplemental improvement through associated innovation (e.g. better software, modems, printers, etc.), new investment, training and re-training, re-organization of the work place, and even re-organization of the firm.

Risk averse management is unlikely to take all the steps required, unless compelled to do so through competitive pressure. In time the new technology will be fully integrated, largely because older management is gradually replaced by people who have grown up with the new technology, thus are both aware of its potential and accustomed to it. Hence a generation-long process of integration.

The process of full integration can be accelerated by high competitive pressure, leading firms to a constant search for ways to reduce costs, improve products, and otherwise appeal to customers. Thus the competitive environment is important, as is the availability of capital, particularly risk capital. In these respects the United States perhaps has an edge on other countries. While de-regulation has been widespread during the past decade or two, it generally occurred in the United States with less concern for protecting

the profits and employment of firms in the industries being de-regulated, hence compelling the firms to adapt or go out of business. For example, America's international flagship air carrier for nearly five decades, Pan American Airways, no longer exists; it went bankrupt, as did several railroads. Few countries have been willing to see that occur. America's once near monopoly telephone company, AT&T, now operates in a highly competitive environment, such that even its survival can be questioned. (Neither of these firms, it should be noted, were publicly owned, but both were subject to heavy regulation.)

An important source of competitive pressure has been openness to international trade. In the late 1990s over 60 percent of total US domestic computer purchases were imported, and over half of US computer production was exported (CEA,p.46). Thus American firms must compete with the best and least expensive products elsewhere in the world. There are no import restrictions on computers and related products.[5] (Extremely advanced computers are however subject to export control, thus stimulating development of such products by non-US firms and governments.)

The United States has been fortunate in a period of new general purpose technology to have an abundance of venture capital -- in times of enthusiasm, perhaps even too much. This is partly due to willingness by many Americans to risk

funds for the sake of substantial gain (and the confidence, subject to income taxation[6], they will receive the gain if it occurs); and partly to an institutional framework, largely in the form of investment banks, for evaluating new ventures and investing risk capital in the most promising of them. American firms in the IT sector increased from under 70,000 in 1990 to 150,000 in 1997 (CEA, p.36), many of which had still not made a profit by 2000. The typical pattern is for one or several people with a bright idea to start a firm by drawing on their own time and savings and that of friends willing to invest. When the idea has been developed sufficiently, and inserted into a plausible business plan, they then approach a source of venture capital, which may provide funds (as well as managerial advice) for the several years' effort necessary to develop the idea further, convert it into a marketable product, and generate enough buying customers to run a profit. Once the product develops a good enough reputation (which may occur even before the new firm is profitable), the firm is "taken public" through an initial public offering (IPO), whereby the shares are sold to the general public, under strong SEC rules regarding disclosure, accounting standards, etc. The venture capitalists typically get their return by selling their equity in the firm to the buying public, thus replenishing their venture capital. Especially during late 1999 and early 2000 there were an extraordinary number of

IPOs, raising over $100 billion in the four quarters from July 1999, equivalent to nearly ten percent of total non-residential fixed investment in the United States. (An impressive $40 billion was also raised through IPOs in Japan, Germany, and the United Kingdom during the same period.) [BIS, 2001, p.107]

Implications for the Rest of the World

To appraise the implications of the "new economy" for the rest of the world it is first necessary to discover whether the rest of the world has experienced the improvement in economic performance that blessed the United States. The answer, with the exception of Australia, seems to be negative. Table 3 (from BIS, p.21) reports growth in productivity in the business sector of 14 rich countries for three periods. Among them, only Australia experienced an increase in productivity growth in the second half of the 1990s; indeed, many other countries experienced a marked reduction, both from the early 1990s and especially from the 1980s.

Two other points in Table 3 should be noted. The first is that recorded productivity growth in the late 1990s was nearly as high in several other countries, including Germany and Japan, as it was in the United States. The second is that many other countries showed much greater productivity growth in the 1980s and even in the early 1990s than did the United

States. These observations should, at a minimum, warn against making too sweeping generalizations based on data for just a few years. Furthermore, since the details of price measurement differ from country to country, and in particular many other countries have not adopted the hedonic measures used in the United States, data on price increases, and hence also on productivity increases, are not strictly comparable across countries. In particular, productivity growth in several other countries would be somewhat higher than that recorded in Table 3 if they used hedonic price indices, insofar as they produce in abundance the products -- especially computers and semiconductors -- whose hedonic prices have fallen so rapidly.[7]

Growth in emerging markets was blunted during the late 1990s by various financial crises -- in Mexico, Korea, Southeast Asia, Russia, Brazil -- that also affected their competitors and trading partners. Poland and Vietnam experienced sharp increases in labor productivity between the 1980s and the 1990s, but this was due mainly to a switch from central planning to market pricing. Ireland also experienced a renaissance in economic growth, in which "new economy" factors undoubtedly played some but not the major role. Among larger countries, the United States stands out, with Australia, for its acceleration of growth.

Suppose the higher growth in the United States is not a

fluke, and can be expected to endure for a decade or longer. What then are the implications for the rest of the world?

Higher US Growth. First, of course, the incomes of Americans will grow more rapidly -- on CEA projections, a full percentage point more rapidly. Americans have shown a marked willingness to increase consumption as their incomes rise. Thus US demand for goods and services, including imports, will continue to rise rapidly. In this respect the United States will continue to be a locomotive for the world economy. Of course, output will also be rising by the same amount, so Americans will produce more goods and services, some of which will be desired and competitive in the rest of the world, thus possibly displacing some more traditional products and creating new demands.

Second, the structure of employment and output will change more rapidly in the United States even than it has been changing. Chart 1 (from CEA, p.35) shows the rapid growth in output and employment that occurred in the IT sectors, along with R&D and patent awards. Employment engaged in the production of all goods (agriculture, mining, manufacturing) has already declined to only 17 percent of the labor force in the United States (another five percent is engaged in construction), leaving 78 percent of the labor force engaged in production of alls kinds of "services." The relative decline in manufacturing employment has occurred with no

decline in manufacturing output; indeed, manufacturing production rose by fifty percent from 1989 to 1999. These trends will continue, with machinery continuing to be substituted for labor in goods production. It will not be long before all goods production occurs with less than 15 percent of the labor force.

At the same time, the returns to new capital do not seem to be declining. Technical change is buoying these returns, even as the capital-labor ratio rises. Another way of putting it is the "quality" of new capital is continually improving. Thus the capital-output ratio has been declining in the United States; less new investment is required for a given increase in output. (As shown in Table 2, the US capital stock grew more slowly than GDP since 1973, and increasingly so.) This rise in productivity of capital explains in part how the United States can continue to grow with low savings rates. Gross investment, embodying new, high-yield technology, is much more important for growth than the net additions to the capital stock that have been emphasized by many economists.

Good returns to capital in the United States will continue to draw investment from around the world, where returns are generally lower or (in emerging markets) higher but less reliable. Thus the dollar is likely to remain strong and the large current account deficit is likely to continue for some time -- although not necessarily as strong and as

large as in 2001 (see Cooper, 2001).

The "new economy" also seems to place a premium on education beyond secondary school levels. Over time, the gap between compensation to college-educated employees and high-school-educated employees has grown significantly (although some narrowing occurred in the late 1990s as unemployment dropped to 4 percent), and this growing gap seems to be related mainly to the nature of technical change, which leads increasingly to new capital being a substitute for unskilled labor, but complementary to educated labor. Expertise and reliability are also important, as manifest in increased wage dispersion even within educational or skill or professional cohorts. These developments will encourage labor to upgrade its skills.

International Diffusion of the Technology. If indeed the "new economy" in the United States is due to the arrival and gradual absorption of a new general purpose technology, information technology, its use will gradually spread to the rest of the world. One channel will be foreign direct investment, especially where organizational changes are necessary to utilize fully the new technology. But how rapidly, and with what degree of dislocation, the diffusion occurs will depend on local circumstances, and particularly on the characteristics of labor markets and the business environment.

If firms are protected, whether by import restrictions or through regulatory protection, they are unlikely to feel the pressure to make the efficiency-enhancing changes permitted by the new technology. Export-oriented firms, of course, must do so sooner or later to maintain their international competitiveness.

Optimal use of the new technology requires organizing the work place in new ways. This should not be a great problem for poor or middle-income countries that are developing rapidly, partly by pulling labor in from the countryside. Such labor is relatively flexible. There the problem is likely to be too little educational background for at least some jobs.

In richer countries, with highly structured and better educated urban labor forces, the problem is more likely to be both the entrenched attitudes of organized labor and the framework of regulations and accepted practices that have accumulated over the years to prevent labor from being treated as a "commodity" and being moved around at will by management. Ironically, one characteristic of much new technology is that it is knowledge-oriented, so the protections of labor accumulated through collective bargaining or political action are outdated. High morale and dedication to work, increasingly reinforced by incentive compensation, is often necessary to achieve the high productivity made possible by

the new technology.

Finally, for some activities a high respect for intellectual property is necessary to foster the continual advancement of the new technology, particularly software. Without such respect, reinforced if necessary by legal protection, effort will not be expended to generate the many applications made possible by ever-advancing computational and communications capacity.

Americans have no monopoly on new ideas or on willingness to translate them into lucrative applications. Silicon Valley is properly famous for being a melting pot, bringing together not only Americans but also British, Chinese, French, Germans, Indians, Vietnamese and many other nationalities to translate new ideas into viable applications and successful business ventures.

Chart 1 shows the sharp rise in US patents awarded for information technology applications during the 1990s. What it does not show is that half the awards are to residents of countries other than the United States, up from around a quarter before 1980, i.e. foreign patents in the US have risen more rapidly than awards to US residents. (Japan accounts for more than any other country.)

The framework for business in the United States is especially conducive to innovation. And the US labor market is relatively flexible, at least compared with that in many

other rich countries. Individuals expect to have many different employers during their lifetimes, and will leave jobs that are considered unsatisfactory. For males the average period of employment with the same employer is four years, and lower for females. Moreover, firms are willing to hire older workers when they have the appropriate qualifications; and it is relatively easy to enter self-employment of many kinds (although not necessarily easy to become highly successful doing so!). Unemployment in the United States is relatively brief, except during periods of recession, averaging only six weeks. Finally, temporary and part-time employment have become well established, for men as well as women. In short, the US labor market involves great flexibility, institutionally and attitudinally, both for employees and for employers. These characteristics, incidentally, should be kept in mind when assessing the official "safety net" in the United States, which is seen as weak by many Europeans.

As noted above, the "new economy" may not function optimally without re-organization not only of the work place, but of the organizations which undertake production of goods and services. Under competitive pressure Americans have been undertaking such re-organization, and indeed the late 1990s was a period of unparalleled mergers and acquisitions among firms, both horizontally and vertically. During the same period firms also did an extraordinary amount of

"outsourcing," i.e. buying goods and (especially) services from outside firms that were once provided within the firm, since with new methods they could often be performed more efficiently by specialized independent firms.

These possibilities are likely to arise across national borders as well as within the United States. A reasonable forecast is that international mergers and acquisitions will continue at a high pace while the new technologies are being diffused; indeed, foreign direct investment will be one of the principal vehicles for such diffusion, through what might be called organizational arbitrage. Those countries where resistance to foreign ownership is high will also be creating resistance to the new technologies.

Similarly, outsourcing across national boundaries will become increasingly common, made possible by quick, reliable, and inexpensive long-distance communication, as can be seen in the increasing internationalization of telephone call services. New opportunities will be available for those quick-footed and flexible enough to take advantage of them.

In summary, continuation of the new economy in the United States will affect the rest of the world through many channels: foreign trade, both imports to satisfy growing US demand and exports of new, technology-related products; foreign investment into the United States, attracted by the new possibilities and relatively high returns to capital

there; US investment abroad, a form of organizational arbitrage through mergers, acquisitions, joint ventures, and outsourcing; and more general diffusion of the new ideas through international conferences, professional journals, journalistic reporting, and extensive education abroad, especially in the United States, where over half a million non-residents are studying. Increased education will command a wage premium world-wide, not just in the rich countries; and there will also be a premium on flexibility and adaptability in the regulatory environment, especially with respect to labor and the formation of new enterprises.

At the same time, five years is a short period on which to base sweeping generalizations and lengthy extrapolations into the future. Caution is indicated by recalling that it was barely more than a decade ago that Japanese approaches to production, organization, and management were seen as superior to those elsewhere, and the wave of the future (for documentation and a reasoned assessment of Japan's economic prowess, see NRC,1992). The economic environment can change rapidly, and unexpectedly.

References

Bank for International Settlements (BIS), 71st Annual Report,

Basel, CH: June 2001.

Boivin, Jean, and Marc Giannoni,"The Monetary Transmission Mechanism: Has It Changed?" Federal Reserve Bank of New York, April 2001.

Brainard, William C., and George L. Perry, "Making Policy in a Changing World," in Perry and Tobin; also comments by Ray C. Fair and John B. Taylor.

Cooper, Richard N., "Is the US Current Account Deficit Sustainable? Will It Be Sustained?" Brookings Papers on Economic Activity, 2001 (1).

Council of Economic Advisers (CEA), Economic Report of the President, January 2001.

David, Paul A., "The Dynamo and the Computer: An Historical Perspective on the Productivity Paradox," American Economic Review, May 1990, 80(2), 355-361.

Gordon, Robert J., "Foundations of the Goldilocks Economy: Supply Shocks and the Time-Varying NAIRU," Brookings Papers on Economic Activity, 1998, No.2; and comments by James Stock.

Gordon, Robert J., "Does the 'New Economy' Measure Up to the Great Inventions of the Past?" Journal of Economic Perspectives, Fall 2000, 14(4), 49-74.

Jorgenson, Dale W., "Information Technology in the U.S. Economy," American Economic Review, 91 (March 2001),1-32.

Landefeld, J. Steven, and Barbara M. Fraumeni, "Measuring the New Economy," Survey of Current Business, March 2001, pp.23-40.

Maddison, Angus, The World Economy: a Millennial Perspective, Paris: OECD Development Centre, 2001.

Mankiw, N. Gregory, "U.S. Monetary Policy During the 1990s," in Jeffrey Frankel, ed., American Economic Policy in the 1990s, June 2001.

National Research Council, Japan's Growing Technological Capability: Implications for the U.S. Economy, Washington: National Academy Press, 1992.

Nordhaus, William D., "Productivity Growth and the New Economy," NBER Working Paper 8096, Cambridge, MA, January 2001.

Oliner, Stephen D., and Daniel E. Sichel, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" Journal of Economic Perspectives, Fall 2000. 14(4), 3-22.

Perry, George L., and James Tobin, eds., Economic Events, Ideas, and Policies: the 1960s and After, Washington: Brookings Institution, 2001.

Rich, Robert W., and Donald Rissmiller, "Structural Change in U.S. Wage Determination," Federal Reserve Bank of New York Staff Report No. 117, March 2001.

Stiroh, Kevin J., "Information Technology and the U.S. Productivity Revival: What Do the Industry Data Show?" Federal Reserve Bank of New York Staff Report No. 115, 2001.

Wilson, John Sullivan, "Telemcommunications Liberalization: the Goods and Services Connection," in Gary Clyde Hufbauer and Erika Wada, Unfinished Business: Telecommunications after the Uruguay Round, Washington: Institute for International Economics, December 1997.

Endnotes

1. The Brainard-Perry analysis has been criticized by Fair (2000) for using the cpi as a measure of domestic price inflation, since it includes imported goods; for failing to include productivity in their wage equation, since it is included in the price equation; and for failing to include cost shocks in their analysis. Fair conjectures that a more complete specification would reveal greater stability in the estimated coefficients. Gordon (1998) finds no influence of productivity on wages; Rich-Rissmiller (2001), in contrast, find that real wages are strongly influenced by changes in productivity.

2. Stock (1998, p.340) suggests that capacity utilization rates, new building permits, manufacturing production, employment growth, and trade sales all do a better job at predicting inflation in the mid-1990s than did unemployment rates.

3. In the United States total production of goods -- agriculture, forestry, mining, manufacturing -- now takes only 17 percent of the labor force, with 78 percent devoted to provision of "services" (including government services) -- a collective expression too broad to be very useful -- and five percent in construction.

4. The Council of Economic Advisers (2001, p.78) reports growth in non-farm business output of 4.2 percent annually 1990-2000 using the income-side measurement, 0.3 percent above the official product-based measure.

5. The absence of import restrictions on information technology products was multilateralized in the Information Technology Agreement of 1997, under which the rich countries agreed to eliminate import duties by January 2000 and other signatories in the subsequent five years. See Wilson (1997).

6. The maximum Federal income tax rate from 1993-2001 was 39.6 percent; addition of state income taxes brings this into the mid-40s, after allowance for deduction from Federal taxable income, in those states with income taxes, which include California, New York, and Massachusetts. The top Federal tax rate on capital gains on investments held more than one year was 20 percent in 2001, reduced from 28 percent in 1997.

7. According to Maddison (2001, p.138), hedonic indices are not used by Belgium, Finland, Germany, Italy, Japan, Spain, or the United Kingdom.