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Stanford University, Palo Alto, California
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The U.S. Economic Outlook

It's a pleasure to join you today. I was very pleased when John Shoven asked me to share the dais with John Lipsky to give my views on the U.S. economic outlook and the implications for monetary policy. Let me note that, as always, I am speaking for myself and my comments do not necessarily reflect the opinions of other Fed policymakers.

I appreciate hearing John's views on the real side of the economy. In general, I'm in agreement with him. Over the past year, output growth averaged three and three-quarters percent, modestly above trend, which, by most estimates, is around three and a quarter to three and a half percent. I believe that we have now seen enough positive signs in the economy to have some confidence that it is on course for sustained growth, being supported by accommodative financial conditions and robust productivity growth.

In terms of the labor market, the data have been consistently positive for several quarters. Taking the average over all of 2004, the economy gained 181,000 jobs per month and in January it added another 146,000 jobs. This performance is by no means spectacular, but it is sufficient to conclude that the labor market is gradually firming up. In January, the unemployment rate fell to 5.2 percent, suggesting that at least a bit of slack still remains.

As a Fed policymaker, of course, I'm committed to the dual goals of maximum employment and price stability. Like my colleagues on the Federal Open Market

Committee, my expectation is that inflation will remain well contained, assuming that the economy continues to grow at a pace that is modestly above trend so that any remaining labor market slack is gradually eliminated.

There are a number of risks to this outlook for inflation over the next year or so, but overall, they appear to be essentially balanced. One risk is that there is a good deal of uncertainty about the actual extent of slack that remains in the labor market. Another relates to the possibility of further movements of important relative prices—especially the price of oil and the foreign exchange value of the dollar. A third risk is that firms’ markups of prices over unit labor costs, which are now exceptionally high, could revert to more normal levels. This could result in a significant reduction in the rate of inflation.

Productivity Growth and Inflation

The final risk factor, and the one I’d like to focus on in my remarks today, concerns the pace of labor productivity growth going forward. Productivity growth, of course, matters not just to inflation but also to the long-run prospects for the U.S. economy. I might add that issues relating to productivity are of particular interest to the Federal Reserve Bank of San Francisco. As some of you know, a couple of years ago we established the Center for the Study of Innovation and Productivity at the Bank to explore these very topics.

Several recent developments have raised concerns about a productivity slowdown that could slow economic growth and boost inflation. For example, during the latter half of 2004, the nation’s productivity growth came in noticeably below the astounding rate of nearly four and a half percent in the prior two and half years. In the third quarter, non-farm productivity growth slowed to around one and three-quarters percent, and in the

fourth quarter to only eight-tenths of a percent. Moreover, during the last year, quality-adjusted computer prices haven't been falling as fast as they have for the past decade. That may signal some slowing of technological innovation in this sector. In addition, there is some industry opinion that the pace of software development is beginning to slow.

These developments give us ample reason to think seriously about what the future may hold for productivity growth. But it is also important to put them into perspective. For one thing, productivity growth rates are extremely volatile over periods as short a few quarters, so we shouldn't make too much of the very recent data. More importantly, I want to emphasize that few economists expect the economy to continue to deliver the very fast productivity growth rates we saw in both 2002 and 2003 and in the first half of 2004. Rather, there's some consensus among economists that the *trend* growth rate of U.S. productivity, since the productivity surge began in 1995, is around two and a half percent. That is still a very high number—nearly double what it had been during the quarter century before 1995—with the potential to enhance living standards dramatically in this country if it is maintained in the decades ahead. The real issue from the standpoint of inflation is whether recent developments portend a slowdown in the *trend* rate of productivity growth below a rate of roughly two and a half percent.

Why would a slowdown below two and a half percent likely boost inflation? In theory, there are two counteracting effects. First, a slowdown in the trend rate of productivity growth is likely to raise business costs for a time, because firms would face more rapid growth of unit labor costs. To offset the resulting squeeze on their profit margins, they would need to raise prices more rapidly. Eventually, increases in unit

labor costs are likely to fall back toward previous slower rates as workers are forced to accept lower wage growth to compensate for their slower productivity growth. But during the adjustment period--which can last for a considerable period of time--there is upward pressure on inflation. Of course, by the same token, a rise in the trend growth rate of productivity could lead to downward pressure on inflation for a time.

A slowdown in trend productivity growth would have a second effect which might offset some of the upward pressure on inflation. A productivity slowdown would likely result in slower growth in aggregate demand. Growth in consumer spending would probably weaken as lower business profits limit stock market gains, thereby reducing household wealth. More foresighted consumers might also reduce spending, perceiving that the prospects for growth in real wages are not as bright. Further, lower expected rates of productivity growth should restrain business investment by reducing the prospective return to capital.

The net impact of the two opposing effects of productivity growth on inflation is an empirical issue. My reading of the evidence suggests that the predominant medium-term effect of a slowdown in productivity growth would likely be *higher* inflation.¹ This would seem to be the counterpart to the reductions in inflation that occurred over the past decade, when rapid productivity growth aided the Fed in bringing inflation toward price stability.

So a key issue for inflation going forward is whether the trend growth rate of productivity will remain near its estimated rate of around 2 ½ percent. If so, core inflation seems likely to remain stable, near its current moderate pace. If productivity

¹ For example, this conclusion is supported by simulations of the Federal Reserve Board staff's model of the U.S. economy called FRB/US.

accelerates or decelerates, we could see inflation start to fall or rise relative to the 1-1/2 to 2 percent rate that prevails today. My own view is that the risks surrounding the outlook for productivity are roughly balanced.

Prospects for productivity

To explain why I hold this view, let me start with a brief look at what the sources of productivity growth have been since the surge began in the mid-1990s. There are three basic factors to consider. The first is capital investment—in particular, the pace at which the quantity of capital per worker rises over time. The second is improved labor quality, or human capital—that is, a better educated or more skilled work force. The third factor is called “multifactor productivity,” which I will refer to as MFP for short. As you can tell by its eloquence, this is a term coined by economists. It essentially stands for all the gains in productivity that are not accounted for by either increased capital investment or improved labor quality. It is thought to capture, more or less, the productivity gains that ultimately stem from innovation. For example, it would include the engineering and scientific knowledge that goes into new technology. It also would include improved management processes, such as “just-in-time” inventory management, as well as “creative destruction,” whereby innovative firms expand market share at the expense of less innovative firms.

Economists at the Federal Reserve Board analyzed U.S. labor productivity, looking at the period from 1996 to 2001, when productivity rose to nearly two and a half percent a year, as well as the period from 2002-2004, when labor productivity rose at an annual rate of almost four and a quarter percent.² They found that the initial mid-1990s

² Figures cited update those in Oliner and Sichel (2002).

acceleration in labor productivity reflected in about equal parts an increased contribution of capital investment and an increase in MFP, with little, if any, change in the contribution from worker skill improvements. But the results for the period from 2002 to 2004 were noticeably different. This period, of course, was the worst of the “investment bust,” when business investment actually receded. The study’s results suggest that, over those years, a further acceleration in MFP accounted for *more* than all of the acceleration in labor productivity.

How do we explain the most recent speedup in the pace of labor productivity and MFP growth? One possible answer is that the increase is more apparent than real, and that it soon will be reversed. This argument relies on a link between shaky business confidence and weak hiring. It’s understandable that the investment bust in the last recession, the tragedy of 9/11, the wars in Afghanistan and Iraq, and the corporate governance scandals could have eroded business confidence. And that may have made firms reluctant to take on the long-run commitment of adding workers. This hesitancy could then lead to strong labor productivity growth to the extent that firms have been pushing their existing workers particularly hard and requiring them to put in extraordinary effort. This extraordinary, unobserved effort would raise measured labor productivity and MFP. Presumably, if this story were correct, then when firms regain confidence, they’ll be willing to start hiring again, and the pace of productivity growth will decline.

Frankly, I have my doubts that an unusual degree of worker effort explains much of the strong productivity performance we’ve seen in the past few years. First, if firms were boosting their productivity by making their existing employees work *harder*, you

would also expect that they were requiring them to work longer hours.³ But the admittedly limited data we have--which covers only production and non-supervisory workers--don't show that. Rather, they show that hours per worker have been declining since the late 1990s.

Second, there have been considerable differences across states in labor market performance since 2001, with some states expanding employment and others contracting. If this story linked to unwillingness to hire were quantitatively important, then you might expect to see less productivity growth in states where employment grew more rapidly than in states where employment growth was weak. But an analysis of the data by staff at the San Francisco Fed does not show that. Instead, for the most recent period, it finds essentially no relationship across states between employment (or output) growth and productivity performance.⁴

So, what if we accept that much of the productivity speedup is real—and not merely a mismeasurement of labor effort? What might explain the pickup in labor productivity growth over the past few years? Some recent studies suggest that the answer lies in information technology, where the pace of technological innovation is clearly quite rapid. But its role in the last few years is different from its role in the late 1990s. In that period, studies tend to find that MFP gains in the *production* of information technology contributed substantially to the overall pickup.⁵ In addition, firms invested heavily in

³ Basu and Kimball (1997) provide a formal theoretical derivation of the link; they also provide theoretical support for using the workweek of labor to proxy for unobserved variations in the workweek of capital. Basu, Fernald, and Shapiro (2001) and Basu, Fernald, and Kimball (2004) provide recent econometric estimates of (otherwise unobserved) variations in factor utilization in U.S. data.

⁴ Daly and Furlong (2005).

⁵ See, e.g., Jorgenson and Stiroh (2000) and Oliner and Sichel (2000).

new (and steadily cheaper) information technology, boosting capital investment in industries that used IT intensively.

But for the more recent period, studies tend to find that the MFP acceleration is more broad-based across industries that *use* technology—not confined to the IT-producing sector. For example, the results I cited earlier from Federal Reserve Board economists suggest that the MFP acceleration since 2002 is entirely accounted for (in fact, more than accounted for) by an acceleration in MFP in sectors that *use* information technology. Sectors that *produce* information technology, especially semiconductors, have actually contributed somewhat less to MFP growth in the 2000s relative to the late 1990s.⁶

A mechanism that may explain the continued rise in MFP in sectors that use technology is that firms are learning new and better ways to use technology they already have in place to become more productive. Indeed, some evidence suggests that the extraordinarily high rates of investment in high-tech equipment during the second half of the 1990s actually led to a *reduction* in measured productivity growth over that period. The reason is that firms had to devote a lot of *human* capital and time to learning how to get the most out of it; that is, resources were diverted from current production to installing the new capital and learning how to use it. If firms continue to increase their proficiency in using the technology they already have, this could help keep productivity growing at a robust pace. For example, one of our contacts told us that his law firm had

⁶ That the U.S. productivity acceleration was broad-based is consistent with a growing body of recent work. An early study that made this claim was Basu, Fernald, and Shapiro (2001). Other studies include Council of Economic Advisers (2003), which reports that between 1973–95 and 1995–2002, non-ICT MFP accelerated sharply, with its contribution to U.S. growth rising from 0.18 percentage points per year to 1.25 percentage points. Bosworth and Triplett (2002) focus on the performance of service industries and find a widespread acceleration. Jorgenson, Ho, and Stiroh (2004) also report that TFP accelerated outside ICT production.

recently discovered they could use computer search facilities effectively to look for incriminating evidence in email files; that meant less labor on the project and therefore reduced legal expenses.

Second, a fundamental way that information technology enhances productivity is by allowing firms to reorganize work-place processes. For example, major banks report that, through ongoing use of technology, they have been able to support growth in customers and services with fewer staff. A further example is the continuing expansion of Wal-Mart and other “big-box” stores, a trend that has had a dramatic effect on productivity growth in the retail and wholesale sectors. This process of using information technology to reorganize work processes, of course, takes time. Sam Walton, for example, argued that he benefited in the 1980s and 1990s from knowledge he had accumulated in the 1960s and 1970s, when he flew around the country visiting competing discount stores and attending IBM conferences.⁷

More formally, the growing academic literature on information technology as a “general purpose technology”--a technology that has broad applicability across the economy--suggests that to reap its benefits, firms have to make substantial complementary investments in learning, reorganization, and the like. Hence, the payoff in terms of measured output may be long delayed.⁸ For example, one study finds that in a sample of 527 large U.S. firms from 1987 to 1994, the benefits of computers for output

⁷ See Walton and Huey (1992).

⁸ See, for example, Brynjolfsson and Hitt (2000) and Bresnahan (undated) for a discussion of the kinds of complementary investments and co-invention that firms undertake in order to benefit from ICT, given its “general purpose” attributes. David and Wright (2004) provide a nice historical reflection on general purpose technologies. See also Bresnahan and Trajtenberg (1995), and Helpman and Trajtenberg (1998).

and productivity rise over time and are not fully realized for at least five to seven years.⁹ The authors interpret their results as suggesting the importance of combining computer investments with “large and time-consuming investments in complementary inputs, such as organizational capital.” Another study finds that industries that had high growth rates of information and communications technology capital in the 1980s or early 1990s tended to have faster MFP growth rates in the late 1990s, consistent with the notion that firms were undertaking unobserved investments in organizational capital, which then paid off in terms of measured output and productivity with a long lag.¹⁰ More generally, innovations in information technology appear to have caused ripples of co-invention and co-investment in other sectors, such as retail trade.¹¹

In addition, the general purpose technology literature suggests that the benefits of information technology used by one firm often “spill over” to other firms, which again imparts a lag to the process. For example, successful new managerial ideas—such as those implemented in retail trade—seem likely to diffuse to other firms. Imitation is often easier and less costly than the initial co-invention of, say, a new organizational change, because you learn by watching and analyzing the experimentation, the successes and, importantly, the mistakes of others.¹²

⁹ Brynjolfsson and Hitt (2003).

¹⁰ Basu, Fernald, Oulton, and Srinivasan (2003).

¹¹ Much of Brynjolfsson’s work tries to quantify the role of unobserved complementary capital. Macroeconomic studies of the effects of organizational capital include Greenwood and Yorukoglu (1997), Hornstein and Krusell (1996), Hall (2001), and Laitner and Stolyarov (2003).

¹² Bresnahan (undated) provides a nice discussion of the channels for externalities to operate. Bresnahan and Trajtenberg (1995) highlight both “vertical” externalities (between general purpose technology producers and each application sector) and “horizontal” externalities (across application sectors).

What does this analysis suggest that we should expect going forward? I'm reasonably optimistic. It seems unlikely that the business learning and reorganization that we've been hearing about and that the academic literature emphasizes has suddenly disappeared. My sense is that businesses are still learning what new technologies can do for them.

As I noted earlier, several leading economists suggest that a reasonable estimate for trend productivity growth going forward is about 2-1/2 percent per year.¹³ This is close to the rate of productivity growth that we saw from 1995 to 2001. And although it would represent a slowing of the outsized, and unsustainable, gains we've seen since then, it appears fast enough to maintain the favorable inflation results we've had in recent years. Forecasting is, of course, always uncertain and difficult. But it seems to me that the risks to this expectation are reasonably well balanced.

Monetary Policy

I'll conclude with just a few thoughts on monetary policy. We know that with the federal funds rate at 2-1/2 percent---only about 1 percent or a bit less above the inflation rate---the current policy stance remains accommodative. Over time, the degree of accommodation will have to diminish, with policy reverting toward so-called "neutral" for inflation to remain well contained. It's uncertain exactly what the neutral range is, but a common estimate is 3-5 percent. The Committee has stated for some time that, with underlying inflation remaining low, policy accommodation can be removed at a pace which is likely to be measured. In fact, we have raised the rate by 25 basis points at each of the last six meetings. However, it should be obvious that the closer the actual rate gets to the neutral range, the more carefully we will need to consider each successive increase.

¹³ See, for example, Baily (2003), Gordon (2003), and Jorgenson, Ho, and Stiroh (2004).

In other words, the pace of removing policy accommodation must, in reality, depend on how economic activity and inflation actually develop. Moreover, these developments themselves could affect the Committee's judgment concerning the momentum in aggregate demand or supply and thus the real federal funds rate corresponding to a neutral policy stance.

If the pace of economic activity accelerates and labor market slack erodes more quickly than expected--or if some of the upside risks to inflation materialize—it would probably be appropriate to remove accommodation more rapidly. If, alternatively, the expansion falters or we experience some of the downside inflation risks, there are likely to be more opportunities for the Committee to pause. Of course, we could be confronted with more difficult choices if output growth and inflation moved in opposite directions. In any event, risks to both growth and inflation abound. However, I agree with the Committee's judgment, reiterated in its statement last week, that the upside and downside risks are currently balanced.

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