

Chapter I

Setting the Stage: The “New Economy” Endures Despite Reduced IT Investment

by Lee Price with George McKittrick*

Despite slow growth beginning in mid-2000, outright recession in 2001, and cutbacks in IT investment, the “new economy” appears alive and well as we begin 2002. American businesses are still expanding their use of Information Technology (IT), the economy’s productivity growth has remained robust and supported strong real wage gains for those employed, and inflation has been tame.

This *Digital Economy* report follows in the tradition of previous reports and focuses on the role of IT in the wider economy. This first chapter focuses on recent developments and what they may suggest for the new economy. Placing the 2001 decline in IT investment into perspective, the chapter finds that:

- the current level of IT investment still exceeds the levels prior to 2000;
- the IT capital stock continues to grow;
- businesses increased IT service employment to harness the benefits of IT investments in 2001; and
- IT has supported exceptional productivity gains despite the economy’s slowdown and recession.

The chapter also notes that IT production appeared to be stabilizing by the end of 2001. The continued price declines and high rate of obsolescence for IT products are widely expected to generate a rebound in IT investment in 2002.

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DISTRESS OF IT-PRODUCING COMPANIES

For most of the last decade, spending on information processing equipment and software grew much more rapidly than other types of investment. With the slowdown in the economy that began in 2000, profits and cash flow have fallen, and businesses have reduced investment. Although investment in other equipment had turned down by mid-2000, IT investment continued to grow through the end of 2000. In 2001, however, businesses cut back more aggressively on IT spending than on non-IT equipment. In just four quarters, nominal IT investment was slashed by 16 percent, with software investment down 3 percent; but computers and peripherals were down 29 percent (Figure 1.1).

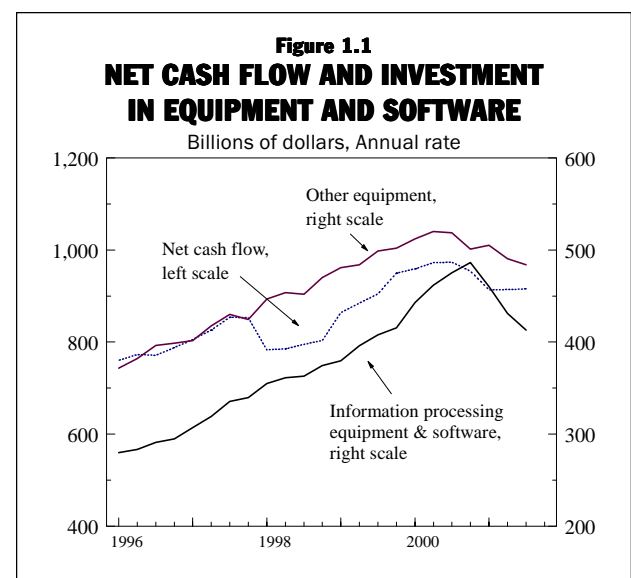


Figure 1.2
INFORMATION TECHNOLOGY EQUIPMENT PRODUCTION



Figure 1.3
SHIPMENTS AND NEW ORDERS INFORMATION TECHNOLOGY
Billions of dollars, Annual rate

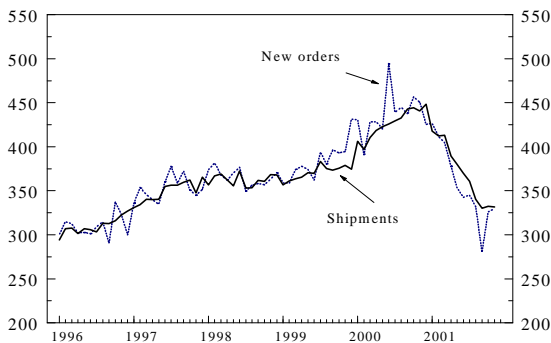
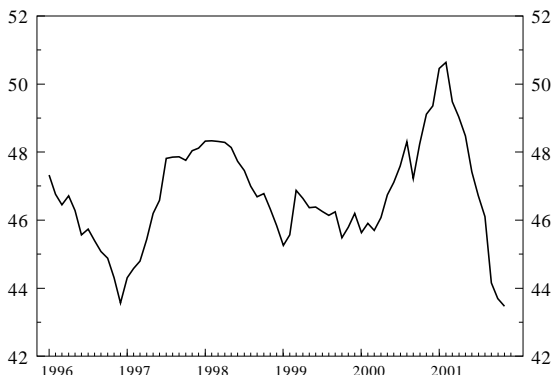


Figure 1.4
INVENTORIES INFORMATION TECHNOLOGY
Billions of dollars

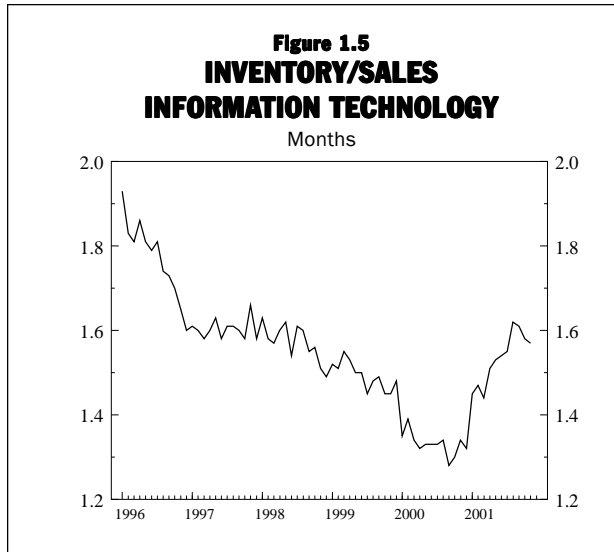


In the second half of the 1990s, production of IT equipment was growing at a torrid pace. By 1995, real output was expanding at an annual rate of 40 percent, a pace that continued for several years. After surging in late 1999 and early 2000, production of IT equipment decelerated for much of 2000, stopped growing, and was falling at a 20+ percent rate in the spring and summer of 2001. Despite the negative effects of September 11 and continued decline in production of telecommunications equipment, overall IT production grew at a 3.1 percent rate between September and December. (Figure 1.2)

The dollar value of IT shipments fell even more steeply (because of falling IT goods prices) for most of 2001, but also appeared to be stabilizing late in the year. After reaching a four-month plateau at the end of 2000 of more than \$440 billion at an annual rate, IT shipments plunged by 25 percent over nine months to a new three month plateau ending in November 2001 at barely a \$330 billion rate. Further indication that the IT goods sector was stabilizing comes from the data on new orders for information technology goods. New orders, which led shipments on the way up in 1999 and 2000 and again on the way down in 2001, bounced back in October and November to virtually the same level as shipments (Figure 1.3).

The drop-off in shipments presented producers of IT equipment with severe inventory problems in 2001 (Figure 1.4). Although inventories were rising for much of 2000, they presented little cause for concern because shipments were rising just as quickly. While nominal shipments peaked in December, inventory levels continued to grow through February. Inventory levels were cut sharply from March to November 2001, but shipments fell even faster through August. As a result, the inventory to shipments ratio has turned down only since September (Figure 1.5).

Experts point to several factors to account for the wide swings in IT equipment activity in recent years. On the up side of the IT spending roller-coaster, corporate IT budgets were ramped up in the late 1990s to address Y2K risks. Meanwhile, new firms emerged with commercial Internet strategies based on heavy IT spending and found ample funding from venture capital firms and the NASDAQ. Traditional firms stepped up investment in IT as a competitive response to the cost-cutting success



of some traditional firms deploying computer networks (e.g., Walmart, General Electric) as well as the market inroads of some Internet based firms in securities trading and book retailing. Excessively optimistic projections of growth in Internet traffic induced massive investments in telecommunications infrastructure.

The downward slide in IT investment spending in 2001 reflects not only the cash flow problems that have pulled down U.S. investment spending generally, but also several IT specific factors. Both new venture capital funding (discussed in Chapter 2) and the NASDAQ have retreated sharply since the first half of 2000, spawning and expanding far fewer IT-intensive businesses. As the Internet-

based business model has met difficulties with profitability and market share, the spur to traditional businesses' IT investments has waned. Substantial overcapacity in large segments of telecommunications infrastructure has induced large reductions in spending on communications equipment. Finally, some financially healthy firms have decided to trim IT investment from levels that they have concluded were excessive and not contributing sufficiently to profitability.

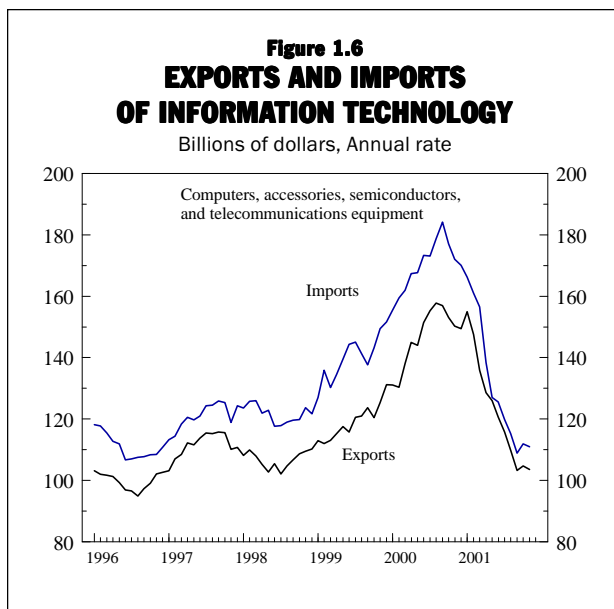
DISTRESS FOR IT PRODUCERS
NOT CONFINED TO U.S.

The retrenchment in IT production has occurred globally. Indeed, international trade figures provided one of the first indications of the worldwide downturn in IT equipment production. After the 1997-1998 Asian crisis abated, both imports and exports of IT equipment (semiconductors, computers and peripheral equipment, and telecommunications equipment) rose sharply for two years. On a seasonally adjusted basis, both exports and imports peaked in the three months ended in October 2000. Over the following 12 months, U.S. IT exports dropped by \$50 billion and imports by \$68 billion (both at annual rates). Both have declined by more than 30 percent. (Figure 1.6) U.S. exports equalled more than one third of IT producers' shipments in late 2000, and the export decline equalled almost half of the shipments decline during 2001. The export drop also reflects the weakness of foreign IT activity. By the same token, the large drop in U.S. imports has been a major setback for foreign IT production and contributed to economic slowdown and recession abroad.

The most timely IT production-related measures—real GDP, the Fed's industrial production, the Census Bureau's shipments and new orders, exports and imports—tell a consistent story of steep declines for most of 2001, but relative stability by the fall. The more forward looking data, those on new orders for IT producers, are also promising.

IT'S EXPANDING ROLE IN THE ECONOMY

With prices falling, the plunge in IT producers' revenues gives a very misleading picture of the role that IT still plays in the overall U.S. economy.¹ For



¹ For a better perspective on the wider role of IT in the economy, we must use "real" or inflation adjusted dollars (although nominal dollars better capture the difficult financial straits of IT producing industries).

Figure 1.7
INVESTMENT IN INFORMATION PROCESSING EQUIPMENT AND SOFTWARE

Billions of 1996 dollars, Annual rate

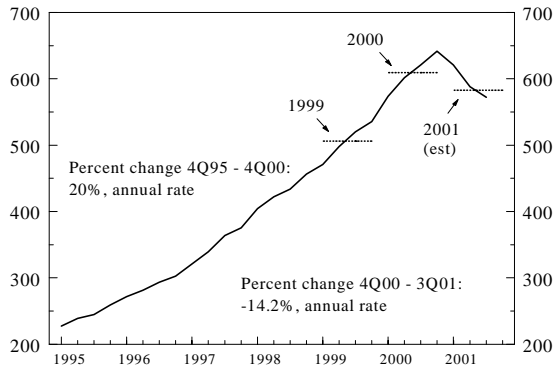


Figure 1.8
REAL NET STOCK OF INFORMATION PROCESSING EQUIPMENT AND SOFTWARE

Percent change from prior period

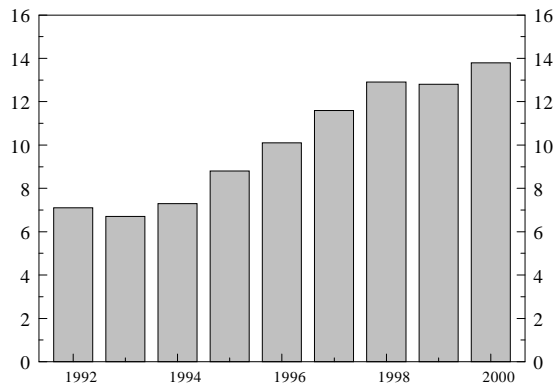
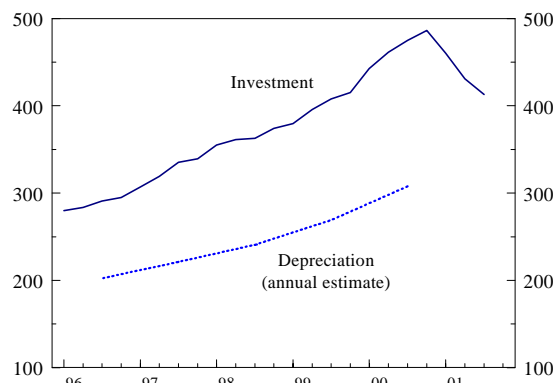


Figure 1.9
INFORMATION PROCESSING EQUIPMENT AND SOFTWARE

Billions of nominal dollars



example, in the fourth quarter of 2001 businesses spent \$80.4 billion on computers and peripheral equipment, 20 percent less than in the first quarter of 2000. Because prices declined by 30 percent over that same period, however, businesses actually acquired 14 percent more equipment in 2001:Q4 than seven quarters earlier. Although computer and peripheral manufacturers would have preferred not to make such deep price cuts, others can take heart in the economy's higher real computer investment.

The level of U.S. real investment in IT soared at a 20 percent annual rate from the end of 1995 to the end of 2000. Even though real IT investment dropped 10.7 percent over the course of 2001, the level for the fourth quarter of 2001 remained higher than at any time prior to early 2000. Even if IT investment continued to fall at the same pace in the fourth quarter, total IT investment for 2001 would still total just 3 percent less than 2000 and 16 percent more than 1999 (Figure 1.7).

The steep growth of IT investment through 2000 translated into a rapidly growing net capital stock of IT equipment and software (Figure 1.8). The net IT capital stock accelerated in the 1990s, reaching double-digit rates by 1997 and a 14 percent rate in 2000, much higher than the growth rate for the stock of non IT equipment. Even though the level of IT investment has dropped in 2001 (Figure 1.9), it has remained above any plausible amount of depreciation. As a result, the net IT capital stock continued to expand in 2001.

In sum, U.S. businesses have trimmed their spending on new IT equipment and software, but have not cut back their use of IT capital. With prices falling, the real volume of IT acquisitions has fallen much less than nominal spending. In addition, the level of spending on IT equipment had reached such a high level by late 2000 that there was considerable room to reduce spending and still add to the net IT capital stock.

Further confirmation that IT continues to play a widening role in the current U.S. economy comes from the data for employment in industries that provide IT services. Employment both in telecommunications services and in computer software and services grew vigorously until the recession began in March 2001 and have remained relatively flat since then. Over the entire 12 months of 2001, however, as employment dropped 1.4 percent in

the total private sector, employment gained 0.5 percent in telecom services and 1.4 percent in computer software and services (Figure 1.10).

PROSPECTS FOR IT REBOUND IN 2002

The convergence of the lines for IT investment and depreciation in Figure 1.9 has encouraged many economic forecasters to project a rebound in IT investment (and therefore overall investment) in 2002. If IT investment were to continue declining at the 2001 rate, it would fall below the estimated rate of depreciation some time in 2002. Because many types of IT equipment tend to be replaced every three or four years, the annual depreciation rate on the IT capital stock is estimated between a quarter and a third. Economic forecasters expect that this replacement cycle will soon kick in for many companies that will want to maintain their IT capital stock. Some experts believe that businesses are finding that the IT equipment is not becoming obsolete as rapidly as a few years ago and they are stretching out their replacement cycle, say from 3 to 3-1/2 or 4 years. If, and to the extent that, the replacement cycle has been extended, the rebound in IT investment will be later and flatter.

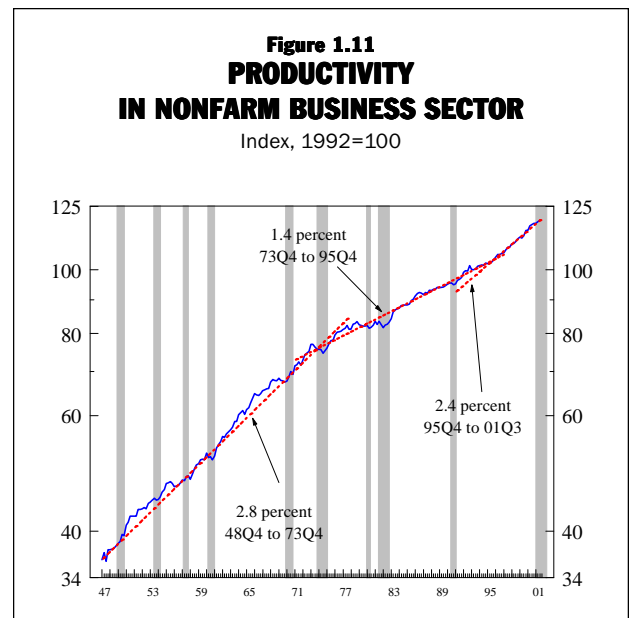
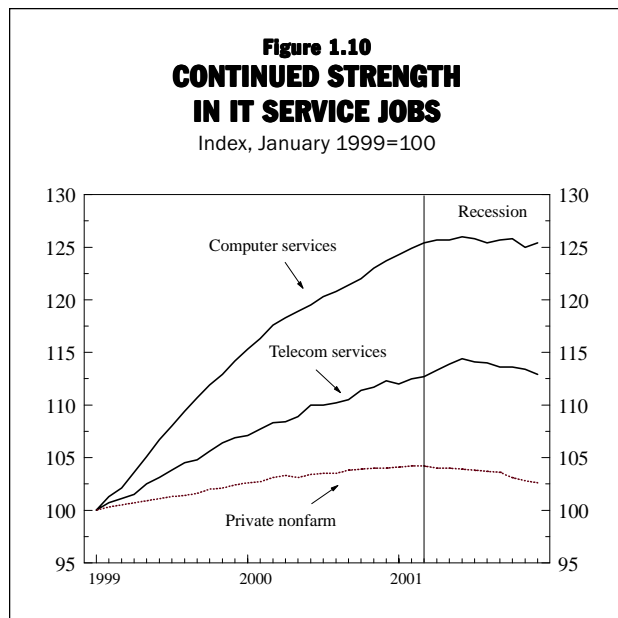
The overall performance of the U.S. economy in the medium term hinges to a large extent on the rate at which the net IT capital stock will grow. Will it resume the double digit growth rate of the late 1990s, slip back to the 7 percent rate typical of the early 1990s, or slow to the even more modest pace typical of non-IT capital in the last decade?

As Chapter 3 and 4 of this report and previous reports in the Digital Economy series have documented, IT has played an outsized role in overall U.S. economic performance, in terms of its own output and economy-wide productivity growth.

IT SUPPORTS A NEW ECONOMY OF FASTER PRODUCTIVITY GAINS

The central feature of the "new economy" has been a higher growth rate of productivity, which in turn has brought faster gains in our standards of living. The upturn of productivity in the second half of the 1990s marked the arrival of a "new economy." (See Figure 1.11.) Productivity improved by an average 2.8 percent per year from 1948 to 1973 but slowed to a 1.4 percent rate for the next 22 years. Had productivity maintained its 1947-73 pace over the next 22 years, real incomes would have been one third higher in 1995. Fortunately, productivity has accelerated to a 2.4 percent pace since 1995 and real incomes have grown faster than at any time in a generation.

The last two years of sluggish growth and recession have disproved several predictions about the "new economy." On the one hand, it has dashed some optimists' exuberant hopes that "new economy" would not only raise productivity but also eliminate the swings in business cycle and equity prices. On the other hand, recent experience has also proven wrong the pessimists who predicted the evaporation of productivity gains when the economy slowed, but much less than normal for a

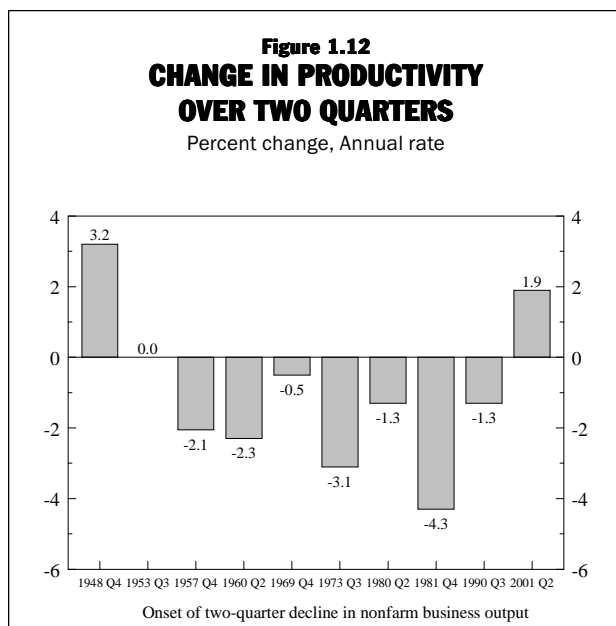


period of such economic weakness. Productivity gained 2.7 percent per year from the end of 1995 through mid-2000, but has still maintained a 1.5 percent pace in the five subsequent quarters when output grew at an average 0.7 percent pace. Output of the nonfarm business sector declined in both the second and third quarters of 2001. Those two quarters marked the first episode in more than 50 years that productivity change remained positive when non-farm business output growth first turned negative for two consecutive quarters (Figure 1.12). The productivity growth rate of +1.9 percent for the two quarters marks by far the best recessionary performance since 1948-49.

Much of the improvement in productivity gains since 1995 appears tied to greater use of information technology and associated organizational change. Several macroeconomic studies have concluded that IT contributed most of the step-up in productivity growth since 1995.²

Occupational employment data also show the tie of IT to productivity gains. Investment in IT with

² See Chapter 3 of *Digital Economy 2000* for an examination of those studies. Two of those studies have recently been updated and extended, both raising earlier estimates of the contribution of IT. See Dale W. Jorgenson, Mun S. Ho, Kevin J. Stiroh, "Projecting Productivity Growth: Lessons from the U.S. Growth Resurgence," dated December 31, 2000; Stephen D. Oliner and Daniel E Sichel, "Information Technology and Productivity: Where Are We Now and Where Are We Going?" mimeo dated January 7, 2002. Both documents were presented to a conference on "Technology, Growth, and the Labor Market," sponsored by the Federal Reserve Bank of Atlanta and Georgia State University, on January 7, 2002. See <http://www.frbatlanta.org/news/conferen/techconference.htm>.



complementary organizational change can raise the productivity of many types of workers, but the most substantial effect should occur among clerical jobs. Since clerical work involves producing, storing, and distributing information, IT can directly substitute for clerical jobs. In 1989, there were 15.4 million clerical jobs³ and 101.9 million other jobs. Over the next ten years, national output rose 34.3 percent and, because of productivity gains, total employment rose 15.3 percent. As non-clerical jobs grew 18.8 percent, clerical jobs actually declined by 8.4 percent. If clerical jobs had grown at the same rate as all other jobs, they would have grown to 18.3 million instead of shrinking to 14.1 million. As a rough approximation, if the productivity gains associated with clerical jobs had been the same as all other jobs instead of accelerated by the substitution by IT, national productivity gains over the decade would have been 0.3 percent per year lower.

Finally, productivity gains directly related to IT investment are also found at the industry level. Chapter 4 of this report presents evidence that more IT-intensive industries have contributed disproportionately to productivity gains since 1995. In addition, two recent studies using establishment level data, one on the retail industry and the other on manufacturing, both found evidence of notable productivity gains associated with IT investment.⁴

CONCLUSION

Although 2001 has been a very difficult year for companies that produce information technology products, conditions appear to have stabilized and 2002 looks more promising. IT plays an expanding and positive role in the U.S. economy. Analysis of recent economic data for IT leads to the following more specific conclusions:

- As businesses suffered declining profits and cash flow in the last two years, they sharply

³ This category includes all occupations defined as "administrative support, including clerical" with the exception of occupations that require personal relationships such as receptionists, interviewers, insurance adjusters, and teachers' aides.

⁴ Mark Doms, Ron Jarmin, and Shawn Klimek, "IT Investment and Firm Performance in U.S. Retail Trade," November 2000, mimeo, Center for Economic Studies, U.S. Bureau of the Census. B.K. Atrostic and Sang V. Nguyen, "Computer Networks and U.S. Manufacturing Plant Productivity: New Evidence from the CNU Data," CES Discussion Paper In Economics, CES-WP-02-01 (January, 2002), Center for Economic Studies, U.S. Bureau of the Census.

cut back their investment spending, including that on IT equipment and software.

- Revenues and profits of companies producing IT equipment were hit by falling prices and rising inventories in addition to shrinking real demand.
- The collapse of both exports and imports of IT equipment indicate that other countries have joined in the downturn of the U.S. IT industry.
- The most recent measures for production, shipments, new orders, exports, and imports all indicate that conditions for IT producers are stabilizing.
- U.S. businesses are nonetheless expanding their use of IT in operations: with IT investment in 2001 far surpassing every year prior to 2000, the IT capital stock continued to grow in 2001, and employment in the service industries that implement IT (telecommunications and computer and software services) grew in 2001.

- The link between IT and productivity is confirmed by employment declines in clerical occupations most readily substitutable by IT.
- The continued contribution of IT to improved productivity gains is suggested by the remarkable productivity gains of the last year despite the weakness of the economy.

Although the “new economy” continues to deliver strong productivity results, it has not created an immunity from the ups and downs of either the business cycle or the equity markets. The economy appears to be enjoying the productivity benefits of prior years’ investments in IT and reorganization. Those productivity gains have buoyed remarkable real wage gains during a recession, but not profits. IT investment will probably remain subdued for a few more quarters until profits and cash flow improve. When a recovery does take hold and profits improve, IT investment should resume growth, propelled by the need to replace obsolete IT capital stock with a new generation of more powerful and less expensive hardware and software.

