Policy Challenges in the "New Economy" Era

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It has often been said that information technology (IT) is spurring the most profound social and economic change to take place since the Industrial Revolution, which began in the latter half of the 18th century. The Internet, which has been growing at an explosive rate since the mid-1990s, has had an incalculable impact upon individual lives and the economy as a whole. However, now that the U.S. economy is beginning to slow down after its astonishing expansion in the 1990s, and the Net bubble has popped, it is unclear where the IT revolution is now headed. The time has come for us to ask what exactly the new economy is, and how it is likely to behave in coming years.

The term "new economy" refers to the advance of information technology and the economic impact thereof: an upsurge in previously stagnant productivity in developed countries; enhanced efficiency of the market mechanism; increased competition; and long-term economic growth accompanied by low inflation and low unemployment. Above all, the new economy has been an American phenomenon. Many macroeconomic studies of the new economy have focused on the relationship between low inflation and unemployment rates. In this paper I shall examine how the impact of the IT revolution is unfolding at the macro and microeconomic levels, and shall also discuss the policy issues that must be addressed in order to ensure the continued growth of the new economy.

Have IT Investments Improved Productivity?

To answer this question, let us start with a macroeconomic review of the economic performance of Japan and the United States in the 1990s. Table 1 shows trends in productivity of labor (defined as real gross domestic product per worker) in the first and second halves of the decade. As shown in the table, productivity rose at an increasing rate in both Japan and the United States throughout the decade. The rise in productivity of labor is attributable to two factors. First, an increasing amount of labor became interchangeable with capital, resulting in the deepening of capital (the replacement of labor with capital). Second, we saw an improvement in total factor productivity (TFP), i.e., increases in economic output due not to increased inputs of labor or capital, but to the ability to use these factors more effectively. For the purposes of this argument, I shall distinguish between two types of capital inputs: information technology investments and other types of investments. The growing rate of investment in information technology increased throughout the 1990s in both Japan and the United States. It is apparent that the increase in labor productivity, which was especially pronounced in the United States, was facilitated by a torrent of investment in information technology. In Japan, which experienced recession following the collapse of the bubble economy, the 1990s have been referred to as "the lost decade," yet it is worth noting that investment in information technology also brought improvements in the productivity of labor in Japan, albeit less pronounced than in the United States.

Technological innovation in the IT sector and increased productivity brought sharply falling prices for IT products, especially computers. These falling prices spurred huge flows of information technology investment in Japan and the United States. The interchange of IT capital and labor has been facilitated by the change of the relative cost of IT products and played a major role in bringing about greater productivity of labor. Turning our attention to the trends of TFP in the economy as a whole, which are important in the consideration of long-term economic growth, we find that TFP in the United States rose by more than 1% per year during the latter half of the decade. More than half of this increase was generated by the IT sector, although it has been said that the IT user sector actually had a negative effect on TFP growth in certain industries (Jorgenson and Stiroh, 2000). In Japan, as well, TFP shot up rapidly in the IT sector while remaining lackluster in the user sector (Ministry of Economy, Trade and Industry [METI], 2001). In this point, however, some have argued that output growth in the service industry-dominated IT user sector is not properly reflected in the statistics and that productivity growth in this sector has been underestimated.[1] Nevertheless, it is gradually becoming apparent from analyses carried out at the level of individual firms on the user side that IT investments do not contribute significantly to TFP growth.

What is Happening at Individual Corporations?

Professor Erik Brynjolffson and others at the Massachusetts Institute of Technology have carried out a study in which they look closely at decision-making authority, employee skill levels, salaries, promotions and other incentive measures at individual companies, and their findings indicate that investments in IT systems have been highest at companies with a so-called "flat management style," i.e., companies that delegate decision-making authority as much as possible to the employees and adopt incentive systems built primarily on merit-based pay. The study also examined productivity

and found that productivity growth was highest, naturally enough, at flat-management companies that have invested aggressively in information technology. Even more interesting, however, is that companies characterized only by a flat management structure achieved greater productivity growth than those characterized only by aggressive IT investments (Bresnahan, Brynjolffson and Hitt, 2000). It would thus appear that a company must switch to a relatively flat and flexible management style in order to reap the full benefits of information technology. In other words, the effect of information technology will only be achieved by realizing this organizational innovation.

To take proper advantage of an information system, a company must upgrade employee skills. It often turns out that the intangibles of IT investments – things like employee training and IT-related corporate restructuring – far outstrip the amount of money spent on such tangibles as computers and software. In a U.S. study of the costs associated with the implementation of enterprise resource planning (ERP) systems from SAP and other suppliers, it was found that initial costs averaged roughly $20 million, with software licenses and development expenses accounting for only 16%. The rest was spent on outside consultants, employee education and other intangible spending. (Gormely et. al., 1998) Again, when we examine corporate expenditures on information processing in Japan, we find that hardware and software combine to make up about half, while labor accounts for much of the remaining half. (Figure 1) As technological innovation drives the prices of IT products lower and lower, we can expect human resource investments and other intangibles to account for a growing share of IT investments, and it is important when discussing the relationship between information systems and productivity to take into account employee skill levels, corporate restructuring and other questions related to management innovation.

When discussing IT investment and corporate restructuring in Japanese companies, it is also necessary to keep in mind the differences between Japanese and U.S. corporate governance. In a wide-ranging study that looked at several issues related to the implementation of information technology by Japanese corporations – restructuring, employee skills and incentive systems – it was found that a complementary relationship exists between information technology, on the one hand, and corporate restructuring and employee skills on the other. At the same time, however, the study showed no clear relationship between information technology and merit-based pay systems. (Motohashi, 1999) Merit-based pay systems stand in opposition to the seniority-based pay and promotion systems that have long been regarded as typical management practice in Japanese corporations. More detailed study is needed to address the question of whether Japanese-style management methods and corporate governance will undergo fundamental changes as information technology infiltrates the corporate world.

Table 1 Factors affecting productivity of labor in Japan and the United States
(Units: Annual productivity rate; Figures in parentheses indicate the share of total productivity)

	Japan (1993-1995)		Japan (1996-2000)	
Productivity of labor	0.77	(100)	1.73	(100)
Capital input	1.52	(197)	1.06	(61)
IT-related investment	0.25	(32)	0.47	(27)
Non-IT investment	1.27	(165)	0.59	(34)
Net working rates	▲ 0.31	(▲ 40)	0.05	(3)
Total factor productivity	▲ 0.44	(▲ 57)	0.62	(36)

	U.S. (1991-1995)		U.S. (1996-1999)	
Productivity of labor	1.53	(100)	2.57	(100)
Capital input	0.62	(41)	1.10	(43)
IT-related investment	0.51	(33)	0.96	(37)
Non-IT investment	0.11	(7)	0.14	(5)
Qualitative changes in labor	0.44	(29)	0.31	(12)
Total factor productivity	0.48	(31)	1.16	(45)

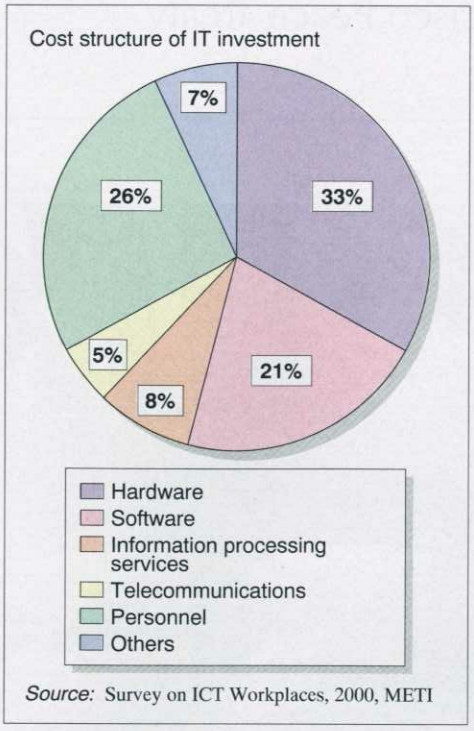
Sources: Japan – Estimates of the Research and Statistics Department (METI)
U.S. – Oliner and Sichel, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" working paper, Federal Reserve Board, February 2000

Promoting the New Economy: the Policy Issues

Former U.S. Undersecretary of Commerce for Economic Affairs Robert J. Shapiro, editor of *Digital Economy 2000,* has described the new economy as a cascading innovation process. In Shapiro's metaphor, product innovation in the IT sector is farthest upstream in the cascade. To achieve this product innovation, organizational innovation on the user side is necessary. And as myriad individual user-side innovations add up, they spur fundamental economic restructuring.

The IT revolution is thus defined as economic restructuring spurred by the advance of information technology. And the source of the IT revolution has been technological innovation (brought on by the dizzying progress in computers and telecommunications fields) and a concomitant jump in productivity in the IT sector. On the technical front, Central Processing Units (CPUs) continue to double their capacity and capability every 18-24 months, just as predicted by Moore's Law. Computers

Figure 1



Source: Survey on ICT Workplaces, 2000, METI

with the newest CPUs always offer significantly improved performance. Improving computer performance and falling prices have been the driving force behind IT investment in the user sector, and have pushed labor productivity upward. In other words, product innovation in the IT sector gave birth to the new economy, and continued product innovation in that sector is necessary to keep the new economy running.

Intel Corp.'s marketing strategy is to double CPU speeds about every two years, which represents a conscious nod to Moore's Law. The Pentium IV, which was rolled out last November, packs over 40 million transistors within a few square centimeters base. Maximum clock speed is 1.5 GHz, and line width, which determined the scale of integration, has been reduced to 0.18 microns. Intel Corp. has also announced the development of a transistor with a gate length of 0.03 microns, and the company intends to use this transistor in combination with a 0.07 micron process to introduce a 10 GHz CPU in 2005.

Product innovation in the IT sector is thus expected to continue for some time to come, but what about organizational innovation further downstream on the user side? Some firms have taken advantage of information technology to build innovative business models that have helped boost performance. A good example is Dell Computer Corp.'s build-to-order (BTO) systems. But the IT revolution is being held back by a downstream bottleneck as seen in the lackluster improvement of TFP in the total IT user sector.

If the new economy is to stay on track, this bottleneck will have to be resolved through bold management innovation at the level of individual firms. Government policy should therefore be formulated to promote the establishment of an environment that will be conducive to such innovation. There are now moves afoot to establish a system to allow more easily for the breakup of large corporations (i.e. amendments to corporate law) and revise bankruptcy legislation (i.e. amendments to the Corporate Reorganization Law). These moves are very significant because they will allow companies to take a more flexible approach to reorganization as they respond to a changing business environment. And according to a report issued by the Organization for Economic Cooperation and Development (OECD), there is a negative correlation between TFP growth in OECD member states and the degree of protection afforded to employees in each country's labor laws. Whenever a company decides to go through with restructuring, it must always be ready to face the nettlesome problem of forcing its employees to transfer to other departments. The problem here in Japan involves more than just legal questions; various institutional issues (including revision of labor practices) must also be addressed. JJTI

Note

1 To measure the degree to which the adoption of information technology has contributed to increased productivity, it is necessary to obtain accurate statistics on economic output, broken down by industry, but some have argued that qualitative output growth in the service industry-dominated IT user sector is not properly reflected in the statistics and that productivity growth in this sector has been underestimated (Jorgenson and Stiroh, 2000). For example, the automated teller machines (ATMs) and online services offered by banks make life considerably more convenient for users, but it hardly seems likely that this factor shows up in the statistics for banking sector output.

References

Ministry of Economy, Trade and Industry (2001), "Current Survey of Industrial Activities 2000," Research and Statistics Department, Economic and Industrial Policy Bureau, METI, March 9, 2001.

Bresnahan, T., Brynjolfsson, E. and L. Hitt (2000), "IT, Workplace Organization and the Demand for Skilled Labor: A Firm Level Analysis," in the forthcoming *Quarterly Journal of Economics*.

Gormely, J., W. Blustein, J. Gatoff and H. Chun (1998), "The Runaway Costs of Packaged Applications," *The Forrester Report,* vol. 3, No. 5, Cambridge, MA.

Jorgenson, D., and K. Stiroh (2000), "Raising the Speed Limit: US Economic Growth in the Information Age," *Brooking Paper on Economic Activity,* 31:1, forthcoming.

Motohashi, K. (1999), "Changing Nature of Japanese Firms?: Technology Adoption, Organizational Structure and Human Resource Strategy," in *Micro- and Macrodata of Firms: Statistical Analysis and International Comparison,* S. Biffignandi ed., Physica-Verlag, New York.

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