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## The IT revolution and productivity growth in Japan <sup>☆</sup>

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**Miyagawa, Tsutomu, Ito, Yukiko, and Harada, Nobuyuki**—The IT revolution and productivity growth in Japan

The objective of this paper is to examine the contribution of IT investment to productivity growth in Japan. To this end, we first construct a panel data set of value added, labor inputs, IT investment, IT capital stock, and non-IT capital stock in 22 industries (including 13 manufacturing industries) from 1980–2000. We then decompose labor productivity into four terms and find that the recent slowdown in productivity is caused by the absence of a reallocation effect of labor. Further, we estimate TFP growth functions and labor productivity functions, examining network externalities of IT capital. We find that TFP growth in the 1990s is affected by positive inter-industry spillover effects from the supply side. *J. Japanese Int. Economies* **18** (3) (2004) 362–389. Department of Economics, Gakushuin University, 171-8588 Mejiro 1-5-1, Toshima-ku Tokyo, Japan; Japan Center for Economic Research, Japan; University of Tsukuba, Japan.

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## 1. The IT revolution and the Japanese economy

The 1990s were a ‘lost decade’ for Japan: while the US economy enjoyed the longest expansion in its history, Japanese economy was stuck in recession. Economists disagree as to the reasons for this long-run stagnation. Some highlight demand-side factors and blame inadequate fiscal and monetary policies for prolonging the recession.<sup>1</sup> Others, however, point to the supply-side, seeing a slowdown in productivity as the main culprit for slow growth in Japan and calling for wide-ranging structural reforms.<sup>2</sup>

At least in some areas, the Japanese government has heeded such calls. A host of structural reform measures were introduced, among which were policies introduced in the late 1990s to stimulate the kind of investment in information technologies (IT) that had fueled the boom in the US economy. These IT policies include an accelerated depreciation of computers, subsidies for IT education and the construction of an optical fiber network. However, these measures are likely to bear fruit only in the long-term and any short-term positive effects, meanwhile, have been overshadowed by the abrupt end to the IT boom worldwide and hence also in Japan. It is therefore uncertain whether investment has contributed to productivity growth in the Japanese economy.

Even in the US, the economic effects of IT investment for a long time were not discernible. In an early piece of research, Solow (1987), for example, pointed out that computers did not seem to contribute to productivity growth, even though people were beginning to utilize them in everyday business. Baily and Gordon (1988) and Oliner and Sichel (1994) tried to investigate this ‘Solow paradox’ by examining output and productivity data by industry. However, their studies also failed to provide compelling evidence for the contribution of IT capital to productivity growth.

With the benefit of hindsight, however, the contribution of IT investment to productivity growth in the US economy by now is beyond dispute.<sup>3</sup> Studies by Jorgenson and others, for example, provide ample evidence that productivity growth in the US economy during the 1990s was achieved largely through capital deepening which was induced by the rapid decrease in prices of IT products.

In Japan, a number of papers have attempted to examine the economic effects of IT investment. Shinozaki (1999) and Japan Center for Economic Research (JCER) (2000a, 2000b) constructed time-series data of IT stock and calculated the rate of return on IT capital stock by estimating the production function. Finding that the rate of return on IT capital stock was higher than that on other types of capital stock, they concluded that policies stimulating IT investment should be implemented. Estimating a Generalized Leontief cost function, Shinjo and Zang (2003) found a high Tobin’s  $q$  for IT investment in Japan which suggests that such investment was insufficient, which was in contrast

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<sup>1</sup> See, for example, Krugman (1998, 2000), Kuttner and Posen (2001, 2002).

<sup>2</sup> Using growth accounting, Hayashi and Prescott (2002) showed that the Japanese economy has moved to lower steady state growth due to a decline in labor hours and total factor productivity.

<sup>3</sup> See Jorgenson and Stiroh (2000), US Council of Economic Advisers (2000), Jorgenson (2001), and Nordhaus (2001). Brynjolfsson and Hitt (2000) surveyed recent studies on the economic effects of IT investment. However, this does not mean that the IT revolution necessarily is the only factor behind the observed productivity growth in the US economy. Blinder and Yellen (2001), for example, maintain that, along with the IT revolution, appropriate macro-economic stabilization policies have played a substantial role.

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