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Explaining Japan's Unproductive Two Decades

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Abstract

Using industry- and micro-level data, this paper examines why Japan's productivity growth has been slow for such a long time and how it can be accelerated in the future. Japan's capital-to-gross domestic product (GDP) ratio continued to increase after 1991, which must have contributed to the decline in the rate of return on capital in Japan by decreasing the marginal productivity of capital. On the other hand, accumulation of information and communications technology (ICT) capital and intangible investment in Japan was very slow. Compared with large firms, which enjoyed an acceleration in total factor productivity (TFP) growth in recent years, Japanese small and medium-sized enterprises (SMEs) were left behind in ICT capital and intangible investment, and their productivity growth has been very low. Furthermore, as large firms expanded their supply chains globally and relocated their factories abroad, research and development (R&D) spillovers from large firms to SMEs seem to have declined.

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1. Introduction

Following the burst of the “bubble economy” in 1991, productivity growth in Japan declined notably and has remained at a relatively low level for more than 20 years. This decline, which has been well documented in many studies,¹ must have reduced the rate of return on capital and exacerbated economic stagnation. Since Japan’s working age population will continue to shrink rapidly and the capital-labor ratio is already high, improving total factor productivity (TFP) represents the only way for Japan to accomplish sustainable economic growth. This paper examines why Japan’s productivity growth has been slow for such a long time and how it can be accelerated in the future.

The analysis in this paper has three characteristics that set it apart from preceding studies on Japan’s productivity slowdown since the 1990s. First, the paper examines Japan’s TFP not only at the macro level but also at the sectoral, firm, and establishment level. Using industry-level data makes it possible to examine in what sectors TFP growth has slowed down and to make inference on the main causes of the slowdown. Moreover, using micro data, it is possible to examine productivity dynamics and the role played by zombie firms. Second, utilizing recently developed cross-country databases, such as the EU KLEMS Database, to which the author has contributed, this paper compares Japan’s sectoral productivity growth with that of other developed countries. Third, in order to fully understand the stagnation of Japan’s productivity, this paper examines the Japanese economy from a long-term perspective by comparing Japan’s productivity performance at the sectoral and micro level since the 1990s with that of the 1970s and the 1980s.

The structure of the paper is as follows. The next section provides an overview of Japan’s TFP growth at the macro and industry level and compares Japan’s performance with that of other developed countries. In the case of the United States, it has been pointed out that the information and communication technology (ICT) revolution and the increase in intangible investment has contributed to the acceleration of TFP growth since the mid-1990s (Inklaar et al. 2007, Corrado et al. 2009). Section 3 examines this issue in greater detail. Specifically, it compares Japan’s ICT and intangible investment in the 1990s and 2000s with that of other developed countries. Section 4 then examines whether the natural selection mechanism works in Japan’s economy or not, and if not, why it does not work. Finally, Section 5 presents some policy implications of the findings and concludes the paper.

2. Japan’s TFP Growth at the Macro and Sectoral Levels

Let us start by examining the sources of Japan’s macroeconomic growth from the supply side by conducting a growth accounting analysis. Assuming a smooth constant returns to scale production

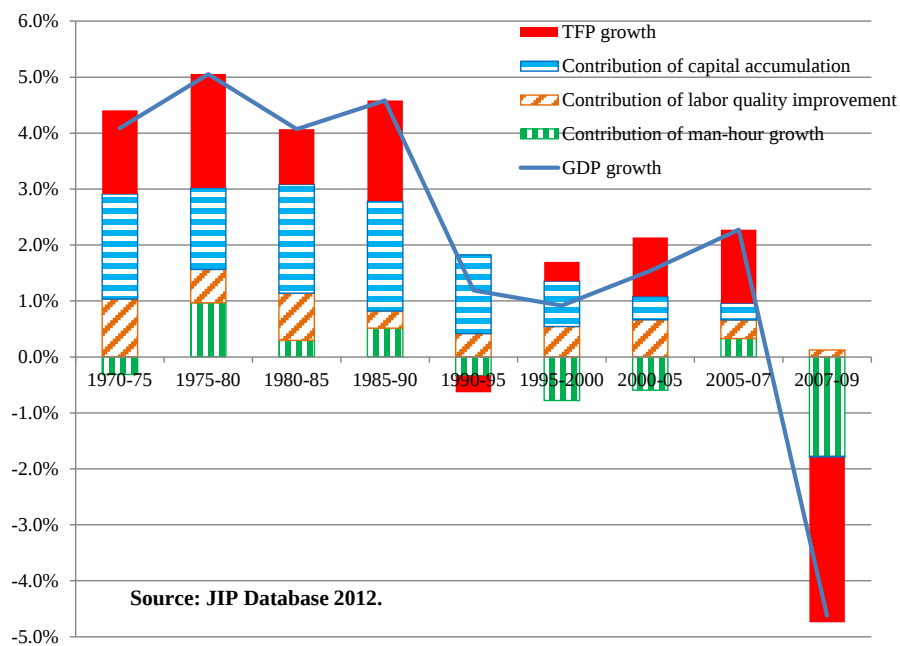
¹ See, for example, Hayashi and Prescott (2002) and Fukao et al. (2004). A survey of studies on the slowdown of TFP growth in the 1990s at the macro level is provided in Inui and Kwon (2005).

function for the macro-economy and perfect competition in factor markets, GDP growth can be decomposed into the contribution of capital input and labor input growth and the residual (TFP growth):

$$\begin{aligned} \text{Growth rate of GDP} &= \text{Capital cost share} \times \text{Growth rate of capital input} \\ &+ \text{Labor cost share} \times \text{Growth rate of man-hour input} \\ &+ \text{Labor cost share} \times \text{Growth rate of labor quality} + \text{Growth rate of TFP} \end{aligned}$$

The first term on the right-hand side of the above equation denotes the contribution of capital deepening to economic growth. The second plus the third term on the right-hand side denote the contribution of labor input growth. The result of the growth accounting analysis is reported in Figure 1. As for many other countries, after the Lehman Shock of September 2008, Japan's TFP dropped sharply because of labor hoarding and the idling of capital stock caused by negative GDP growth.² In order to focus on the long-term trend before this exogenous shock, the growth accounting result for the period after 2007 is shown separately in the figure.

Figure 1. Growth Accounting for Japan's Macro-economy



² Because of the steep decline in Japanese exports, Japan's real GDP growth during the period 2008-2009 was much lower than that of the United States, which was the epicenter of the Lehman Shock. This drop in GDP and serious labor hoarding, which was partly caused by the high job security in Japan, resulted in a larger TFP decline in Japan than in the United States. In the United States, the average annual growth rates of real GDP and TFP during this period were 1.9% (Economic Report of the President 2012) and 0.9% (Conference Board's Total Economy Database), respectively.

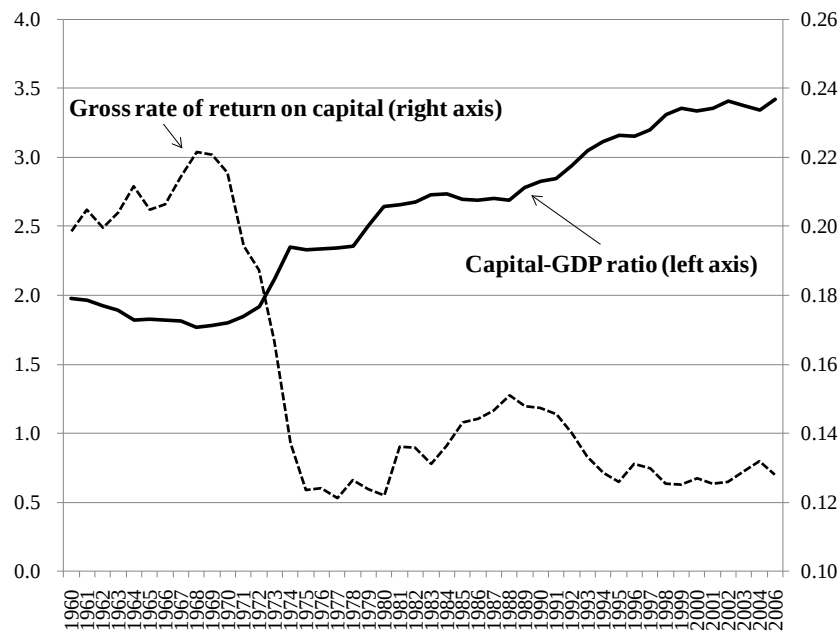
Figure 1 shows that after 1990 all three sources of economic growth – capital accumulation, labor input growth (man-hour input growth plus labor improvement growth), and TFP growth – diminished substantially and contributed to the slowdown of GDP growth. Comparing the 1970–1990 period and the 1990–2007 period, the annual contribution of capital accumulation, labor input growth, and TFP growth declined by 1.0, 1.0, and 1.1 percentage points, respectively. In the 2000s, TFP growth gradually recovered until 2007, but the average annual TFP growth rate during 2000–2007, 1.1%, was still only about two-thirds of the TFP growth rate during 1970–1990, which was 1.6%.³

It has been argued that deflation (Hamada and Horiuchi 2004) and damage to firms' balance sheets (Koo 2003) have reduced capital accumulation, and that this was the main cause of Japan's stagnation.⁴ In fact, however, as Figure 2 shows, capital accumulation continued apace after 1990, especially when taking the slow rate of GDP growth and the decline in the working age population into account. According to the EU KLEMS Database, November 2009, Japan's capital-GDP ratio (Gross capital formation deflator $\times$ Real capital stock / Nominal GDP) increased by 21.2% during the 16 years from 1990 to 2006, which is even slightly greater than the 21.1% increase in the capital-GDP ratio during the 25 years from 1975 to 1990. This increase in the capital-GDP ratio must have contributed to the continuous decline in the rate of return on capital in Japan by decreasing the marginal productivity of capital (Figure 2).

³ Because of labor hoarding and the idling of capital stock, there is a risk of underestimating TFP growth in recessionary periods, such as the period 1990–1995. Using the capacity utilization rate of the JIP Database, which covers both the manufacturing and the non-manufacturing sector, it is possible to check this issue. When taking account of changes in the capacity utilization rate, the estimate of annual TFP growth in 1990–1995 becomes 0.2 percentage points higher than that shown in Figure 1 (see Fukao 2012). However, this adjustment does not change the overall picture. On the other hand, making adjustments in order to take labor hoarding into account is more difficult. It is possible to assume, though, that when the GDP gap is zero or positive, the problem of labor hoarding is probably not very serious, and when comparing the TFP level of years with a zero or positive GDP gap over time, a similar declining trend in TFP growth can be observed. Thus, it seems safe to say that the decline in TFP growth seen in Figure 1 is not simply an artifact created by labor hoarding and the idling of capital stock.

⁴ On the main causes of Japan's economic stagnation, also see Saxonhouse and Stern (2004), Ito et al. (2005), and Caballero et al. (2008).

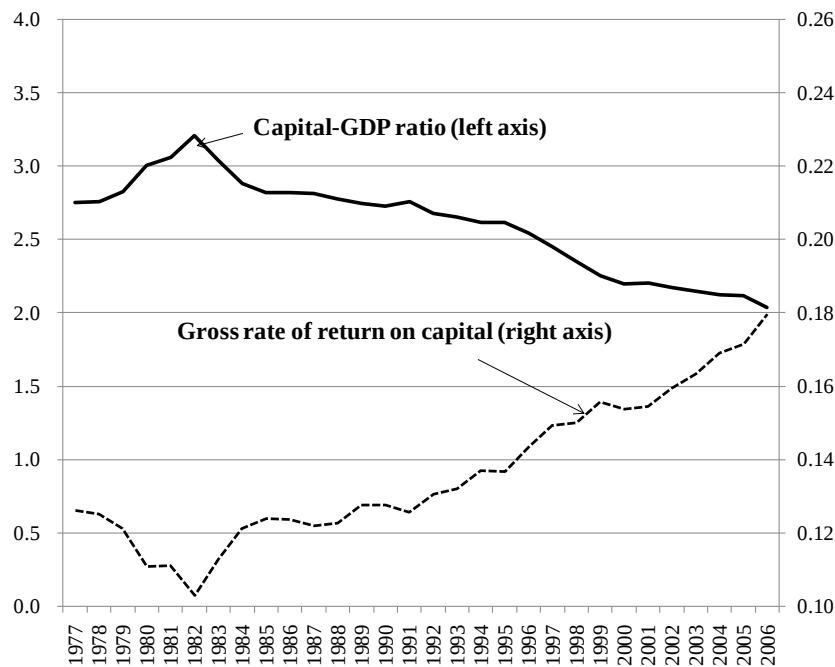
Figure 2. Capital Coefficient and Gross Rate of Return on Capital in Japan



Source: Fukao (2012). The original data for 1975-2006 are taken from the EU KLEMS Database, November 2009.

Notes: Capital-GDP ratio = Gross capital formation deflator $\times$ Real capital stock/Nominal GDP.
Gross rate of return on capital = Gross operating surplus/(Gross capital formation deflator $\times$ Real capital stock).

Figure 3. Capital Coefficient and Gross Rate of Return on Capital in the United States



Source and notes: See Figure 2.

In contrast with Japan, the United States, as shown in Figure 3, has experienced a continuous decline in the capital-GDP ratio and an increase in the rate of return on capital (measured as Gross operating surplus / (GDP deflator $\times$ Real capital stock)). It seems that these stark differences in the capital-GDP ratio and the rate of return on capital between Japan and the United States are mainly due to differences in the main engines of economic growth between the two countries.⁵

That Japan's growth has been led by capital accumulation can be seen by comparing the main engines of labor productivity growth in the two countries. In both countries, annual labor productivity (real GDP/man-hour) growth from 1990 to the Lehman Shock was 2.0% (the rate for Japan is for 1990-2007, that for the United States for 1990-2006). Using growth accounting, labor productivity growth can be decomposed into the following three factors: increases in the capital input-labor input ratio, improvements in labor quality, and TFP growth. In the case of Japan, the contribution of each of these was 0.8, 0.7, and 0.5 percentage points respectively, while in the case of the United States, it was 0.8, 0.2, and 1.0 percentage points respectively. Thus, Japan's labor productivity growth was mainly accomplished by physical and human capital deepening, not by TFP growth. On the other hand, the main engine of labor productivity growth in the United States was TFP growth. This difference is responsible for the increase of the capital-GDP ratio and the decline of the rate of return on capital in Japan.⁶

Although the rate of return on capital stagnated in the 1990s and the early 2000s, Japan's capital-GDP ratio continued to increase. The prolonged zero interest rate policy and public sector investment as part of the fiscal stimulus measures is likely to have contributed to this increase. However, because of the decreasing marginal productivity of capital, it is impossible to permanently maintain investment-led growth in the presence of a declining labor force and low TFP growth. As

⁵ As will be seen in the next section, the information and communication technology (ICT) investment / non-ICT investment ratio in the United States is higher than that in Japan; the capital formation deflator for ICT capital continued to decline; and the depreciation rate of ICT capital and capital losses from ICT capital holdings are larger than those of non-ICT capital. It should be noted that the decline of the capital-GDP ratio and the high rate of return on capital in the United States are probably partly caused by these factors. However, when using the capital-GDP ratio and the rate of return on capital in real terms, that is, Real capital stock / Real GDP, and Gross operating surplus / (GDP deflator $\times$ Real capital stock), similar differences between Japan and the United States as in Figure 2 and 3 can be found.

⁶ The analysis here is based on the following reasoning. Assume a Solow-type constant returns to scale macro production function, $Y=F(q_K K, A q_L H)$, where, Y , q_K , K , A , q_L , and H denote GDP, quality of capital, capital stock, the Harrod neutral productivity index, labor quality, and man-hour input, respectively. Then the capital input-GDP ratio, $q_K K/Y=1/F(1, A q_L H/q_K K)$, will be an increasing function of the capital input-labor input ratio, $q_K K/q_L H$, and a decreasing function of the productivity index, A . Moreover, the marginal productivity of capital input, $\partial Y/\partial q_K K=\partial F(q_K K/q_L H, A)/\partial (q_K K/q_L H)$, will be a decreasing function of the capital input-labor input ratio, $q_K K/q_L H$, and an increasing function of the productivity index, A . Further, TFP growth is equal to the growth rate of A times the cost share of labor. In Figures 2 and 3, the capital stock-GDP ratio, K/Y , and not the capital input-GDP ratio, $q_K K/Y$, is used. However, similar results are obtained when using the capital input-GDP ratio in place of the capital stock-GDP ratio.

Figure 1 shows, the contribution of capital accumulation to economic growth rapidly declined in the 2000s. It appears that investment-led growth in Japan is coming to an end.⁷

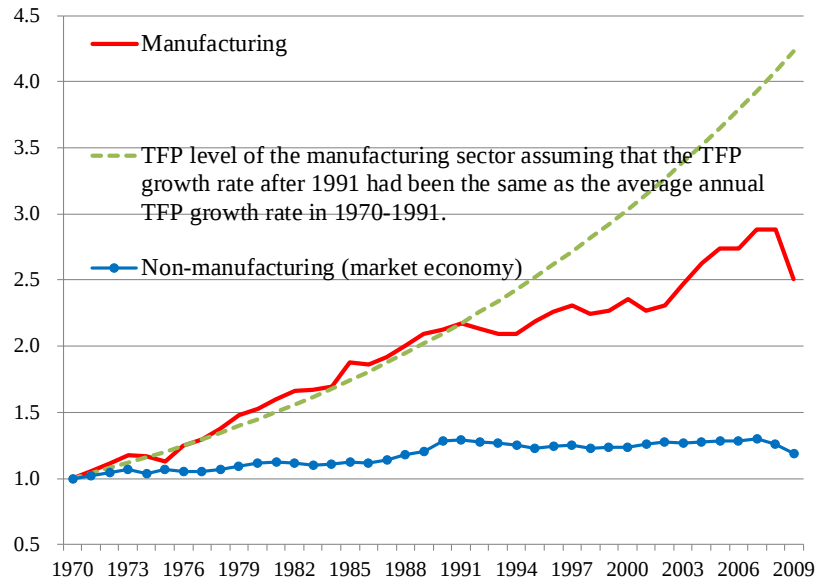
The low rate of TFP growth and the low rate of return on capital are of considerable relevance in the debate on the policy mix pursued by the present government. Japan has been suffering from a lack of final demand for the last two decades. Even now, Japan has a negative GDP gap of 3% (estimation by the Cabinet Office). The government is taking policies to get out of deflation and seems to be planning to stimulate private investment through a reduction in real interest rates. However, since investment opportunities are limited and the rate of return on capital is very low, extremely low or negative real interest rates are required, but maintaining very low or negative real interest rates, a positive inflation rate, and full employment without causing bubbles is likely to be extremely difficult to achieve. Therefore, for sustainable growth, it is necessary to raise the rate of return on capital through productivity growth and stimulate private consumption through job creation and higher wage incomes.

Next, let us analyze Japan's TFP growth at the sectoral level. Figure 4 shows how TFP (on a value added basis) in Japan's manufacturing and non-manufacturing sectors changed over time. Since inter-temporal changes of TFP in non-market activities such as public administration, education, and health and social services are difficult to measure, our data for the non-manufacturing sector cover only the market economy.

In the case of the manufacturing sector, TFP growth declined sharply after 1991. The dotted line in the figure shows the TFP level of the manufacturing sector when assuming that the TFP growth rate from 1992 onward had remained the same as the average annual TFP growth rate in 1970–1991. TFP growth in the manufacturing sector accelerated again after 2002. However, since the stagnation of TFP growth in the 1990 and the early 2000s was so pronounced, there is a huge gap between the past trend line and the actual TFP level. If Japan's manufacturing sector had been able to maintain TFP growth as high as that in 1970–1991 after 1991, the manufacturing sector's real value added now would be more than two-thirds larger (without increasing factor inputs) than the actual current level.

⁷ Hayashi (2006) presents a macro model in which corporate governance mechanisms do not work well and firms invest excessively by reinvesting all their earnings after paying minimum dividends (on this issue, also see Ando 2002). However, in the 2000s, large Japanese firms used their huge savings not for physical investment but for paying back their liabilities and for the accumulation of liquid assets (Schaede 2008). This means that the excess investment hypothesis does not really appear to describe Japan's recent economic experience very well.

Figure 4. TFP Level of the Manufacturing and the Non-manufacturing Sector, 1970–2009 (1970=1)



Notes: TFP values are on a value-added basis. The non-manufacturing sector (market economy) does not include imputed rent for owner-occupied dwellings.
Source: JIP Database 2012.

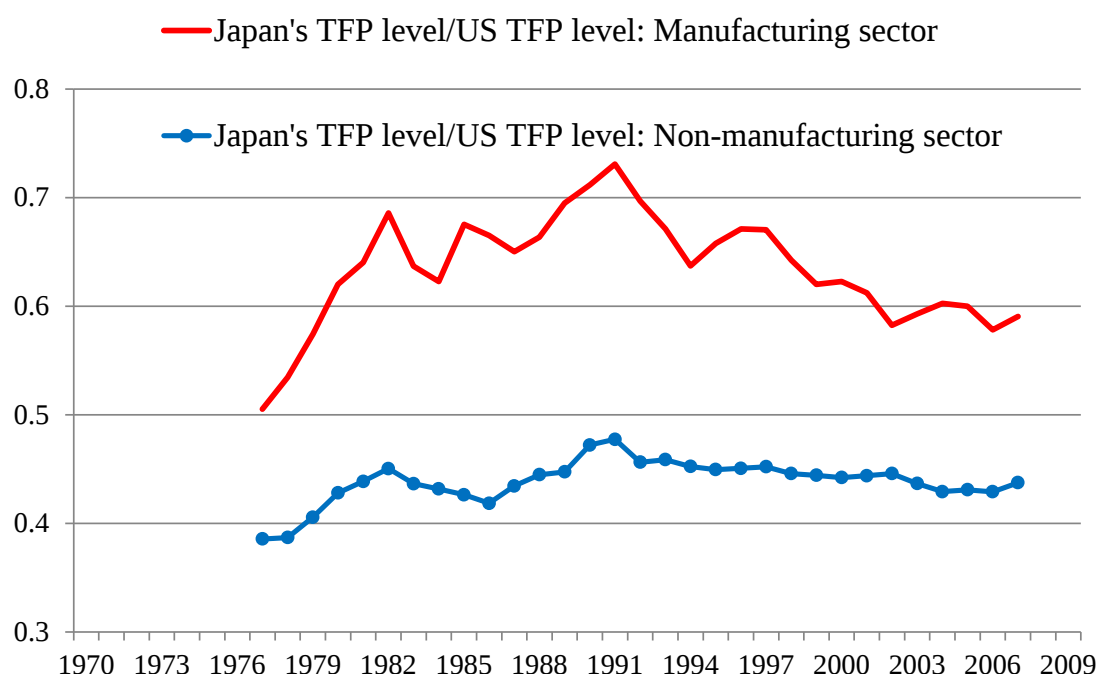
In the case of the non-manufacturing sector, TFP growth in Japan, like in other countries, has been much lower than that in the manufacturing sector. Nevertheless, there is also a distinct difference between before and after 1991. Until 1991, the non-manufacturing sector achieved slow but steady TFP growth and the TFP level in 1991 was 29% higher than that in 1970. However, after 1991, there was almost no TFP growth in this sector.

Comparing the 1970–1991 period with the 1991–2007 period, average annual TFP growth in the manufacturing sector declined by 1.94 percentage points from 3.70% to 1.76%, while average annual TFP growth in the non-manufacturing sector (market economy) fell by 1.16 percentage points from 1.20% to 0.04%. Since the nominal value added share of the non-manufacturing sector (market economy) is more than twice as large as that of the manufacturing sector (in 1991, the shares were 54% and 26%, respectively), the contribution of the slowdown of TFP growth in the non-manufacturing sector (market economy) to the slowdown of TFP growth in the macro-economy (approximated by multiplying the TFP growth decline by the value added share) was slightly greater than that of the manufacturing sector. Overall, it seems fair to say that both the manufacturing and the non-manufacturing sector almost equally dragged down macro TFP growth after 1991.

Next, comparing Japan's TFP growth with that of the United States helps to more clearly understand the stagnation of TFP growth in Japan after 1991. Figure 5 shows the TFP levels of Japan's manufacturing and non-manufacturing sectors in relation to those of the United States.

Before 1991, Japan was rapidly catching up with the United States. Partly because of low productivity growth in the United States in the late 1970s and early 1980s, Japan's TFP level relative to that of the United States in 1977–91 increased by 45% in the manufacturing sector and by 24% in the non-manufacturing sector. After 1991, both the slowdown in productivity growth in Japan and the acceleration in productivity growth in the United States reversed this trend. In 1991–2007, Japan's TFP level relative to that of the United States declined by 19% in the manufacturing sector and 8% in the non-manufacturing sector.

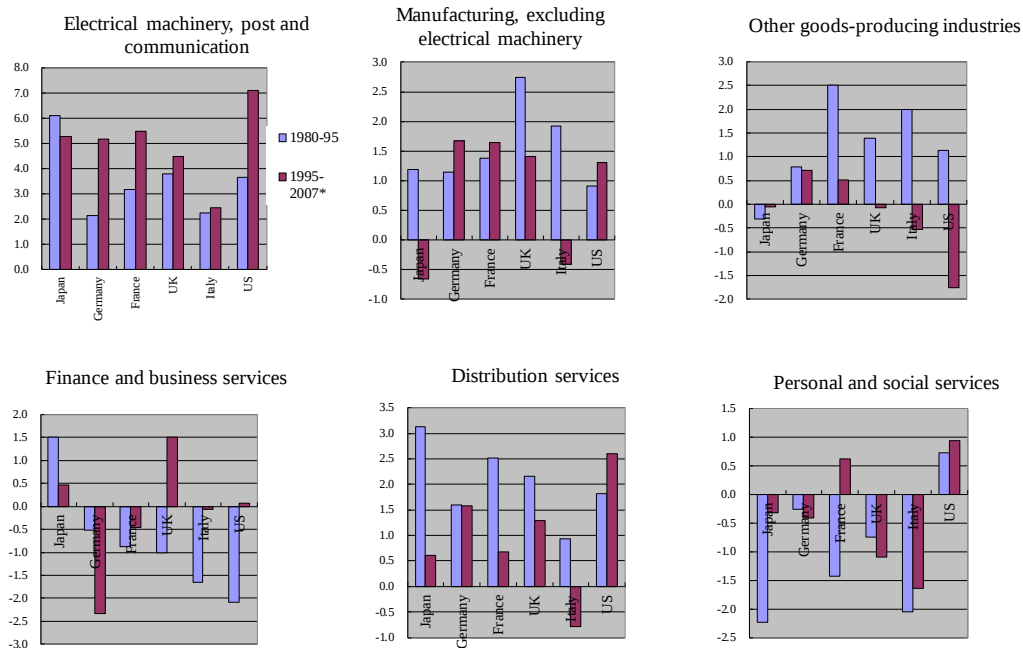
Figure 5. TFP Level of the Manufacturing and the Non-manufacturing Sector, Japan–United States Comparison: 1977–2007



Why has TFP growth in the United States accelerated? And why was Japan left behind? As already mentioned, one important factor is the ICT revolution in the United States. This can be confirmed by comparing Japan's TFP growth with that of the United States and other developed countries at a more disaggregated level.⁸ In Figure 6, the market economy is divided into six sectors and average annual TFP growth rates in each sector before and after 1995 are compared across six major developed economies.

⁸ For more details on the industry classification and the ICT intensity of each sector, see Timmer et al. (2007).

Figure 6. TFP Growth in the Market Sector: by Sector and by Country, 1980–95 and 1995–2007* (Annual Rate, %)



Source: EU KLEMS Database, November 2009.

* Growth accounting for Japan is for the period 1995–2006.

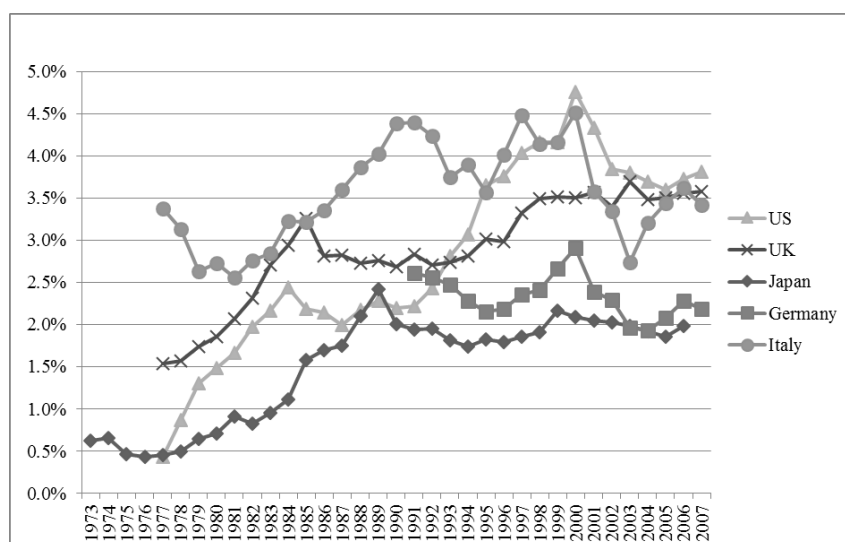
The figure shows that the United States experienced an acceleration of TFP growth not only in the ICT-producing sector (electrical machinery, post and communication), but also in ICT-using sectors, such as distribution services (retail, wholesale and transportation) and in the rest of the manufacturing sector (i.e., excluding electrical machinery). Japan also experienced relatively high TFP growth in the ICT-producing sector. The problem for Japan, however, is that TFP growth in ICT-using service sectors, such as distribution services and the rest of the manufacturing sector, declined substantially after 1995. Moreover, these ICT-using sectors are much larger than the ICT-producing sector: the average labor input share (hours worked) of the ICT-producing sector in Japan's total labor input in 1995–2007 was only 4.1% (similar to the corresponding share in the United States of 3.8%). On the other hand, the labor input shares of distribution services and the rest of the manufacturing sector in 1995–2007 were 22.8% and 16.5%, respectively.

Figure 6 also shows that most of the major European countries did not achieve a productivity acceleration in the ICT-using sectors like the United States after 1995, although their performance was not quite as bad as that of Japan.

3. ICT and Intangible Investment in Japan

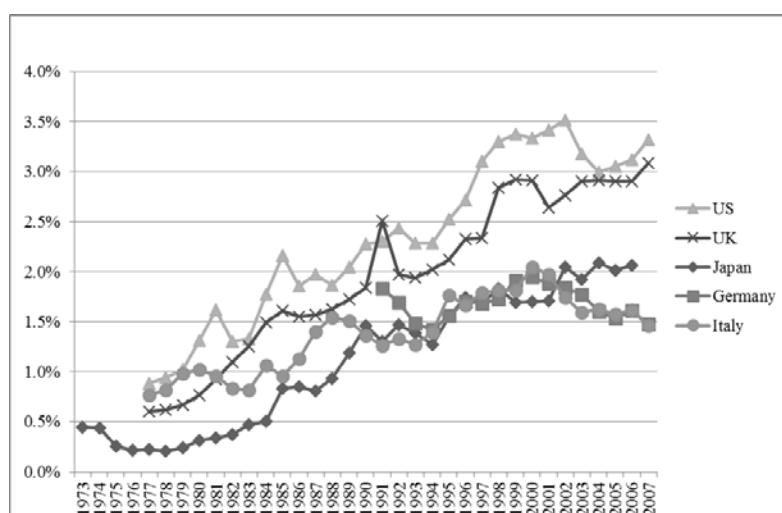
Why did an ICT revolution of the magnitude observed in the United States not occur in Japan and the major European countries? This question was one of core themes of the EU KLEMS Project supported by the EU Commission. Figures 7 and 8 show the project's main answer to this question.

Figure 7. ICT Investment–GDP Ratio in Major Developed Economies: Distribution Services



Source: EU KLEMS Database, November 2009.

Figure 8. ICT Investment–GDP Ratio in Major Developed Economies: The Rest of the Manufacturing Sector



Source: EU KLEMS Database, November 2009.

In Japan and some of the European countries, such as Germany, the ICT investment–GDP ratio in IT-using service sectors, such as distribution services, and in the rest of the manufacturing sector

is very low in comparison with the United States. This is the result obtained after a careful compilation of internationally comparable data of fixed capital and software investment by detailed category of capital goods. It appears that the ICT revolution did not happen in Japan simply because Japan has not accumulated sufficient ICT capital.

The next question that needs to be addressed is why ICT investment in some sectors is so small in Japan. It is interesting to note that Japan's ICT investment in these sectors has been low in comparison with other countries since the 1970s. It therefore cannot be argued that the economic slump after 1991 has been the main cause of Japan's low ICT investment. Several structural impediments to ICT investment in Japan can be pointed out.

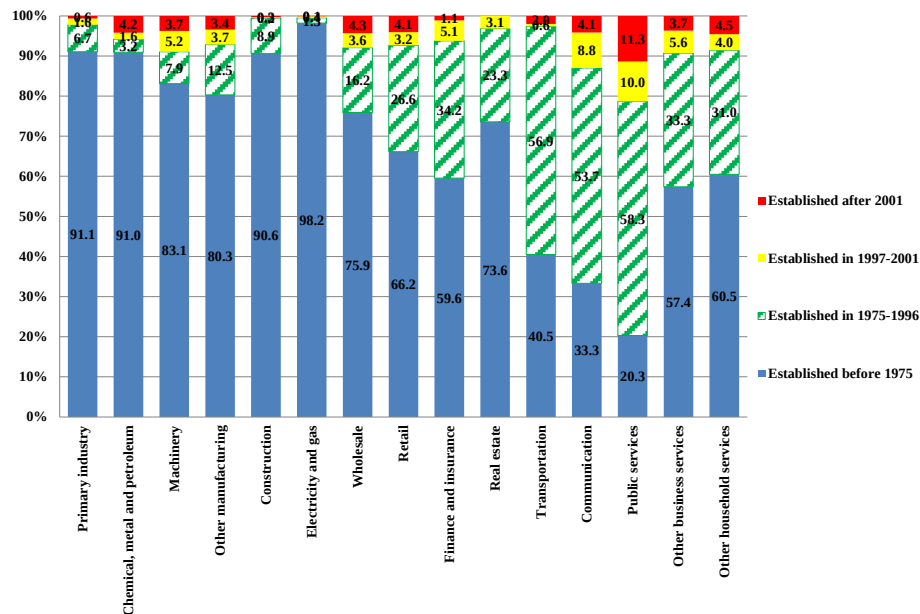
First, one of the main contributions of the introduction of ICT is that it allows firms to save unskilled labor input. However, because of the high job security in Japan, it may be difficult for firms to actually cut jobs.

Second, in order to introduce ICT, firms need to incur certain initial fixed costs, such as those associated with the revision of organizational structures and training of workers.⁹ Some of these expenditures are one shot, and it seems that once firms have adjusted their organizational structures to new ICT and have accumulated a certain mass of ICT-literate workers, they can expand their scale later without a lot of additional costs. Probably because of this characteristic of ICT technology, younger and growing firms tend to be more active in ICT investment. Using micro data of the Ministry of Economy, Trade and Industry's *Basic Survey of Japanese Business Structure and Activities*, Fukao et al. (2012) find that, in Japan's non-manufacturing sector, after controlling for firm size, industry, etc., younger firms have a significantly higher software stock/sales ratio. However, because of the low entry and exit rates in Japan, firms that have been around for 45 years or more have a majority of market share in all industries except transportation, communication, and public services (Figure 9). This low metabolism has probably impeded ICT investment in Japan.

Third, Japan's retail sector is characterized by small shops, whereas the US retail sector is characterized large chain stores (Haskel et al. 2007). Moreover, in service sectors, Japanese listed firms are of a much smaller scale on a consolidated basis than their counterparts in the United States (Fukao and Miyagawa 2010), and these smaller firms in Japan probably have found it more difficult to introduce ICT because of their small scale.

⁹ On this issue, see Bloom et al. (2012). Using firm-level data for Japan and the United States, Atrostic et al. (2008) find that computer network use has a much larger positive impact on firms' performance in the United States than in Japan.

Figure 9. Sales Share by Firm Age Group in 2009



Source: Fukao et al. (2012).

Note: The original data are from the *Basic Survey of Japanese Business Structure and Activities*. The data cover only firms with more than 50 employees and paid-in capital of more than 30 million yen.

It is also important to note that in order to avoid changes in corporate structure, employment adjustment, and training of workers, Japanese firms tend to choose custom software rather than packaged software, making ICT investment more expensive and network externality effects smaller, because each firm uses different custom software.

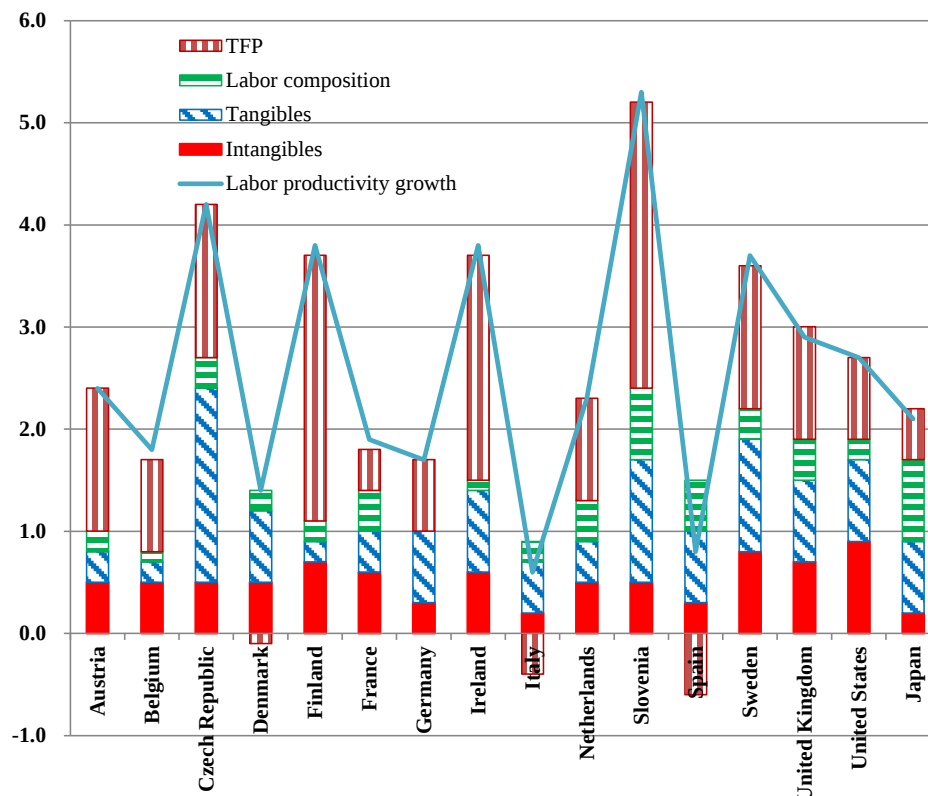
The impediments to ICT investment mentioned above may be closely related with intangible investment in Japan. Intangible investment is defined as expenditures by firms for future production and profits and includes training of workers and the revision of firms' organizational structure. ICT capital and intangible assets may be close complements, as highlighted in the 2007 Economic Report of the President, which states that "[o]nly when they made intangible investments to complement their IT investments did productivity growth really take off" (p. 56).

Using the perpetual inventory method and intangible investment data, it is possible to estimate how intangible assets have been accumulated over time. Moreover, using this result, it is possible to conduct a new type of growth accounting in which capital services from intangible assets are treated as one of the factor inputs. In the present system of the national accounts, most categories of intangible investment are still treated as firms' intermediate inputs, not as capital accumulation. Therefore, in this new approach, it is also necessary to estimate a new "GDP," in which goods and

services used for intangible investment are regarded as final goods and services, and not as intermediate inputs.

Using this type of framework, which was first proposed by Corrado et al. (2009), new growth accounting has been conducted for many developed countries. Figure 10 presents a comparison of the results across countries. This figure shows that in 1995–2007, the contribution of intangible investment to labor productivity growth in Japan was the lowest among the major developed countries. When conducting growth accounting without taking account of intangible asset accumulation, as in Figure 1, the derived “TFP” growth will contain the contribution of intangible asset accumulation to economic growth. Therefore, the low “TFP” growth in Japan since 1990, which we observed in Figure 1, must have partly been caused by the slow growth of intangible assets in Japan.¹⁰

Figure 10. Contributions to the Growth of Output per Hour: Market Economy, 1995 to 2007 (Annual Rate, %)



Source: Corrado et al. (2012) and Miyagawa and Hisa (2012).

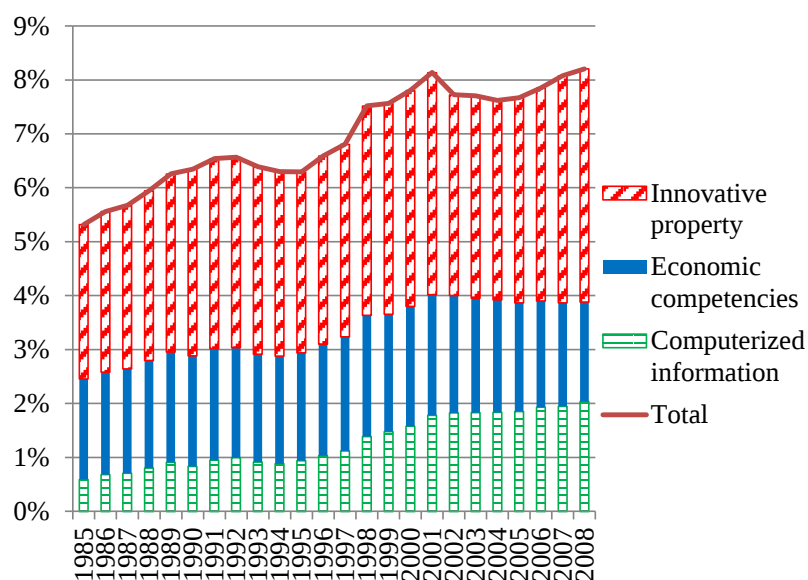
¹⁰ It should be noted that since the definition of GDP changes, as already explained, the following equation does not hold exactly:

TFP growth derived when not treating intangible assets as factor input
= TFP growth derived when treating intangible assets as factor input
+ Contribution of accumulation of intangible assets to economic growth
For more details on this issue, see Corrado et al. (2009) and Fukao et al. (2009).

Figure 10 shows another interesting point. That is, in the case of the United States, the contribution of intangible asset accumulation to labor productivity growth has been very large. In fact, it has been larger than the contribution of TFP growth in the United States and the largest among all the countries listed. It thus can be said that the “TFP” resurgence of the United States after 1995 seen in Figure 2 was partly caused by active investment in intangibles.¹¹

Why has intangible asset accumulation in Japan been so small? In the framework of Corrado et al. (2009), intangible assets consist of three categories: innovative property (science and engineering R&D, mineral exploitation, copyright and license costs, other product development, design, and research expenses), computerized information (software and databases), and economic competencies (brand equity, firm-specific human capital, organizational structure). Figure 11 shows Japan’s intangible investment–GDP ratio for each of the three categories.

Figure 11. Japan's Intangible Investment–GDP Ratio by Category: 1985–2008



Source: JIP Database 2011.

Note: For details of the estimation procedures, see Chun et al. (2012).

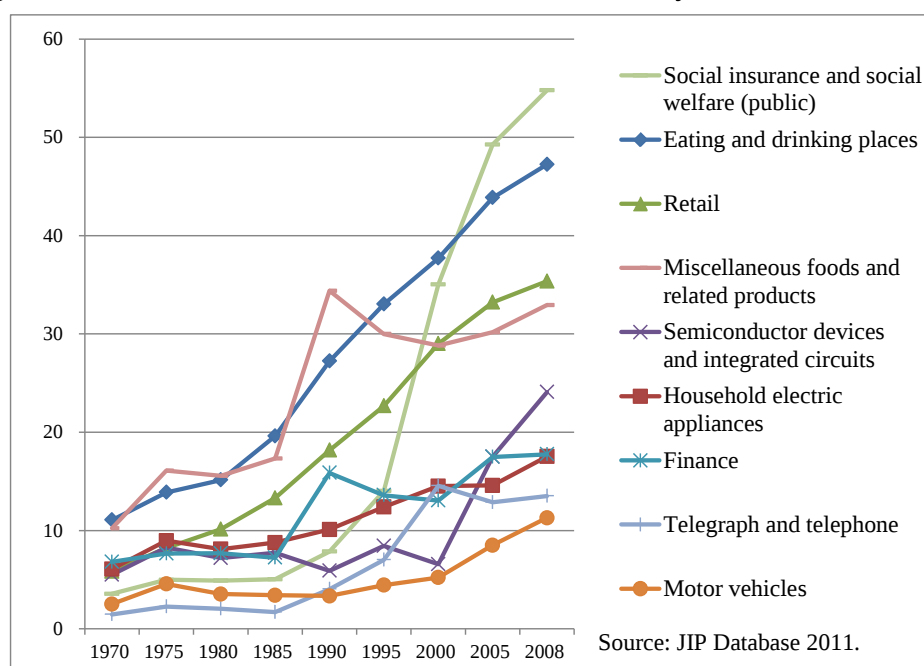
Looking at intangible investment in detail and comparing that for Japan with that for other countries shows that, reflecting the huge R&D expenditures by manufacturing firms, Japan invests a lot in innovative property but relatively little in economic competencies. Moreover, since around

¹¹ It should be noted that both the ICT investment in Figures 7 and 8 and the intangible investment in Figure 10 include software investment.

2000, in particular investment in economic competencies and computerized information has stagnated.

It seems that the decline in the accumulation of economic competencies was caused by the harsh restructuring resulting from the long-term economic stagnation. For example, many firms increased the percentage of part-time workers in total workers (Figure 12) and did not provide intensive training in the case of part-time workers. This change reduced training expenditure substantially.¹²

Figure 12. Share of Part-Time Workers in Total Workers by Sector: 1970–2008 (in %)



Why is the percentage of part-time workers increasing so rapidly in many industries in Japan? In sectors where individual proprietorships used to dominate, such as retail and eating and drinking places, one factor is that as individual proprietorships are replaced by corporations, family employees are replaced by part-time workers. However, this explanation does not apply to many other sectors, such as most manufacturing industries.

Another possible factor is that firms are increasing the number of part-time workers in order to maintain the flexibility of employment levels. Given the decline of the working age population and

¹² The estimation of intangible investment used in Figures 10 and 11 does not include on-the-job training, which many Japanese firms regard as important. If on-the-job training were added to intangible investment, the investment in economic competencies shown in Figure 11 would be larger. However, since firms invest little in on-the-job training for part-time workers and the percentage of part-time workers in total workers is rapidly increasing, including on-the-job training would not raise the contribution of intangible asset accumulation to Japan's economic growth in Figure 10. On this issue, see Fukao et al. (2009).

economic stagnation, most firms cannot expect their need for employees to steadily increase, as was the case during the high-speed growth era. At the same time, areas in which individual firms have a competitive advantage over their rivals are changing quickly and Japan's comparative advantage as whole is also changing over time. Given the high job security provided under traditional employment practices, increasing the reliance on part-time workers is almost the only way for firms to maintain both the level and the mix of employment flexible.

Providing a theoretical model to capture these aspects, Matsuura et al. (2011) empirically show that firms which face greater uncertainty in their sales tend to have a higher percentage of part-time workers. They conjecture that globalization and the increase in international competition have raised sales uncertainty for manufacturing firms and that this factor has contributed to the increase of part-time workers in Japan's manufacturing sector.

In order to examine whether firms employ part-time workers simply to take advantage of lower wage rates or to gain more flexibility in their workforce, Fukao et al. (2006) estimate both the marginal productivity of part-time workers in comparison with that of regular workers and the compensation of part-time workers in comparison with that of regular workers, using employer-employee matched data at the factory level. They find that the productivity gap between part-time workers and regular workers is larger than the wage gap between part-time workers and regular workers. This means that firms pay a premium to part-time workers in order to obtain flexibility of employment.

Such behavior by firms is quite rational in the context of slow economic growth and Japan's system of high job security. However, at the same time it may also be creating a huge economic loss by reducing human capital accumulation, and this loss seems to be greater than the observable wage gap between part-time workers and regular workers. In order to resolve this problem, Japan's labor market needs to be reformed.

4. Has the Natural Selection Mechanism Been Working in Japan's Economy?

Sector-level TFP growth is equal to the weighted average of the TFP growth of firms or factories in that sector. Since productivity levels differ considerably across firms and factories within each sector, resource allocation across firms and factories is bound to have a large impact on TFP growth. If the economic natural selection mechanism works, more productive firms would be expected to enter and expand and less productive firms to shrink and exit. The slowdown of Japan's TFP growth may have partly been caused by a deterioration of this mechanism.

Several studies have already examined this issue. For example, using data on listed firms, Ahearne and Shinada (2005) and Caballero et al. (2008) have shown that since the 1990s, in bad loan infested sectors, such as real estate and construction, profitless and highly indebted (zombie) firms tended to survive, probably because of lender banks' continuous support. Using data of the

Basic Survey of Japanese Business Structure and Activities, which covers not only large firms but also small and medium-sized firms, Nishimura et al. (2005) examined productivity dynamics in the manufacturing and non-manufacturing sectors from the mid-1990s onward and observed negative exit effects (productive firms exit and less productive firms survive) in some industries such as commerce. On the other hand, using factory-level data of the Ministry of Economy, Trade and Industry's *Census of Manufactures* from the beginning of the 1980s onward, Fukao and Kwon (2006) examined productivity dynamics in the manufacturing sector and found that the market selection mechanism already did not work very well in the 1980s, so that entry and exit effects made a much smaller contribution to TFP growth than in other countries. They further found that the slowdown in TFP growth in the 1990s was mainly due to a slowdown in TFP growth within factories.

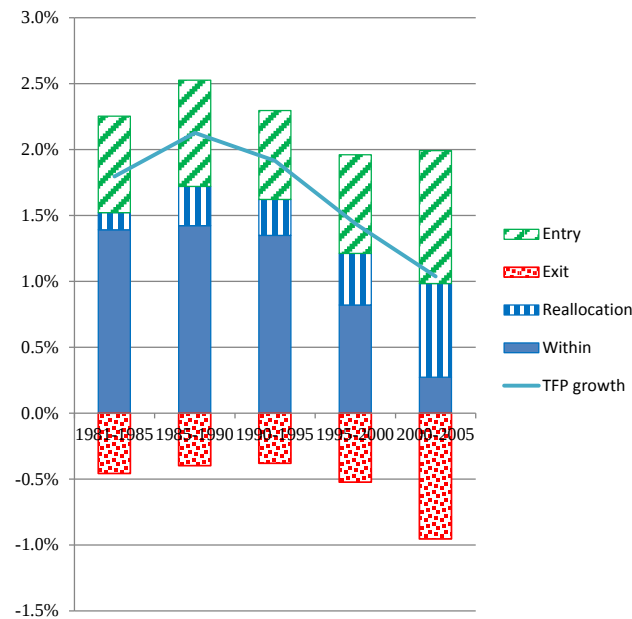
This section revisits the issue of productivity dynamics using recent empirical results. In addition, the results of the analysis of productivity dynamics will be compared with the results of the sectoral and macro-level analysis in Section 2.

In Figure 13, TFP growth (on a gross output basis) in Japan's manufacturing sector is decomposed into entry, exit, reallocation, and within effects. Micro data of the *Census of Manufactures*, which covers all factories with four or more employees, were used. Factories are classified into 54 industries and, following Good et al. (1997) and Aw et al. (2001), within each industry, each plant's TFP level in comparison with the industry average TFP level was measured.

Figure 13 shows that from 1990 onward the within effect steadily declined and the negative exit effect expanded (that is, productive factories were shut down, while less productive factories remained). Taken together, these two trends reduced TFP growth in the manufacturing sector substantially. On the other hand, the positive entry effect and the reallocation effect expanded and partly mitigated the decline in TFP growth.¹³

¹³ It should be noted that there is some inconsistency between the continuous decline in TFP growth in Figure 13 and the sector-level results in Figure 4, where TFP growth in the manufacturing sector partly recovered after 2002. One possible explanation is that the *Census of Manufactures* does not cover headquarters where no manufacturing activities are conducted. If the efficiency of such headquarter activities is improved, TFP growth at the sectoral level can become larger than that at the micro level, as observed in Figure 4 and 13. There are at least two more potential causes of the difference. First, the TFP data for Figure 13 are on a gross output basis, while those for Figure 4 are on a value added basis. And second, inter-temporal changes in labor quality are not taken into account in the process of deriving the TFP data for Figure 13, but are taken into account in the case of the TFP data for Figure 4.

Figure 13. Decomposition of TFP Growth in the Manufacturing Sector (Annual Growth Rate)



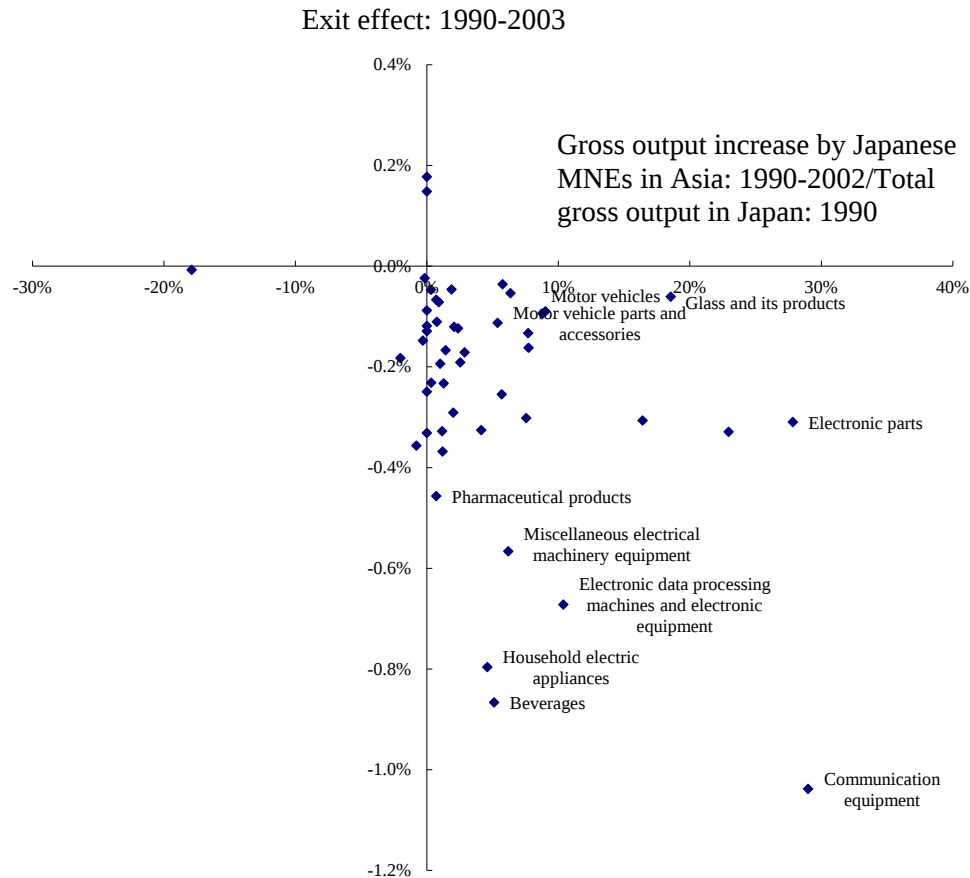
Source: Ahn et al. (2012).

Why did the negative exit effect increase over time? Comparing the survival rates of factories shows that less productive factories have a higher probability of being shut down. However, some large and productive factories have also been shut down, as a result of which the weighted average of the TFP level of factories that are closed has been higher than the average TFP level of staying factories (Kim et al. 2007).

As Figure 14 shows, there is a statistically significant negative correlation between the industry-level exit effect and industry-level gross output growth by Japanese multinational enterprises (MNEs) in Asia. MNEs have higher productivity than non-MNEs (Fukao 2012) and many of them have relocated, or are relocating, production activities abroad, meaning that as they reduce production within Japan,¹⁴ only unproductive non-MNEs are left behind. It seems that this is the main cause of the negative exit effect.

¹⁴ As already explained in Section 2, despite ample cash flow, large firms are not (directly) expanding production in Japan. Instead, excess cash is used for debt repayment, portfolio investment, outward FDI, and/or the expansion of the production capacity of their domestic affiliates.

Figure 14. Overseas Production and the Exit Effect at Home

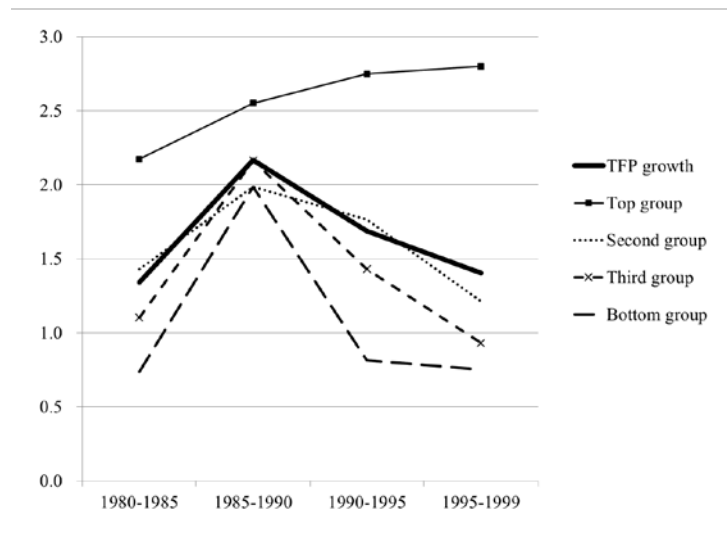


Source: Kim et al. (2007).

Another important fact we can point out from the micro data is that the productivity gap between large firms and small and medium-sized firms (SMEs) has increased in the 1990s and 2000s. Figure 15 shows the results of Kim et al. (2010) on this issue. Employing the data used for Figure 13, they examined the TFP growth of stayers by factory size for five-year intervals from 1980 to 1999 (the final period is on 1995–1999). They subdivided factories into four groups by factory size at the beginning of each period for each industry. The grouping is conducted so that the total sales of each group in each industry is equal to one quarter of the total sales of that industry. They then calculated the weighted average of the TFP growth for each group of factories of different size. They found that in the manufacturing sector, the TFP growth of large factories, most of which are owned by large firms, actually accelerated in the 1990s, while small and medium-sized factories, most of which are owned by SMEs, were left behind. Thus, there was no lost decade in the case of large manufacturing firms. Using micro data of the Ministry of Finance's *Financial Statements Statistics of Corporations*

by *Industry*, it can be further confirmed that the TFP gap between large firms and small firms in the manufacturing sector continued to expand in the 2000s (Fukao 2012).

Figure 15. TFP Growth by Factory Size



Source: Kim et al. (2010).

One possible explanation of this divergence is that SMEs were left behind in R&D. In the 1990s and 2000s, the R&D expenditure–gross value added ratio of the Japanese manufacturing sector continued to grow. However, in Japan, R&D expenditure is mainly confined to large firms, which conduct the bulk of R&D. According to the *White Paper on Small and Medium Enterprises in Japan 1999*, the average R&D–sales ratio of Japanese firms is higher than that of US firms in the case of firm groups with 5,000 or more employees, but it is lower in the case of firm groups with less than 5,000 employees. Moreover, according to the *Report on the Survey of Research and Development 2011*, total R&D (including sponsored research) by firm groups with 300 or more employees amounted to 13 trillion yen, while total R&D by firm groups with less than 300 employees was only 1 trillion yen.

Japanese SMEs probably enjoyed R&D spillovers from large firms through tight supplier-purchaser relationships and geographic proximity within Japan before the 1990s. However, as large firms expanded their supply chains globally and relocated their factories and even their R&D activities abroad (Belderbos et al. 2009), spillovers from large firms seem to have declined.

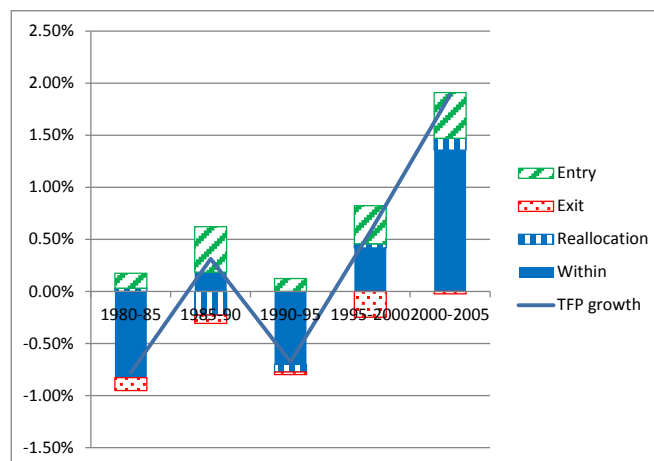
Using matched micro data of the *Census of Manufactures* and the Ministry of Education, Culture and Sports, Science and Technology’s *Survey of Research and Development* from the 1980s to the 2000s, Kwon et al. (2013) examine R&D spillover effects through geographic and

technological proximity and supplier relationships. They find that R&D spillover effects have declined since the 1990s partly because of a decline of geographic proximity through the closure of factories in industrial districts by R&D intensive firms. In recent years, SMEs have started to become more active in R&D (Fukao et al. 2012), probably in order to respond to this decline of spillover inflows. However, it will take some time for SMEs to catch up.

It should further be noted that only a limited part of the decline in SMEs' TFP growth shown in Figure 15 can be explained by the weakening of spillover effects (Kwon et al. 2013). Another factor contributing to the decline in TFP growth probably is the stagnation of investment by SMEs in ICT and intangibles (Fukao et al. 2012). However, further research is needed on this issue.

Next, let us examine the slow TFP growth in the non-manufacturing sector. It is difficult to conduct an analysis that is as detailed and rigorous as that for the manufacturing sector because of a lack of sufficient micro data. That being said, Figure 16 shows the results of decomposing the TFP growth of listed firms in the non-manufacturing sector using data from financial reports. Since the data cover only listed firms, “entry” refers to firms that were newly listed, while “exit” refers not only to firms that went bankrupt but also to those that delisted.

**Figure 16. Decomposition of TFP Growth of Listed Non-manufacturing Firms
(Annual Growth Rate)**



Source: Kim et al. (2010).

The figure shows that the sharp drop in TFP growth from 1985–90 to 1990–95 was mainly caused by the decline of the within effect. On the other hand, although the contribution of the entry effect declined, there was some improvement in the reallocation and the exit effect in 1990–95. Therefore, when looking at all listed firms in the non-manufacturing sector as a whole, it seems difficult to argue that the “zombie” firm problem was the number one cause of the decline in TFP growth from 1985–90 to 1990–95.

This figure also shows that after the bad performance in 1990–95, TFP growth steadily increased after 1995. The main engine of this TFP growth resurgence was the increase in the within effect. In the case of the TFP growth acceleration from 1995–2000 to 2000–05, both the increase in the reallocation effect and the reduction of the negative exit effect also contributed to the TFP acceleration. These two factors may be related with the fading out of the “zombie” problem.

As in the manufacturing sector, listed firms in the non-manufacturing sector, most of which are large firms, enjoyed an acceleration in TFP growth in recent years. Therefore, Figure 16 does not really help to explain the extremely low TFP growth in the non-manufacturing sector in the 2000s seen in Figure 4. Figure 16 covers only listed firms, which make up only a relatively small portion of all firms in the non-manufacturing sector. Comparing data on listed firms and data from the *Financial Statements Statistics of Corporations by Industry*, Kim et al. (2007) suggest that in the case of the non-manufacturing sector, the value added share of listed firms among all firms in the sector was only 22% in 2000.

To examine the TFP performance of firms in the non-manufacturing sector by firm size, Inui et al. (2011) classified firms within each of the 17 non-manufacturing industries into four groups by firm size and found that the gap between the average TFP level of the group of largest firms and the group of smallest firms was 14% in 1982–1990, 18% in 1991–2000, and 21% in 2001–07. In other words, the TFP gap between large and small firms has increased substantially over time. According to Fukao and Kwon (2011), larger, older, and more productive firms in the non-manufacturing sector are very slow to increase their capital and labor input. As in the case of the manufacturing sector, it seems that the natural selection mechanism does not work well in the non-manufacturing sector. More analyses are needed on why SMEs have been left behind in terms of productivity and why the natural selection mechanism does not work in the non-manufacturing sector.

5. Conclusion

Using industry- and micro-level data, this paper examined why Japan’s productivity growth has been slow for such a long time and how it can be accelerated in the future. The main findings are as follows.

1. Japan’s TFP growth declined substantially after 1991 both in the manufacturing and the non-manufacturing sector. Before 1991, Japan’s TFP was rapidly catching up with that of the United States, but after 1991, Japan’s TFP level relative to that of the United States declined by 19% in the manufacturing sector and 8% in the non-manufacturing sector. It seems that this large and prolonged drop in TFP growth cannot be fully explained by labor hoarding and the idling of capital stock caused by a scarcity of final demand.

2. Japan's capital accumulation continued apace after 1990, especially when taking the slow rate of GDP growth and the decline in the working age population into account. Japan's capital–GDP ratio continued to increase after 1991, and this increase in the capital–GDP ratio must have contributed to the decline in the rate of return on capital in Japan by decreasing the marginal productivity of capital.
3. From 1995, the United States experienced an acceleration of TFP growth in ICT-using sectors, such as distribution services and in the rest of the manufacturing sector. It appears that a similar ICT revolution did not occur in Japan simply because Japan has not accumulated sufficient ICT capital. Japan's accumulation of intangible capital was also very slow. Since ICT capital and intangible assets may be close complements, it seems that the stagnation of these two types of investment mutually reinforced each other.
4. The low levels of ICT and intangible investment are closely related with labor market problems. For example, one of the main contributions of the introduction of ICT is that it allows firms to save unskilled labor input. However, because of the high job security in Japan, it may be difficult for firms to actually cut jobs. Moreover, many firms increased the percentage of part-time workers in total workers and did not provide intensive training in the case of part-time workers. This change substantially reduced training expenditure, which is an important part of intangible investment.
5. Large firms enjoyed an acceleration in TFP growth in recent years and the productivity gap between large firms and small and medium-sized firms (SMEs) has increased in the 1990s and 2000s. It seems that Japanese SMEs were left behind in the accumulation of ICT capital and intangible investment. Furthermore, as large firms expanded their supply chains globally and relocated their factories and even their R&D activities abroad, R&D spillovers from large firms to SMEs seem to have declined.
6. The natural selection mechanism does not work well both in the manufacturing and the non-manufacturing sector. In the case of manufacturing, this is partly because large productive firms have been relocating their factories abroad.

The above findings yield the following policy implications.

First, as explained in Section 1, the present government is taking policies to overcome deflation and appears to be planning to stimulate private investment through a reduction in real interest rates. However, since investment opportunities are limited and the rate of return on capital is very low, extremely low or negative real interest rates are required, but maintaining very low or negative real interest rates, a positive inflation rate, and full employment without causing bubbles is likely to be

extremely difficult to achieve. Therefore, for sustainable growth, it is necessary to raise the rate of return on capital through productivity growth.

Second, more empirical analysis is needed to judge for certain whether Japan's low growth rates of ICT capital and intangible assets are sub-optimal. However, if it is indeed desirable to enhance ICT and intangible investment, labor market reforms (such as improving the social safety net, enhancing labor market flexibility, and reducing the unfair gap between regular and part-time workers) and support for ICT and intangible investment by SMEs will be important issues. Labor market reform is also important from the perspective of human capital accumulation. Firms pay a premium to part-time workers in order to obtain flexibility of employment. Such behavior by firms is quite rational in the context of slow economic growth and Japan's system of high job security. However, at the same time it may also be creating a huge economic loss by reducing human capital accumulation.

Third, to raise TFP growth, the natural selection mechanism of the economy needs to be enhanced. To achieve this in the case of the manufacturing sector, it is important to enhance the startup of domestic establishments by Japanese and foreign multinationals through the improvement of regional logistics, the establishment of FTAs, the reduction of corporate taxes, etc. In the case of the non-manufacturing sector, this is still overregulated in Japan and regulatory reforms are required. For example, the government could relax regulations preventing the entry of private firms in agriculture and medical services. It could also revise the Large-scale Retail Stores Law and facilitate the entry of large retail stores. When the government supports SMEs, it should restrain from supporting all SMEs uniformly. Such support harms the market selection mechanism. Instead, the government needs to introduce a scheme which enhances the growth of promising small firms. For example, the government could promote the diffusion of technology to innovative SMEs by revising the Japanese version of the Bayh-Dole Act (Article 30 of the Law on Special Measures for Industrial Revitalization and Innovation). The government could also increase its procurements from SMEs. Labor market reform is another important element to enhance the natural selection mechanism, because the expected high closure cost of firms decreases the incentives for entrepreneurs and investors to set up new businesses. In sum, there is a wide range of steps the government could take to address the fundamental cause of Japan's economic stagnation – low TFP growth – and boost the economy's growth potential.

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