

## **Part I Productivity improvement and international business development**

To achieve improvements in required productivity for both medium and long term economic growth in Japan, this part analyzes the current state of productivity in Japan, and presents a way of thinking for initiatives that provide improvements to productivity through such means as overseas expansion of business and inbound policy.

### **Chapter 1 Japan's current productivity in comparison with other countries**

The Japanese economy has experienced extremely low growth at 0.8% per annum (real term) over the last 20 years. While facing with a declining birthrate and a growing proportion of elderly people in addition to decrease in population, for Japan to achieve medium and long term economic growth, improvements to productivity through expansion from various measures and policies is necessary.

From these viewpoints, this chapter will focus on labor productivity<sup>1</sup> and Total Factor Productivity (hereafter, TFP), which represent productivity measure. International comparisons that focus on the United States and Europe (Germany, the United Kingdom, and France) are also performed to understand and analyze the current state of productivity in Japan.<sup>1</sup>

First, in section 1, in order to analyze what factors are causing the long term stagnation in the Japanese economy, the real GDP growth rate is decomposed onto factors using a method called growth accounting.<sup>2</sup> Continuing to section 2, decomposition is performed for real GDP per capita growth rate used as a measure for the affluence of a single average citizen. By analyzing these factors, it can be shown that the cause of the declining growth of the Japanese economy is the stagnation in TFP and labor productivity. In section 3, we will calculate the labor productivity and TFP for each sector comprising industry and perform an international comparison centered on Japan, the United States and the Europe. In section 4, we will perform a cross-sectional analysis after combining Japan's productivity with the added value share of each industry. Finally, we will summarize the results obtained from the analysis in this chapter.

#### **Section 1 Factor decomposition of real GDP growth rate - Analysis using growth accounting -**

First, to check what kind of effect is placed on Japan's economic growth through stagnation in productivity increase, factor decomposition must be performed for the real GDP growth rate using the growth accounting and then conduct a comparison with the major countries such as the United States,

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<sup>1</sup> Total factor productivity (TFP): Productivity measure that considers not just labor, but also all production factors such as raw materials and capital.

$$\text{Total Factor Productivity (TFP)} = \frac{\text{Production volume}}{\text{All input factors of production}}$$

Labor productivity is the measure that emphasizes only labor out of factors of production inputed into production. However, TFP is the productivity measure that takes into account raw materials and capital as well as labor, so improving TFP improves production efficiency without depending on physical volume input. That is, it is believed to be a measure that displays improvements for operating efficiency and technological innovation. (Refer to RIETI homepage at <http://www.rieti.go.jp/jp/database/JIP2012/ans.html?page=Q3>).

<sup>2</sup> Refer to supplementary notes 1 for the methodology of growth accounting method. In the following context for growth accounting, we use the same meaning for TFP growth rate and contribution of TFP (to GDP growth rate).

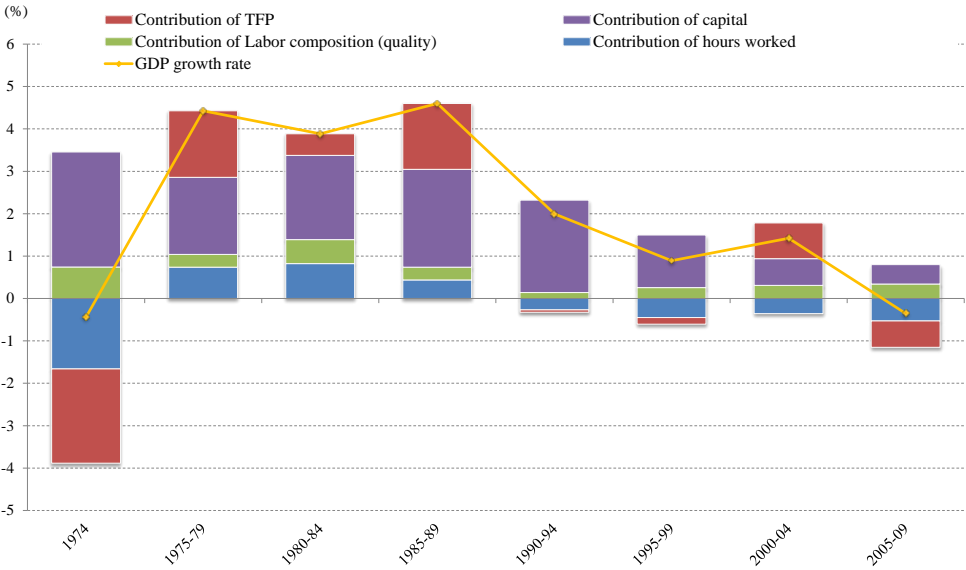
and the Europe. This analysis will reveal that the decrease in Japan’s TFP growth rate is quite significant after 1990’s.

Figure I-1-1-1 shows factor decomposition for contributions of (1) TFP, (2) hours worked, (3) labor composition (quality), and (4) capital to Japan’s real GDP growth rate based on growth accounting. Japan’s real GDP growth rate achieved stable growth at around 4% until the latter half of the 1980s, except for 1974 when the growth rate dropped due to the effect of the first oil crisis. However, the GDP growth rate greatly dropped due to so called the collapse of the bubble economy and, the economy has continue at low growth that is less than 1% on average since 1990.

When looking at the growth rate decomposition, contribution based on TFP growth had greatly dropped in Japan since 1990 excluding the first half of the 2000s. Furthermore, since 1990, the contribution of hours worked has been consistently negative. In this way, it can be seen that the decline in TFP growth rate and hours worked are the major factors in the decline of GDP growth rate for Japan from 1990.

On the other hand, the labor composition (quality) maintained a positive contribution that was of a scale to partially offset the negative contribution of hours worked. The contribution of capital has consistently been positive value while exhibiting a declining trend in recent years. Overall, it can be seen that these factors supported the GDP growth rate in Japan.

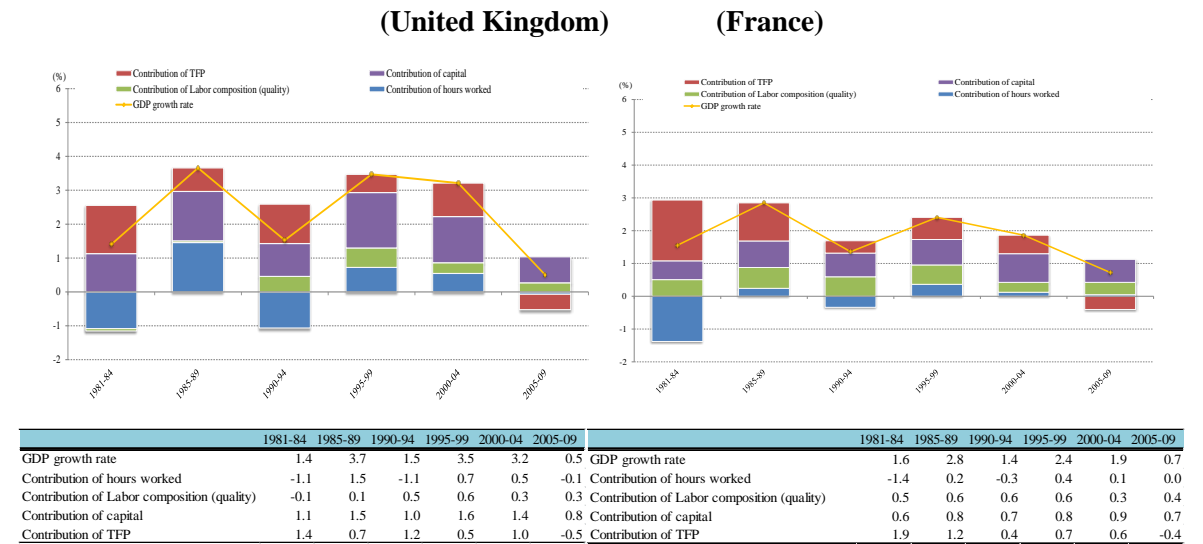
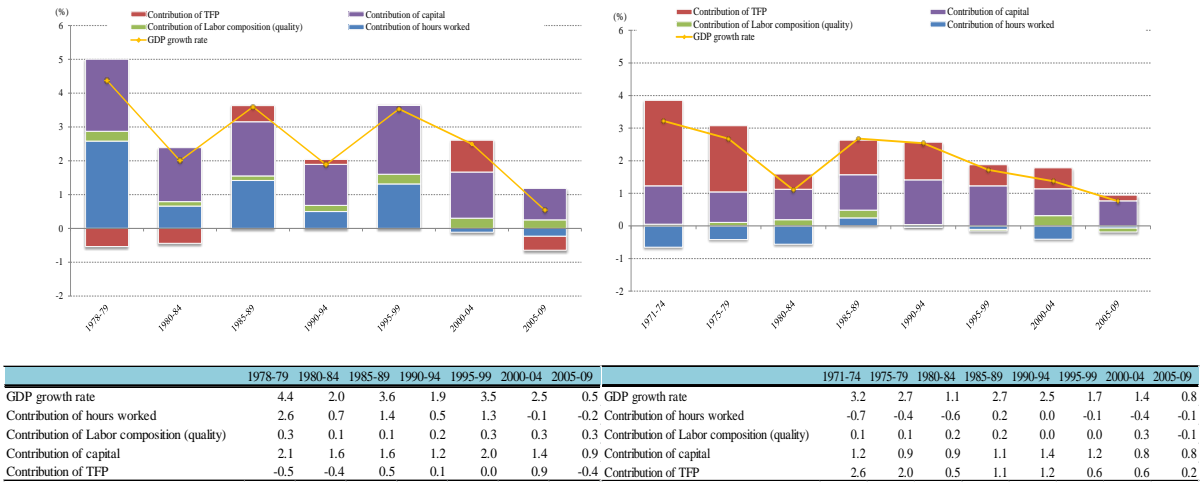
**Figure I-1-1-1 Growth accounting for Japan’s real GDP growth rate**



	1974	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09
GDP growth rate	-0.4	4.4	3.9	4.6	2.0	0.9	1.4	-0.4
Contribution of hours worked	-1.7	0.7	0.8	0.4	-0.3	-0.4	-0.4	-0.5
Contribution of Labor composition (quality)	0.7	0.3	0.6	0.3	0.1	0.3	0.3	0.3
Contribution of capital	2.7	1.8	2.0	2.3	2.2	1.2	0.6	0.5
Contribution of TFP	-2.2	1.6	0.5	1.6	-0.1	-0.2	0.8	-0.6

Source: EU KLEMS2012 release.

**Figure I-1-1-2 Growth accounting for real GDP growth rate  
(United States) (Germany)**



Source: EU KLEMS2012 release.

Using the same method, the real GDP growth rate for the United States and the major countries in Europe are decomposed into each factor (Figure I-1-1-2). First, the United States real GDP growth rate was less than Japan's in the first half of the 1990s. However, after the latter half of the 1990s, this completely changed and the United States achieved GDP growth rate that was higher than Japan's. In particular, after 1990, the United States TFP growth rate was consistently above the rate for Japan. The contributions of labor composition (quality) and capital were the same as Japan and were consistently positive, while at the same time, contributed to positive. The contribution of hours worked turned to small negative after 2000.

In Germany, the real GDP growth rate itself was not very high, however, contributions based on TFP growth have transitioned during the period analyzed to consistent positive. In particular, the points at which contributions were positive for TFP growth was different from other countries for from 2005 to 2009, including the collapse of Lehman Brothers inc., and the European debt crisis.

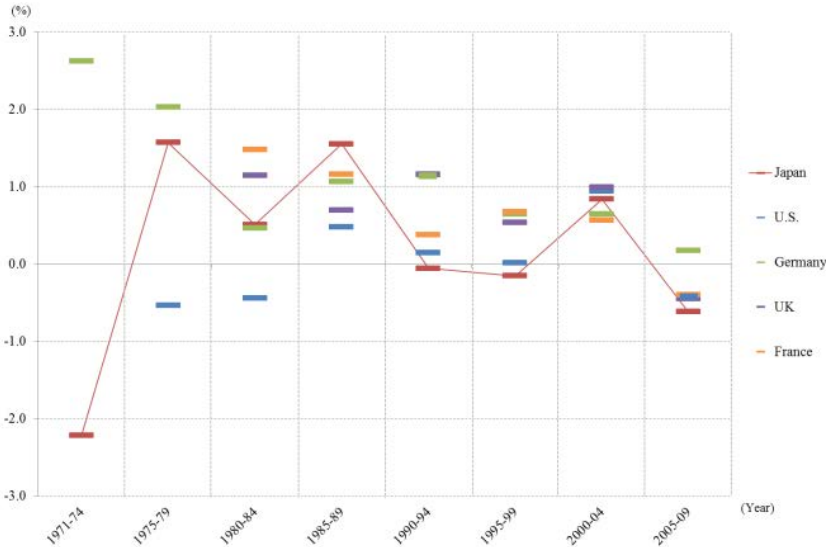
Contribution of hours worked was negative, excluding the period from 1985 to 1989. Contribution of labor composition (quality) contribution was relatively small in comparison with other countries and the contributions to GDP growth rate due to both capital increase and TFP growth was large.

The United Kingdom was the same as Germany as the TFP growth rate has been transitioning with stability while the labor composition (quality) and hours worked were contributing to positive growth since 1995.

Finally, France’s real GDP growth rate was quite low and the breakdown based on factor decomposition shows that it similar to the United Kingdom.

Figure I-1-1-3 shows the transition of the TFP growth rate for each period for the major advanced countries as mentioned above. After the first half of the 1990s, Japan’s TFP growth rate was the lowest level, excluding the years 2000 to 2004, out of all five countries, was consistently low in relation to the United States.

**Figure I-1-1-3 Transition for each subperiod of the TFP growth rate for the whole macroeconomy of the major advanced countries**



Notes: Figures for Japan between 1971 and 1974 are the single year of 1974. Figures for the United States for the period between 1975 and 1979 are from 1978. Figures for the United Kingdom and France for the period between 1980 and 1984 are from 1981.

Source: EU KLEMS2012 release.

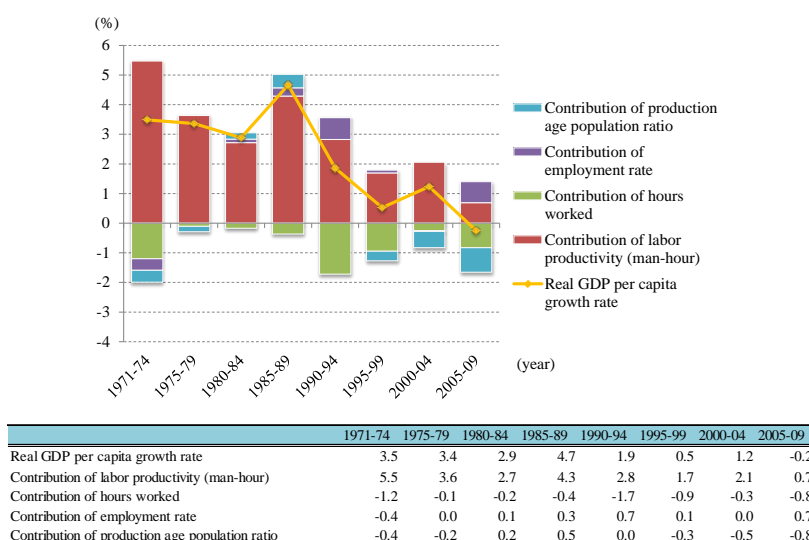
**Section 2 Factor decomposition for real GDP per capita growth rate**

In the previous section, it was indicated that the drop in TFP growth rate and hours worked caused the decline in Japan’s GDP growth rate after 1990. In this section, factor decomposition of the real GDP growth rate per capita is performed. By doing so, it is seen that the slow-down in the labor productivity growth rate caused persistent decline in the real GDP growth rate per capita in Japan after

1990s.

When Japan's real GDP per capita growth rate is decomposed<sup>3</sup> into the four factors of (1) labor productivity (man-hour base<sup>4</sup>), (2) hours worked per capita, (3) employment rate, and (4) production age population ratio, it can be seen that the contribution of labor productivity peaked between 1985 and 1989, but as a whole, there was a declining trend (Figure I-1-2-1). The hours worked per capita had a negative contribution during the period analyzed; however its direction is unsettled and this is the same trend for other countries which will be looked into later. On the one hand, the production age population ratio shows consistent negative trend from 1990, and the negative gap increasing from period to period. This decline for the production age population ratio, even when compared to other countries as seen below, was of an unprecedented magnitude. Coupled with these factors, the real GDP per capita growth rate in Japan transitioned to less than 2% after 1990.

**Figure I-1-2-1 Factor decomposition for the real GDP per capita growth rate**



Source: OECD Stat.

Using the same method, real GDP per capita growth rate for the United States and themajor countries in Europe are decomposed into each factor in figure I-1-1-2. When looking at the United States, the contribution of labor productivity transitions by fluctuating repeatedly with the top 1% as the axis. During 2005 to 2009 including the effects of the collapse of Lehman Brothers Inc., the employment adjustments due to the severe recession was reflected in the large decline of -0.9% in the employment rate, which worked as a factor to depress the real GDP growth rate, and this worked as a factor in the real GDP per capita growth rate decline.

In Germany<sup>5</sup> (West Germany before 1991), excluding the periods from 1990 to 1994 and 2005 to 2009 when there were effects of the unification of East and West Germany as well as the collapse of Lehman Brothers Inc., a contribution of 2% or more was maintained due to the labor productivity growth.

<sup>4</sup> Man-hour is the total labor input volume calculated from labor worker x labor time (Refer to RIETI homepage at <http://www.rieti.go.jp/jp/database/JIP2012/ans.html?page=Q5>).

<sup>5</sup> In Germany, because data on labor time per capita does not exist for 1976 or earlier, per capita labor time contribution changes between 1971 and 1974 was not considered.

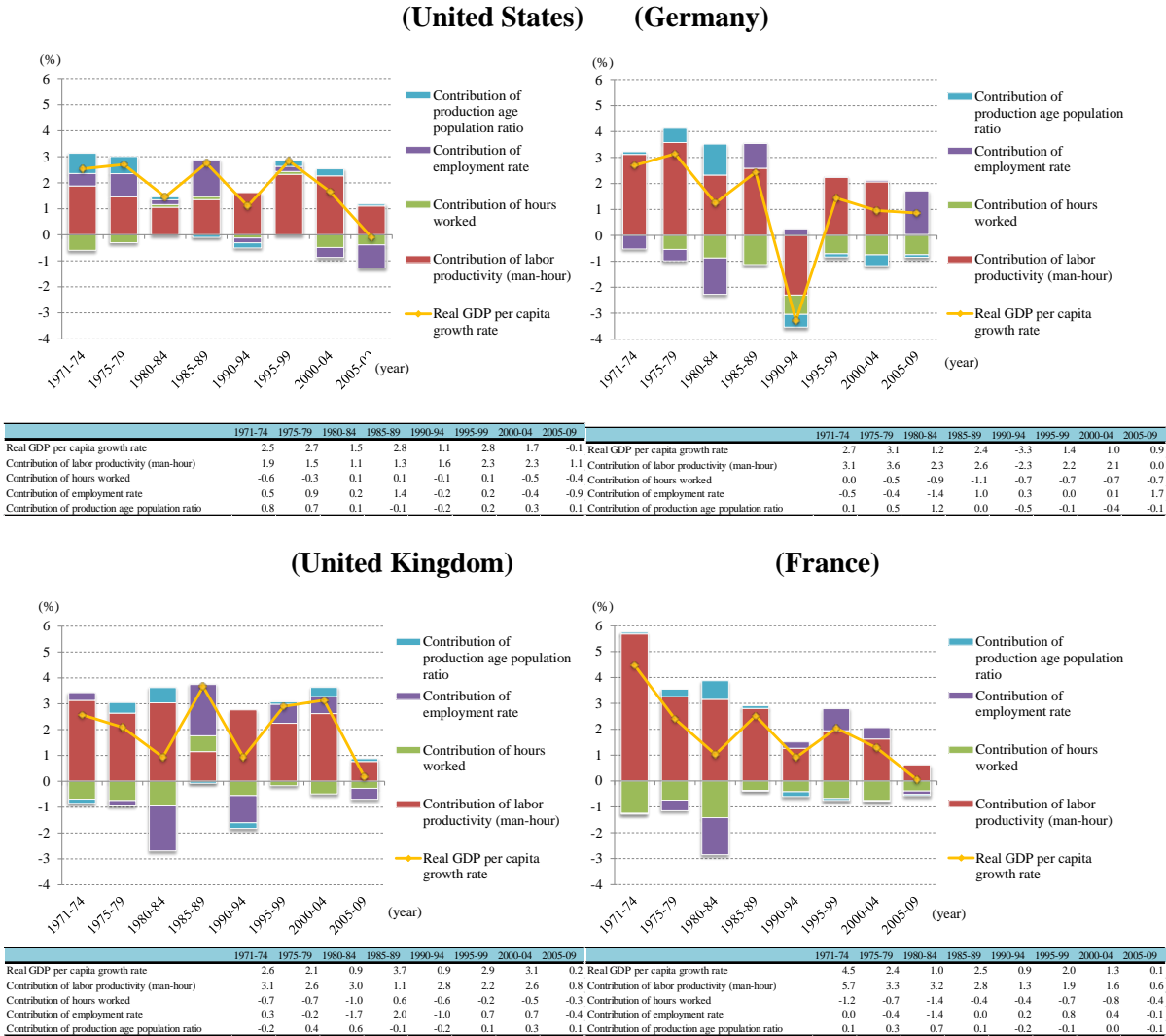
A contribution due to 2% or more labor productivity growth was maintained. Hours worked per capita is the same as Japan's and maintains a negative contribution. On the other hand, in recent years (from 2005 to 2009), the employment rate increase offset the negative contribution from other factors and this contributed to boosting the real GDP per capita growth rate.

In the United Kingdom, excluding the periods from 1985 to 1989 and 2005 to 2009, a contribution of 2 to 3% was maintained due to the labor productivity growth. Meanwhile, the hours worked per capita was the same as Japan from 1990 and continued to provide a negative contribution.

Finally, in France, from 1971, contribution due to a labor productivity growth on the whole showed a declining trend as well as a large negative contribution over the whole period for hours worked per capita.

Even when compared with major advanced countries in the world, declining trend due to labor productivity growth caused the real GDP per capita growth rate decline for Japan and France only.

**Figure I-1-2-2 Factor decomposition for real GDP per capita growth rate**



Source: OECD Stat.

**Section 3 International comparison of labor productivity and TFP**

As seen in the analysis of the overall macroeconomy until now, after 1990, there was a large

decline in labor productivity and TFP growth rate in the background for Japan's long term economic stagnation.

In this section, the precise nature of the stagnation of Japan's productivity growth is made clear in more detail by internationally comparing the labor productivity and TFP by industry. The EU KLEMS database is used for international comparison of the labor productivity and TFP by industry<sup>6</sup>. The countries that will be compared are the United States, Germany, United Kingdom, and France. Korea has been included<sup>7</sup> after considering the rise of Korean business in recent years in the world market for all industries and the manufacturing industry, non-manufacturing industry, metal industry, general machine industry, electronic equipment industry and transportation equipment industry<sup>8</sup>.

Below, the labor productivity and TFP are reviewed for all industries and the overall manufacturing industry together with the trend for labor productivity of the overall non-manufacturing industry, and then each individual industry will be looked into.

### **1. Productivity comparison for total industries**

Figure I-1-3-1 shows the (1) labor productivity level, (2) labor productivity level compared to the United States, (3) TFP growth rate, (4) TFP level compared to the United States for the six countries including, Japan, the United States, Germany, the United Kingdom, France and Korea based on the overall industry.

First, looking at the labor productivity level compared to the United States (United States = 100), Japan was at a level of 57.2% of the United States in 2009, and at a lower level than each of the European countries. From the latter half of the 1970s to the middle of the 1990s, Japan gradually caught up to the United States, but after this point, there was stagnation in the disparity reduction with the United States. However, this was not a phenomenon unique to Japan, since both Germany and France also experienced disparity reduction stagnation. Korea has the lowest level throughout the whole period; however, the difference in productivity with Japan is shrinking.

When also looking at the TFP level compared to the United States (United States = 100), there was a stagnation in disparity reduction, which peaked at 61.9% in comparison to the United States in 1992. While the European countries were transitioning to around 80 to 90% in comparison to the United States, Japan's TFP level compared to the United States remained at 59.8% in 2009.

Finally, when looking at the TFP growth rate for each subperiod in each country, as seen in the previous section, Japan's TFP growth rate was inferior to other countries after 1990, but excluding the first half of the 2000s. In relation to the United States, Japan was consistently inferior to the other countries after 1990, excluding the first half of the 2000s. Korea's TFP growth rate consistently

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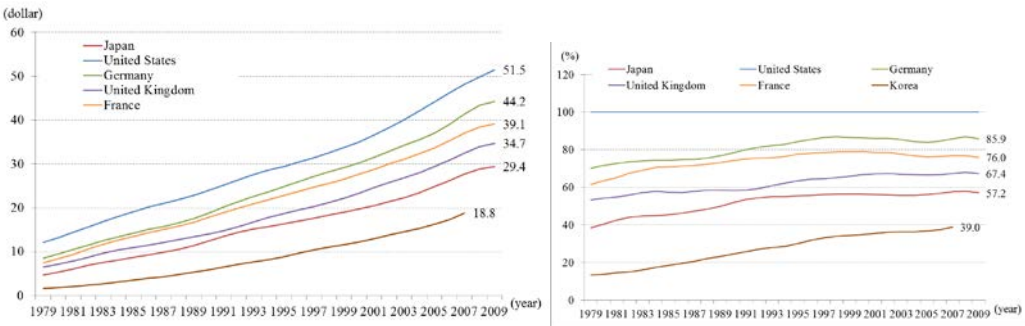
<sup>6</sup> Refer to supplementary note 3 for details regarding the EU KLEMS database.

<sup>7</sup> Total labor time data for the period between 2008 and 2009 for the United States is not disclosed in the EU KLEMS2012 release, so the 2007 total labor time data of 2009 release was multiplied by the rate of change for the 2008 to 2009 total labor time index (year of 2005 = 100) for the extension. Furthermore, the labor productivity calculation for each country below uses the 2012 release. For Korea however, this data has not been updated, so the 2009 release was used. In addition, the Korean TFP standard compared to the United States is not listed due to data restrictions.

<sup>8</sup> Metal, general machine industry, electronic equipment and transportation equipment are listed in the addendum at the end.

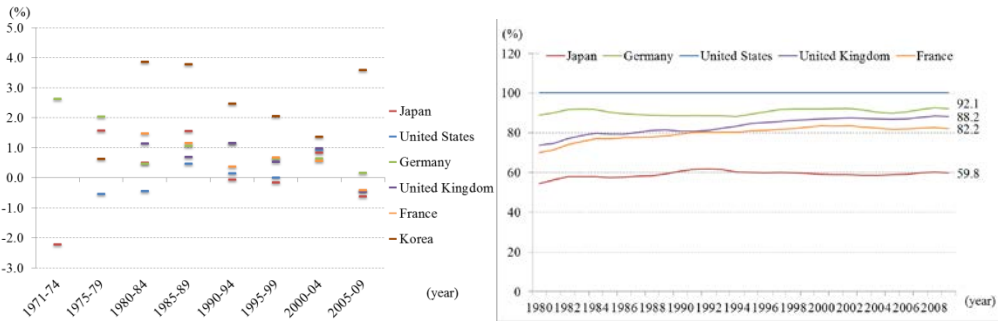
maintained high level above other countries after 1980.

**Figure I-1-3-1 Labor productivity and TFP for total industries**  
**(Labor productivity level) (Labor productivity level compared to the US)**



**(TFP growth rate)**

**(TFP level compared to the US)**



Notes: To remove the variation for a single year for labor productivity level, labor productivity level compared to the United States, and TFP level compared to the United States, which is calculated as moving average of the previous three years. The total labor time for the United States for the period between 2008 and 2009 was calculated by applying the rate of change of the total hours worked index (year of 2005 = 100) for the period between 2008 and 2009 to the 2007 total hours worked. This was the same for Figure I-1-3-2 and Figure I-1-3-5 below.

Source: EU KLEMS2012 release, EU KLEMS2009 release, EU KLEMS2008 release, GGDC database, JIP database 2012, Bureau of Economic Analysis

**2. Comparison in manufacturing industry productivity**

**(1) Overall productivity**

Next, a comparison is performed for productivity in the overall manufacturing industry for each country, the same as in the previous section(Figure I-1-3-2).

The labor productivity level compared to the United States for Japan’s manufacturing industry was 69.9% of the United States in 2009 and, the difference was small in comparison for the overall industry. Nevertheless, the difference was in the range of 30%. When looking at the transition, from the latter half of the 1970s until the first half of the 1980s, Japan surpassed the United Kingdom’s level and the productivity difference with the United States manufacturing industry shrank. From the latter half of the 1990s, the difference extended once again. This was especially due to the surge in the labor productivity level in the United States manufacturing industry entering the 2000s.



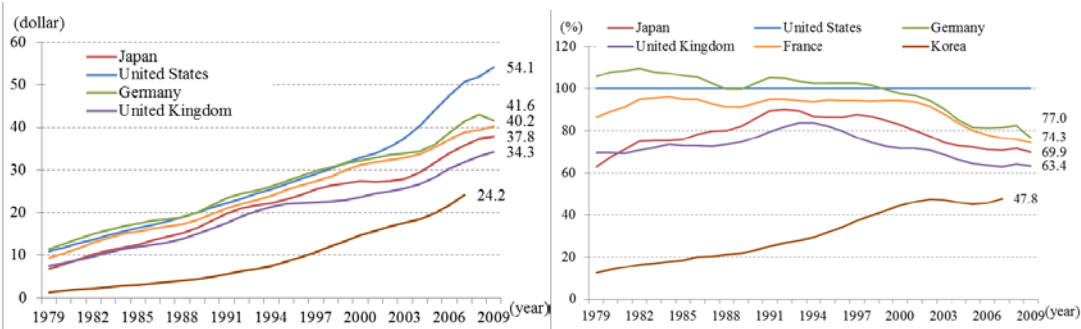
The labor productivity of Germany’s manufacturing industry was almost the same level as the United States until the latter half of the 1990s. However, after this period, it exhibits that the trend of increase of difference and was at 77% in comparison to the United States in 2009. The labor productivity level in the United Kingdom and France also shows similar trend to Germany. Regarding Korea, the labor productivity level was the lowest over the period analyzed, however, the difference of productivity compared to Japan and the United Kingdom has been slowly shrinking.

When looking at the TFP level compared to the United States, Japan was at 84.4% in 2009 and this is the lowest level among all countries compared in 2005 (It was not possible to calculate the TFP level compared to the United States for Korea due to data restrictions). From the beginning of the 1990s, the difference with European countries was increasing<sup>9</sup>.

The decrease in difference with the United States comparing all industries when looking particularly at the manufacturing industry means that productivity for the non-manufacturing industry is low in Japan, and this indicates a decline in labor productivity and TFP for all industries.

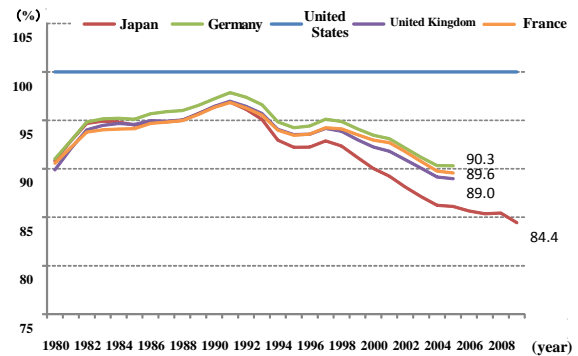
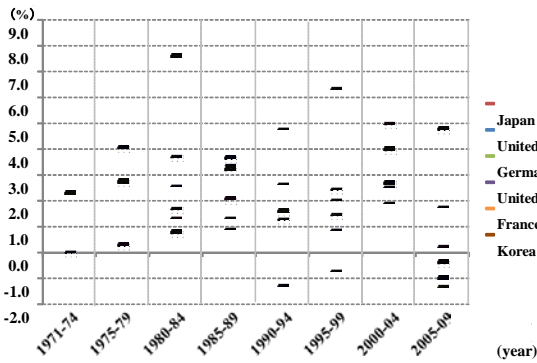
The TFP growth rate, as with the case of all industries, Japan’s TFP growth rate for the manufacturing industry was consistently lower than that of the United States manufacturing industry.

**Figure I-1-3-2 Labor productivity and TFP in manufacturing industry**  
**(Labor productivity level)      (Labor productivity level compared to the US)**



**(TFP growth rate)      (TFP level compared to the US)**

<sup>9</sup> The EU KLEMS database does not provide benchmark of the value-added-based TFP level compared with the United States for the overall manufacturing industry. The TFP level compared with the United States for the entire manufacturing industry is calculated here by using weighted averages for the TFP level compared with the United States of the gross output base of individual industries included in the manufacturing industry. Gross output-based TFP growth rate data has not been updated since 2005 for Germany, the United Kingdom, and France. Data from the JIP database 2012 and the Bureau of Economic Analysis were used for the extension of Japan and the United States.



Notes: Same as Figure I-1-3-1.

Source: EU KLEMS2012 release, EU KLEMS2009 release, EU KLEMS2008 release, GGDC database, JIP database 2012, Bureau of Economic Analysis.

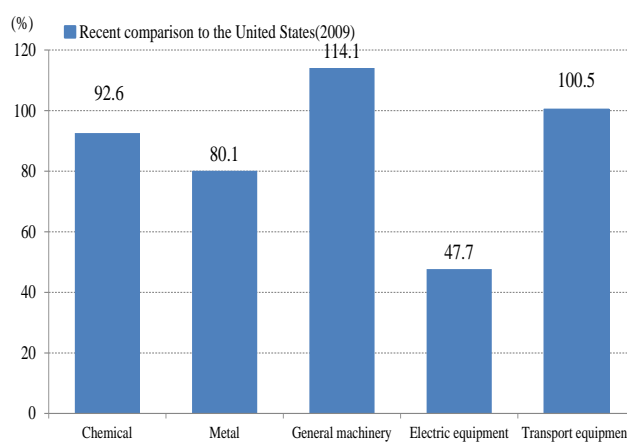
## (2) Productivity of major industries

The major industries in manufacturing are analyzed here. Figure I-1-3-3 and Figure I-1-3-4 show the difference between the peak and 2009 for comparisons with the United States, for the labor productivity and TFP levels of major industries.

The figures show that productivity for general machinery, transport equipment, chemical, and metal are above or the same as the United States. Details are shown in the appendix at the end of volume, however, Japan has no industry that solely surpasses other countries. In many cases, Japan is neck-and-neck with the other countries including Europe. In transport equipment and metal, Korea continues to catch up.

On the other hand, electric equipment, in terms of labor productivity and TFP, had exhibited productivity level that largely exceeded the United States at its peak. However, this was followed by a significant decline compared to the United States, which was a substantial drop from the time of the peak. This is also shown in the appendix, the decline of productivity level in Japan was not actually outstanding compared to other countries. The low productivity level for Japan compared to the United States was largely affected by the rapid growth of electric equipment in the United States.

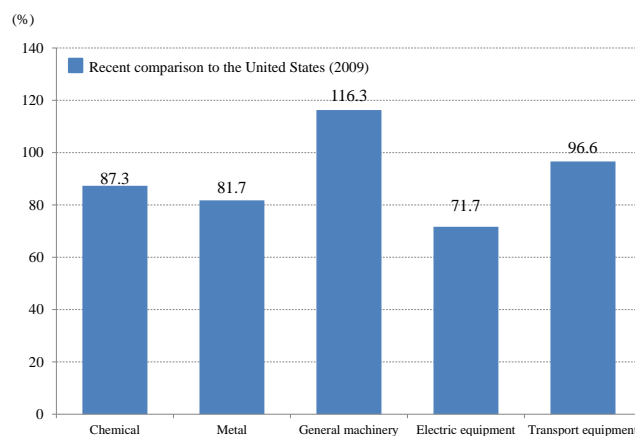
**Figure I-1-3-3 Labor productivity level compared to the US for major industries in manufacturing**



	Recent comparison to the United States(2009)	Comparison to the United States at the peak	Difference between recent and the peak
Chemical	92.6	128.5 (1999)	-35.9
Metal	80.1	106.3 (1991)	-26.1
General machinery	114.1	124.8 (1993)	-10.7
Electric equipment	47.7	163.0 (1991)	-115.3
Transport equipment	100.5	109.2 (1990)	-8.7

Source: EU KLEMS2012 release, EU KLEMS2008 release, and Bureau of Economic Analysis.

**Figure I-1-3-4 TFP level compared to the US for major industries in manufacturing**



	Recent comparison to the United States (2009)	Comparison to the United States at the peak	Difference between recent and the peak
Chemical	87.3	100.4 (1998)	-13.0
Metal	81.7	95.4 (1985)	-13.6
General machinery	116.3	116.3 (2009)	0.0
Electric equipment	71.7	138.6 (1982)	-66.9
Transport equipment	96.6	102.4 (1990)	-5.7

Source: EU KLEMS2012 release, EU KLEMS2008 release, GGDC database, and Bureau of Economic Analysis.

### **3. Comparison in non-manufacturing industry productivity**

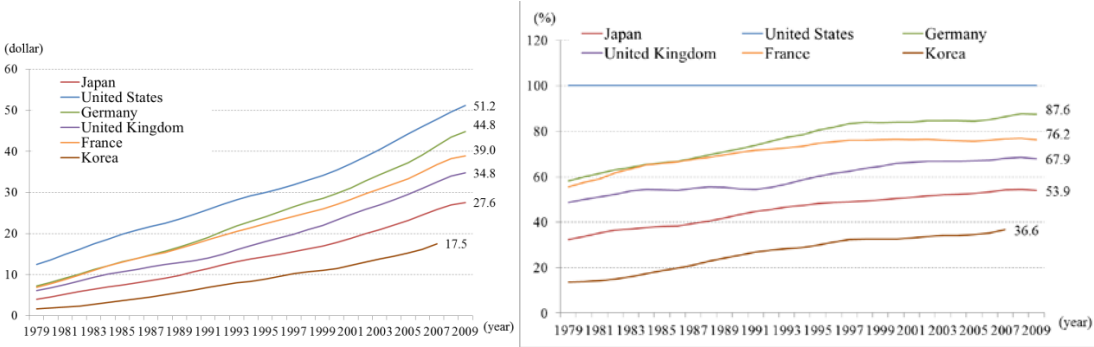
#### **(1) Overall productivity**

As with the previous section, when labor productivity for each country is compared with the

United States for the overall non-manufacturing industry<sup>10</sup>, after the latter half of the 1990s, the difference in non-manufacturing with the United States has been shrinking, contrary to the manufacturing industry. However, the productivity difference with the United States and Europe was large for the non-manufacturing industry, and the level compared to the United States in 2009 was 53.9% and Japan was also inferior to Europe (Figure I-1-3-5)<sup>11</sup>.

The productivity difference with the United States gradually shrank, while the productivity difference with Europe remained almost constant.

**Figure I-1-3-5 labor productivity in non-manufacturing industry**  
**(Labor productivity level) (Labor productivity level compared to the US)**



Notes: Same as Figure I-1-3-1.  
 Source: EU KLEMS2012 release

**(2) Productivity in major industries**

Next, major industries in the non-manufacturing industry are analyzed. Figure I-1-3-6 and Figure I-1-3-7 show the difference for comparisons with the United States in 2009, and comparisons with the United States during the peak period, for the labor productivity and TFP levels in major non-manufacturing industries, which is the same as the previous analysis for the manufacturing industry.

When looking at the labor productivity level, construction is around 85% to that of the United States. When looking at the TFP level, finance and insurance<sup>12</sup> was in the same level as the United States, construction was 90% to that of the United States, and although some industries showed a productivity level which compete to the United States, many of the non-manufacturing industries such as wholesale, retail, accommodations/food services are around 50% of the level of the United States.

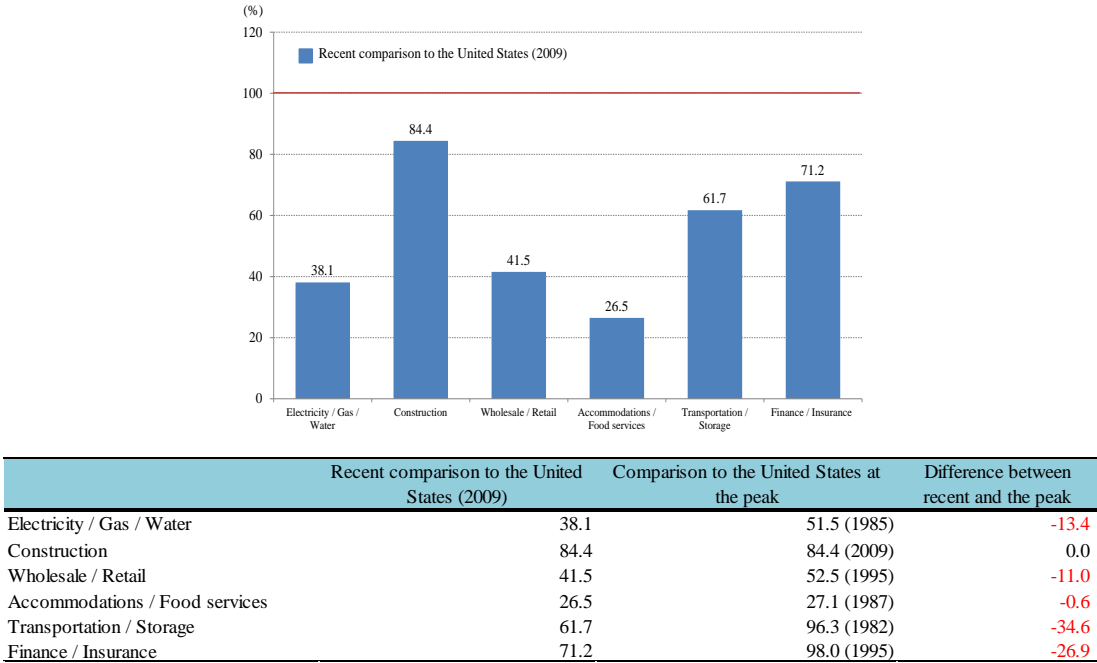
<sup>10</sup> Labor productivity for the overall non-manufacturing industry was calculated by subtracting from the value-added for the all industries converted using purchasing power parity to the value-added for overall manufacturing industry converted using the same purchasing power parity and, the difference was divided by the total hours worked of the non-manufacturing industry. Furthermore, for the overall non-manufacturing industry, due to data restriction, a comparison of the TFP level compared to the United States and the TFP growth rate was not performed.

<sup>11</sup> Only labor productivity is listed because the TFP level for the overall non-manufacturing industry and the TFP growth rate is not calculated in EU KLEMS database.

<sup>12</sup> In 2007, 80% was maintained compared to the United States. As seen in the next section, it was close to level of 90% when compared to the United States on average from 2003 to 2007. It is considered that the level in 2009 was strongly affected by the Lehman Brothers bankruptcy.

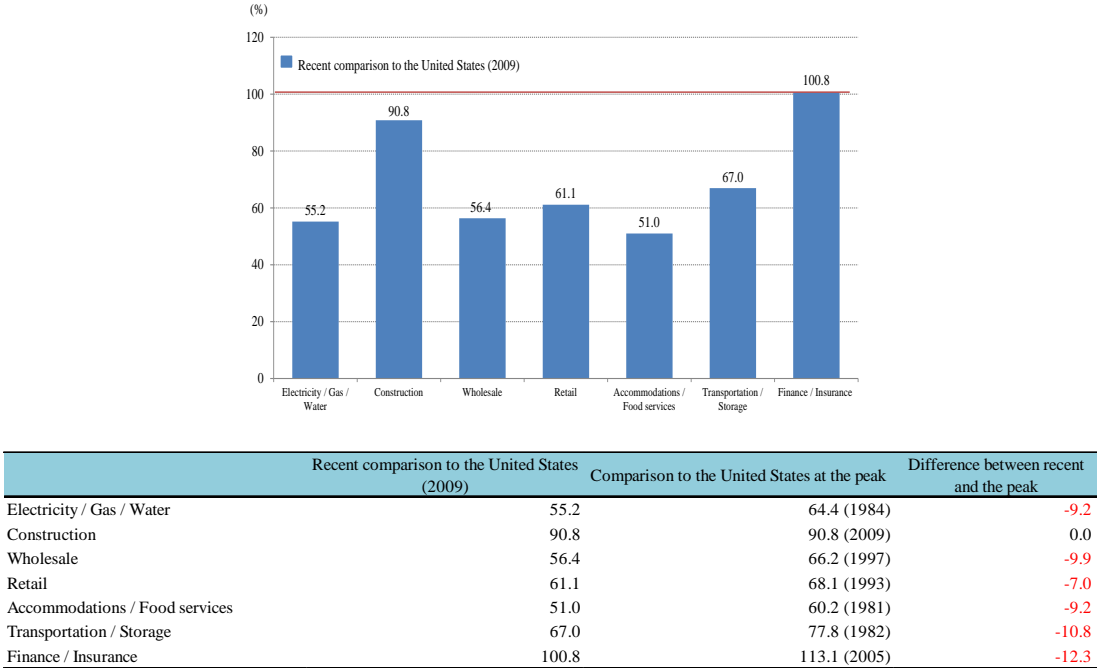
However, since the difference in service quality may not be sufficiently reflected for the non-manufacturing industry, the results must be looked on with a certain range of freedom.

**Figure I-1-3-6 Labor productivity level compared to the US for major industries in non-manufacturing**



Source: EU KLEMS2012 release, EU KLEMS2008 release, and Bureau of Economic Analysis.

**Figure I-1-3-7 TFP level compared to the US for major industries in non-manufacturing**



Source: EU KLEMS2012 release, EU KLEMS2008 release, GGDC database, and Bureau of Economic Analysis.

#### **Section 4 Cross-industry analysis of productivity**

So far, manufacturing and non-manufacturing productivity for each country was analyzed. In section 4, a cross-sectional analysis is performed on Japan's productivity combined with industrial composition. Figure I-1-4-1 illustrates shares of each industry value-added in whole economy<sup>13</sup> in the horizontal axis and labor productivity compared to the United States for each industry in the vertical axis. Items are ordered starting with high labor productivity industries.

Standard labor productivity level for industries in Japan are generally low compared to the United States; however, general machinery, chemical, metal, and transport equipment<sup>14</sup> industries in manufacturing industry, as well as finance and insurance, construction in non-manufacturing industry record labor productivity that is higher than or compete to the United States. When looking at industrial composition, the value-added share of industries with a labor productivity above 80% compared to the United States make up 38% and, by contrast, the added value share of industries with low labor productivity, such as wholesale/retail (23%), transportation/storage (11%) etc is high, and is reducing the labor productivity level for the whole economy.

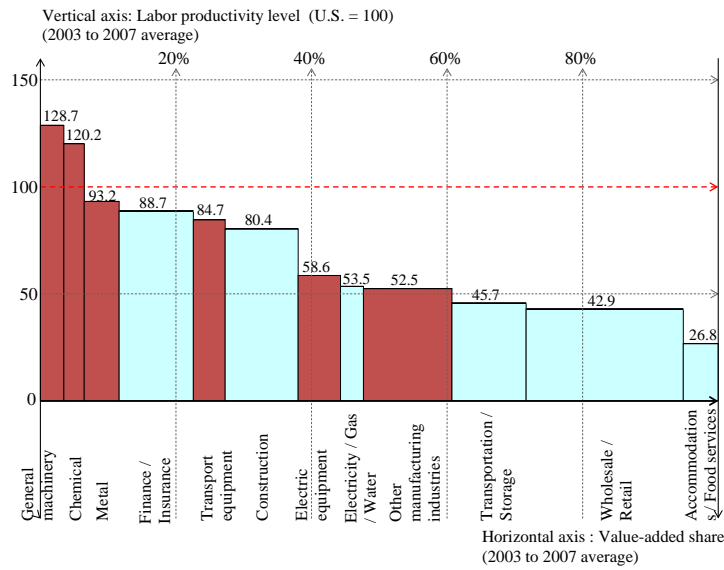
For Germany, which has an industrial composition comparable to Japan, when looking at labor productivity level (compared to the United States), chemical, metal, and general machinery, and other manufacturing (rubber/plastics, non-metallic mineral products, and wood products) in manufacturing industry, as well as wholesale/retail and construction, in non-manufacturing industry record labor productivity that is higher than or compete to the United States. When looking at industrial composition in Germany, the value-added share of industries with labor productivity above 80% compared to the United States make up 56%, which makes up over half of the whole economy, and is higher than Japan (Figure I-1-4-2).

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<sup>13</sup> Here, whole economy represents entire market economy, excluding non-agricultural sector.

<sup>14</sup> Transport equipment includes aircraft, ship, and rail. For automobiles only, labor productivity compared to the United States (2003 to 2005) improve to 106.1.

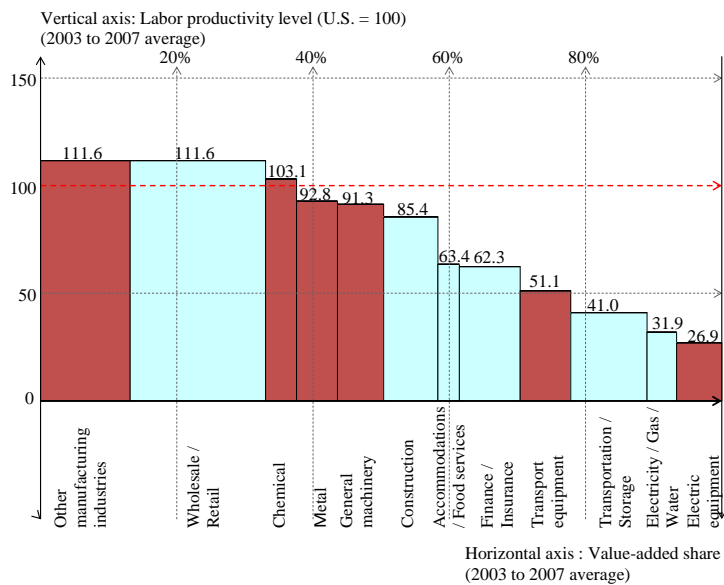
**Figure I-1-4-1 Labor productivity and value-added share by industry in Japan**



Notes: Manufacturing industry is expressed in red and non-manufacturing industry is expressed in blue.

Source: EU KLEMS.

**Figure I-1-4-2 Labor productivity and value-added share by industry in Germany**



Notes: Manufacturing industry is expressed in red and non-manufacturing industry is expressed in blue.

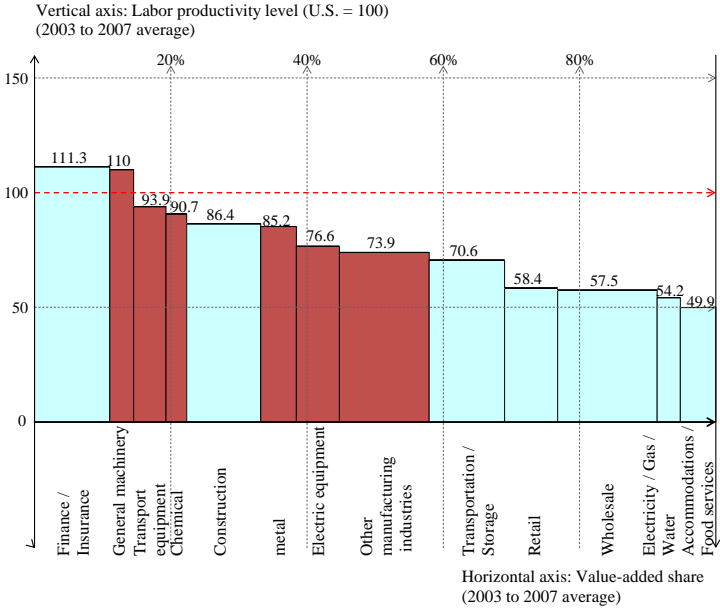
Source: EU KLEMS.

Next, in the vertical axis in Figure I-1-4-1, labor productivity is replaced by TFP level. Similar to the above analysis, the value-added share of industries with TFP level above 80% compared to the United States is 40%, and the TFP level for industries in Japan is generally low compared to the United States, although there are industries with higher or equivalent TFP level to the United States. In

particular, the TFP level for non-manufacturing industries such as real estate and wholesale/retail which make up high proportion of value-added in whole economy, is low compared to the United States, and the TFP level for the whole economy is depressed (Figure I-1-4-3).

When looking at the TFP level and industrial composition for Germany in the same way, the value-added of German industries with TFP level above 80% compared to the United States is 68%, and is higher than Japan (Figure I-1-4-4).

**Figure I-1-4-3 TFP level by industry in Japan (compared to the United States)**

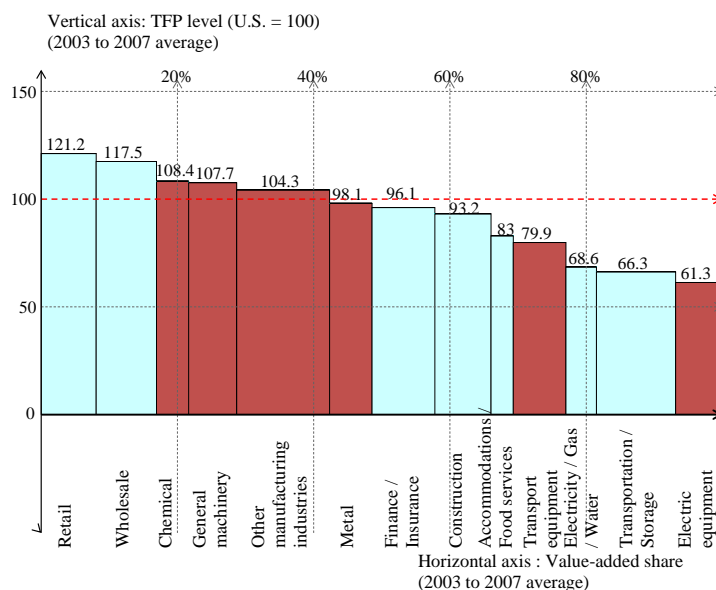


Notes: Manufacturing industry is expressed in red and non-manufacturing industry is expressed in blue.

Source: EU KLEMS, GGDC.



**Figure I-1-4-4 TFP level by industry in Germany (compared to the United States)**



Notes: Manufacturing industry is expressed in red and non-manufacturing industry is expressed in blue.

Source: EU KLEMS, GGDC.

In this way, it is confirmed that high productivity sectors in Japan make up low proportion of the whole economy, and that low productivity sectors make up high proportion. In the future, in order to improve productivity in Japan, it is needed (1) the expansion of high productivity sectors in the economy and, (2) productivity improvement for individual firms.

In order to expand economic activities of sectors with high productivity, with consideration to these sector representing the export industry,<sup>15</sup> it is effective to acquire the demand in emerging markets. Productivity improvement for individual firms is also effective for total industries because low productivity sectors make up high proportion of the total value-added, the productivity improvement for these sectors will play a large role in productivity improvement for the whole economy.

## Section 5 Summary of this chapter

In this chapter, the state of economic growth and stagnation in Japan was grasped and, through an international comparison, GDP growth and GDP per capita growth rate were decomposed into each factor, and labor productivity and TFP were analyzed by industry. The main results of the international comparison in this chapter are summarized as follows.

- Japan's GDP growth rate has largely kinked downward since 1990. According to growth accounting based analysis, decline of GDP growth rate in Japan is affected by decline in TFP growth rate and hours worked.
- Based on real GDP per capita growth rate factor decomposition, the vast decline in Japan's growth rate from 1990 is largely affected by decline in labor productivity growth rate and

<sup>15</sup> Refer to Figure III-3-2-15.

production age population ratio.

- Productivity for total industries in Japan caught up to the United States until the mid 1990s. However, this difference has not been shrinking. For manufacturing industry, productivity difference with the United States is comparatively small; however, there is an expanding trend in recent years. For non-manufacturing industry, there is a declining trend in productivity difference; however, this difference is large.
- Some industries such as general machinery, chemical, metal, transport equipment, in Japan shows productivity level that was higher or compete to the United States; however, these industries make up small proportion of total value-added of the whole economy.

In order to recover strong economic growth and achieve higher standard of living in Japan, increase in productivity represented by labor productivity and TFP is essential. For this purpose, expansion of economic activity in high productivity sector through the acquisition of demand in emerging markets and increase in overall productivity for sectors with low productivity is needed. By doing so, Japan's productivity will increase and there is still chance to decrease the difference in productivity level with the United States and the Europe.