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Japan**

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# **The Transformations of Growth Regime and De-industrialization in Japan**

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## **Abstract**

This study analyzes the long-term transformations of growth regime and the process of de-industrialization in Japan, taking account of domestic institutional changes and international economic relations. Influenced by structural changes in the manufacturing industry, the delocalization of productive activities and long-lasting recession, de-industrialization has accelerated in the Japanese economy since the 1990s. In particular, linkages between the export-goods manufacturing industry and the business-related service industry are analyzed to understand the characteristics of de-industrialization in the Japanese economy. We try to extend the theoretical framework of the growth regime in the *régulation* theory, taking account of long-term industrial structural changes. Both macroeconomic analysis of growth and distribution and *Input-Output Analysis* are conducted on the basis of institutional analysis. This study also considers the possibility of a new growth regime in Japan from the *régulationist* perspective.

**Keywords:** growth regime, de-industrialization, *régulation* theory, input-output analysis, the Japanese economy

## **1. Introduction**

In the Japanese economy, de-industrialization has accelerated since the long-lasting recession in the 1990s. De-industrialization is usually defined as the relative decline in output and employment, which is observed universally in the advanced economies. In the Japanese case, however, de-industrialization has accelerated very rapidly, faced with institutional changes in the domestic economy and changes in the international economic relations. The Japanese economy, which realized the stable export-led growth

in the 1980s, has experienced long stagnation and rapid industrial structural changes, especially, de-industrialization since the 1990s. In such circumstances, the creation of new industrial structures and the establishment of a stable growth regime are truly essential.

The aim of this paper is to analyze the transformations of growth regime and changes in industrial and employment structures from a long-term perspective to understand the structural characteristics of de-industrialization in the Japanese economy. We try to extend the theoretical framework of the growth regime in the *régulation* theory, taking account of long-term industrial structural changes. Especially, changes in macroeconomic patterns and industrial structures are analyzed with SNA database and Input-Output database (JIP Database) in Japan.<sup>1</sup>

In the analysis in this study, we follow three specific points. First, we analyze the long-term process of economic development in Japan, especially focusing on changes in institutional forms and the transformations of growth regime from the view point of *régulation* theory (Petit 1986, Boyer 1988).<sup>2</sup> Second, we analyze structural economic dynamics thoroughly, focusing on specific structural characteristics of the Japanese economy: the export-goods manufacturing sector, the non-export-goods manufacturing sector, the business service sector, the consumer service sector, and the public service sector. Third, we analyze structural linkages between the manufacturing industry and the service industry to understand the characteristics of de-industrialization in the Japanese economy. In this regards, we extend the method of the analysis of de-industrialization based on *Input-Output Analysis* which was developed by Franke and Kalmbach (2005) to study the German economy. Furthermore, we consider conditions essential to the establishment of a new growth regime in Japan.

## 2. Dynamics of the Growth Regime and Structural Change

In the process of economic growth, the dynamics of demand factors and supply factors plays an important role, and the interaction of real and financial factors influences the dynamics of the economy. Furthermore, the industrial structural change should be integrated in the analysis of economic growth, especially when we consider the process of de-industrialization.

First of all, we will consider the long-term interaction between demand factors and supply factors in the economy. In the *régulation* theory, a growth regime is said to be

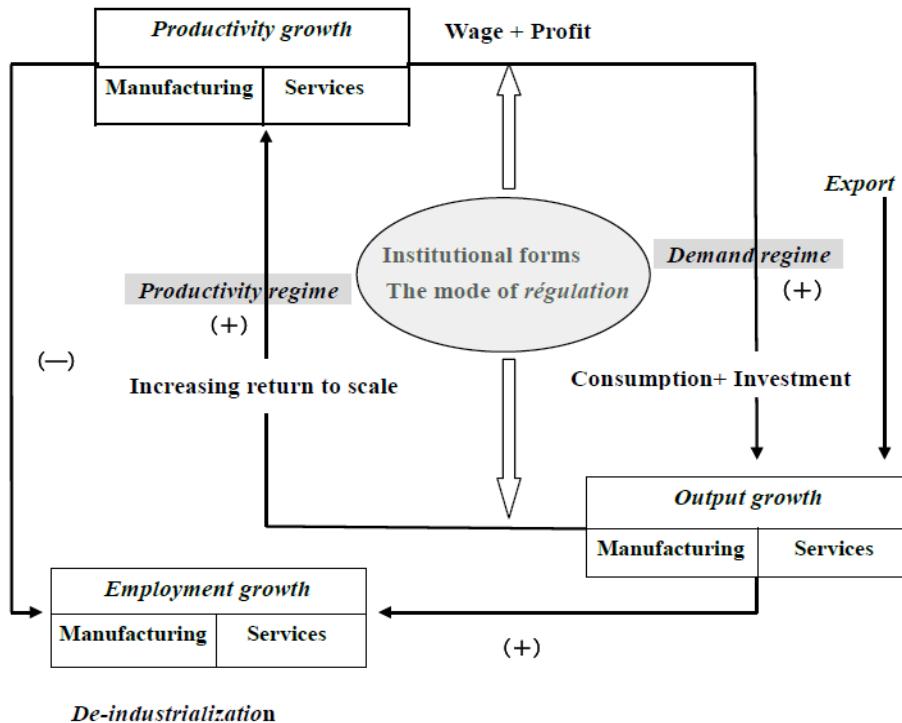
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<sup>1</sup> As for JIP database, see Fukao and Miyagawa (eds.) (2008).

<sup>2</sup> In Japan, “de-industrialization” has been studied within the framework of the *régulation* theory. For example, see Uemura (1991) and Harada (1997, 2007), Tahara (2009, 2010, 2011).

established when stable economic growth is achieved in the national economy. The cumulative effect of productivity growth and output growth determines the dynamism of a growth regime. Especially, this effect operates more strongly in the manufacturing industry (Kaldor 1978, Petit 1986, Boyer 1988).<sup>3</sup> The basic framework of cumulative growth and de-industrialization is depicted in Figure 1.

**Figure 1 The Growth Regime and De-industrialization**



The main logic of demand formation is as follows. Productivity gains are distributed into wages and profits, and an increase in profits has a positive effect on the expected profit rate and investment. Then, an increase in investment realizes more profits. Therefore, there is usually a cumulative causality between the profit rate and the accumulation rate (Marglin 1984). Furthermore, investment leads to an increase in intermediate inputs from other manufacturing sectors and the service sectors. At the same time, an increase in wages leads to more consumption demand (Rowthorn 1982, Taylor 1991). Accordingly, the markets of consumer durable goods and consumer services expand.

Next, there is a linkage effect from the consumption to investment. This consists of both short-period and long-period effects. As for the short-period effect, changes in

<sup>3</sup> H. Uni analyzed both cumulative growth and structural change, developing the macro economic analysis of the *regulation* theory based on an Input–Output analysis (Uni 1998).

demand influence investment through the adjustment of capacity utilization in the manufacturing industry. This is called “the principle of capital stock adjustment”. As for the long-period effect, a continuous expansion of consumption influences the expected return of investment leads to a continuous increase in investment. This is called “the accelerator effect” (Boyer 1988). In the actual process of investment decision, these two effects and the influence by the profit rate are integrated in the decision making of investment. The accumulation rates are not uniform across the industries as there exist profitability differentials. In this context, there exist two different patterns of demand formation with the financial system and wage-labor nexus. If investment is highly sensitive to profits, the causal chain called “profit-led growth”: profits-investment-economic growth is realized. On the contrary, if investment is very sensitive to demand expansion, the causal chain called the causal chain called “wage-led growth”: wage-consumption -investment-economic growth is realized. Furthermore, in the manufacturing industry, the causal chain: productivity-unit labor costs-export plays a crucial role in the growth of the export goods manufacturing industry, which is a basic logic of “export-led growth”. In short, all of these linkages from productivity gain to demand formation are called “the demand regime” in the *régulation* theory (Boyer 1988).<sup>4</sup>

Next, the linkage from demand growth to productivity growth is another major causal chain in the economy. An increase in investment leads to an increase in productivity by replacing capital equipments. This effect is more remarkable in the manufacturing industry with the dynamics of the introduction of new capital equipments and the scrapping of old ones. Furthermore, an increase in demand also leads to productivity growth through increasing return to scale especially in the manufacturing industry. This is often called “Kaldor-Verdoon Law”. Innovation also contributes to productivity growth depending on the social system of innovation in each national and regional economy. In short, these linkages from demand growth to productivity growth are called “the productivity regime” (Boyer 1988).

As for the linkages between the manufacturing industry and the service industry, which should be particularly focused on in the study of de-industrialization, the following points are important (Petit 1986). First, cumulative causation between output growth and productivity growth operates strongly in the manufacturing industry. Second, the cumulative causation is relatively weak in the service industry. Therefore, if the

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<sup>4</sup> The growth pattern is different from country to country, depending on the specific institutional arrangements. In the Japanese case, “profit-led growth” played a leading role in the high economic growth in the 1960s, and “export-led growth” became dominant after 1980s (Uemura 2000, 2012).

service industry expands with a long-term shift of demand from the manufacturing industry to the service industry, the cumulative causation may become weaker in the economy as a whole. Third, the manufacturing industry has its own “subsystem dynamics” (Landesmann and Scazzieri 1996)) and causes changes in the linkage between the manufacturing industry and the business-related service industry with the externalization of business activities and intermediate inputs. The spillover effect of intermediate demand between the manufacturing industry and the service industry contribute to output growth and productivity growth in both industries. For example, business-related services promote productivity growth in the manufacturing industry, and the input of business equipments helps productivity growth in the service industry.

The dynamism of output growth and productivity growth determines employment growth. We can formalize this relation as follows:  $(\text{the growth rate of real output}) - (\text{the growth rate of productivity}) = (\text{the growth rate of employment})$ . Therefore, in the matured economy in which the percentage of agricultural employment becomes very small, de-industrialization occurs in terms of the relative share of employment when the growth rate of real output minus the growth rate of productivity in the service industry is bigger than that in manufacturing industry. This dynamics was originally formalized by W. Baumol, and was applied to the process of de-industrialization in the Rowthorn’s model (Baumol 1967, Rowthorn and Wells 1987).

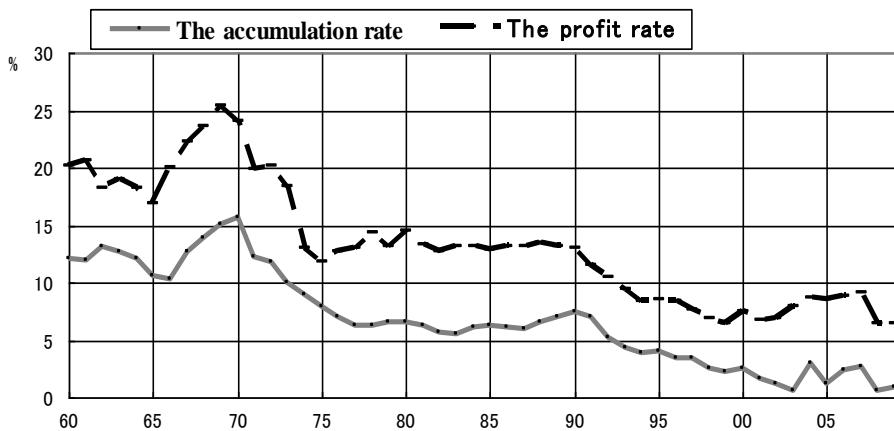
Furthermore, foreign trade and foreign direct investment have following important effects in the growth process. Trade specialization between manufactured goods and services has an effect on the dynamism of the national economy. For example, the export goods manufacturing industry can be a starting point of “cumulative causation”, producing tradable products with the increasing return to scale. If the national economy depends so much on the export of natural resources, this may exacerbate the long-term economic stagnation. In this way, a pattern of trade specialization causes to a “virtuous circle” or “vicious circle” in the national economy. Foreign direct investment sometimes has both positive effect with international division of labor and the negative effect to accelerate de-industrialization, or the hollowing-out of industry in an even worse case.

### **3. The Growth Regime and the Long-term Evolution of Industrial Structures**

#### **3.1 Patterns of long-term growth in the Japanese economy**

The patterns of long-term growth in the Japanese economy are seen in the interaction between the rate of capital accumulation and the rate of profit (Figure 2).

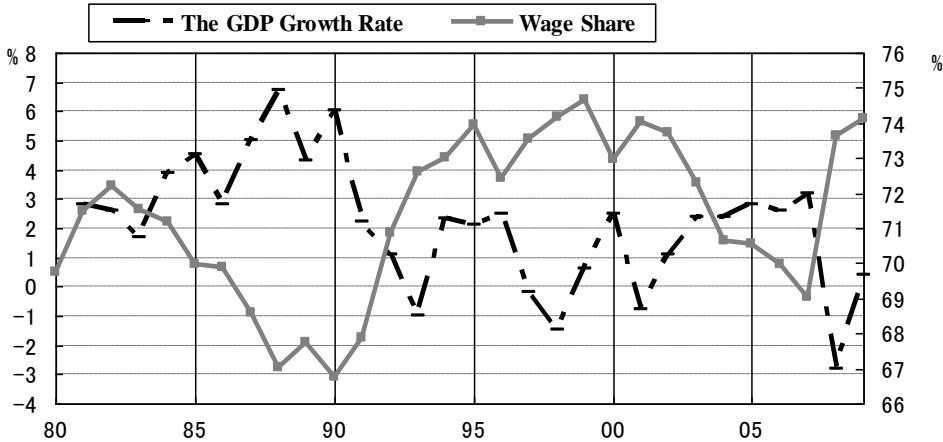
**Figure 2 The Accumulation Rate and the Profit Rate**



Source: Cabinet Office, *Annual Report on National Account and Gross Capital Stock of Private Enterprises*.

In the Japanese economy in the 1960s, the accumulation rate and the profit rate had a strong mutual enhancing effect, producing the profit-investment growth in the period of high economic growth. The high economic growth ended with the saturation of the domestic demand of consumer durable goods and continuously rising wages in 1970. Then, the Japanese economy was hit by the oil price shock in 1973, and experienced the structural recession in the 1970s. Being different from other advanced economies, the Japanese economy started to recover from the recession very early and showed the export-led growth in the late 1970s. The accumulation rate and the profit rate were relatively stable with the firm export demand. However, the accumulation rate continuously rose though the profit rate started to fall in the bubble boom in the late 1980s. This was a kind of “over-accumulation”, so the Japanese fell into the structural crisis due to the over-accumulation and the collapse of bubble boom in the 1991. The accumulation rate and the profit rate also decreased very sharply in the process. After so-called “the Lost Decade”, the Japanese economy started to recover from the recession in 2002. In the recovery process, the profit rate recovered slightly, but the accumulation rate did not at the aggregate level. For this process was promoted by the export goods industry, which was strongly dependent on the export to Asian countries. Then, the profit rate fell very sharply when the Japanese economy was hit by the Subprime crisis and a following decrease in export in 2008.

**Figure 3 The GDP Growth Rate and Wage share**



Source: Cabinet Office, *Annual Report on National Account*.

The fluctuation of the profit rate is determined by wage share and the output-capital ratio.<sup>5</sup> The relationship between the real GDP growth rate and the wage share is depicted in Figure 3. In the Japanese economy, wage share fluctuates counter-cyclically due to “labor hoarding” in large firms in the manufacturing industry, and this supports consumption demand in a recession.<sup>6</sup> However, in the recovery process after 2002, the fall in wage share was extremely sharp because wages were depressed and many workers were fired with institutional changes in the employment system. When the Japanese economy was hit by the Subprime crisis in 2008, wage share started to rise again, and this caused a strong pressure to reduce employment.

### 3.2 Industrial structures and their dynamics in the Japanese economy

In order to understand the long-term dynamics in the Japanese economy, we should take into account industrial structural changes. In particular, the export goods manufacturing industry plays a central role in the economic growth, and structural changes in the manufacturing industry and the inter-linkages between the manufacturing industry and the service industry strongly influences the growth pattern of the Japanese economy. Therefore, we should have a proper classification of industry to analyze the economic structures. We modify the industry classification used by R. Frank and P.

<sup>5</sup> As for the analysis of the potential output-capital ratio and capacity utilization, see Uemura (2000, 2012). There has been a decreasing trend of output-capital ratio in the Japanese economy.

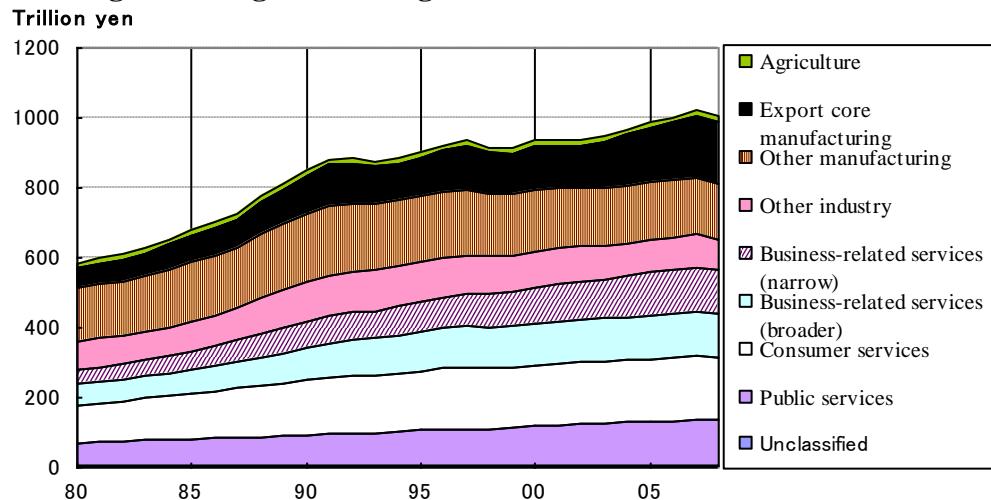
<sup>6</sup> H. Uemura analyzed the “counter-cyclical” movement of wage share, taking account of institutional arrangements in the “wage-labor nexus” in the Japanese economy (Uemura, 2000).

Kalmbach to analyze de-industrialization in Germany (Franke and Kalmbach 2003, 2005), and apply our framework to the Japanese economy.

**Table 1 Industry Classification for the Structure Analysis**

<b>1</b>	<b>Agriculture</b>	Agriculture, Forestry, Fisheries, Livestock and sericulture farming
<b>2</b>	<b>Export core manufacturing</b>	Transportation equipment, General Machinery, Electronic and electrical equipment, Precision machinery and equipment
<b>3</b>	<b>Other manufacturing</b>	Textile, Office and service industry machines
<b>4</b>	<b>Other industries</b>	Construction, Electricity and Gas, Water supply, Mining
<b>5</b>	<b>Business-related services in a narrow sense</b>	Finance, Rental of office equipments and goods, Advertisement, Information services and internet-based services
<b>6</b>	<b>Business-related services in a border sense</b>	Wholesale, Research, Telegraph and Telephone, Mail, Transportation
<b>7</b>	<b>Consumer services</b>	Retail, Insurance, Real estate, Tranportation, Broadcasting, Entertainment, Eating and Drinking Places, Accomodation
<b>8</b>	<b>Public services</b>	Education, Medical, Hygiene
<b>9</b>	<b>Unclassified</b>	Unclassified

**Figure 4 Long-term Change in Inndustrial Structures**



Source: RIETI, JIP Database.

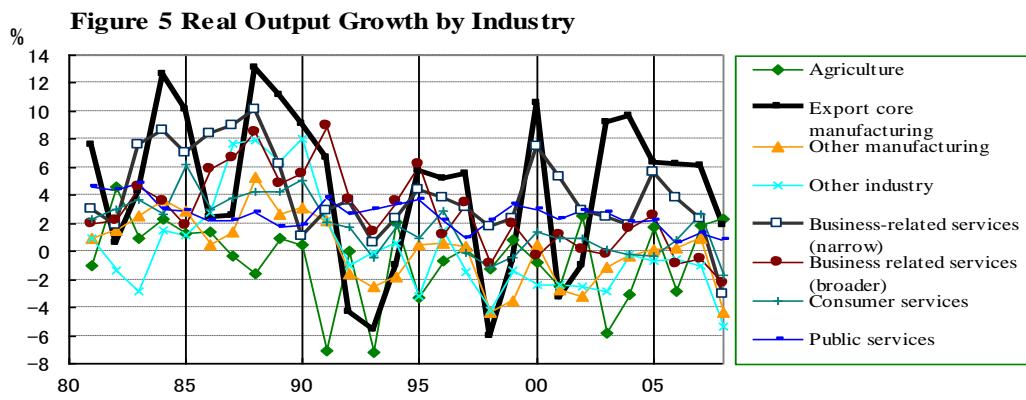
The following points are remarked with the industry classification in Table 1. First, the manufacturing industry is classified into “export core manufacturing” with a high export ratio and “other manufacturing”, emphasizing the leading role of “export core manufacturing” to promote economic development.<sup>7</sup> The “other industry” includes construction and mining. Furthermore, the service industry is classified into “business-related services in a narrow sense”, “business-related services in a broader sense”, “consumer services” and “public services”, clarifying the structural linkages with the manufacturing industry. Figure 4 shows long-term changes in the industrial structures in term of real output with this classification in the Japanese economy.

As we see the growth rate of each integrated industry in Figure 5, “the export core manufacturing industry” has fluctuated very largely, responding to the fluctuation of external demand, and this has influenced on the other industries. Moreover, “the business-related service industry” fluctuates almost in line with “the export core manufacturing industry”. In the Japanese economy, each industry shows different patterns of trend and fluctuation in “the demand regime”. Especially, “the export core manufacturing industry” played a leading role, influencing the other industries, in the disproportional export-led growth in the late 1990s and the early 2000s.

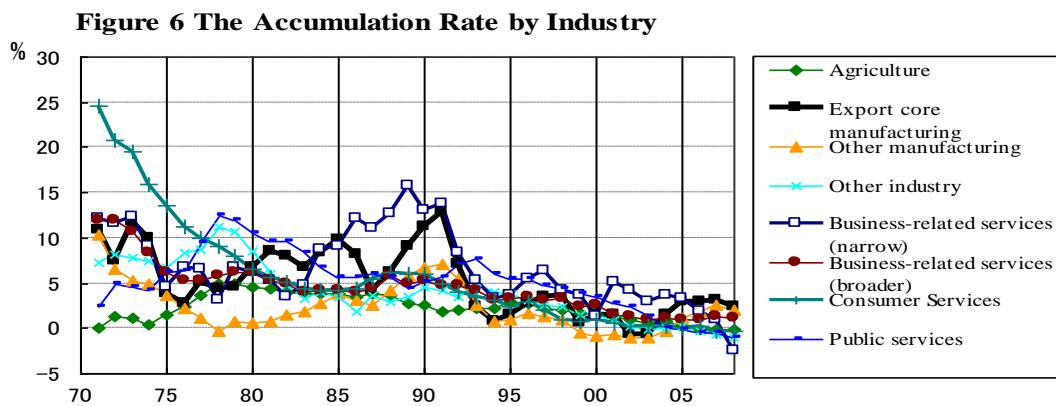
The accumulation rates by industry are seen in Figure 6. The accumulation rate increased very sharply in “the export core manufacturing industry” in the bubble boom at the end of the 1980s, and this was a main forces to cause the “over accumulation” and subsequent excess capacity which we have seen in Figure 1. Furthermore, capital accumulation also increased in “the business-related service industry”, induced by the dynamics of “the export core manufacturing industry”, in the late 1980s and the early 2000s..

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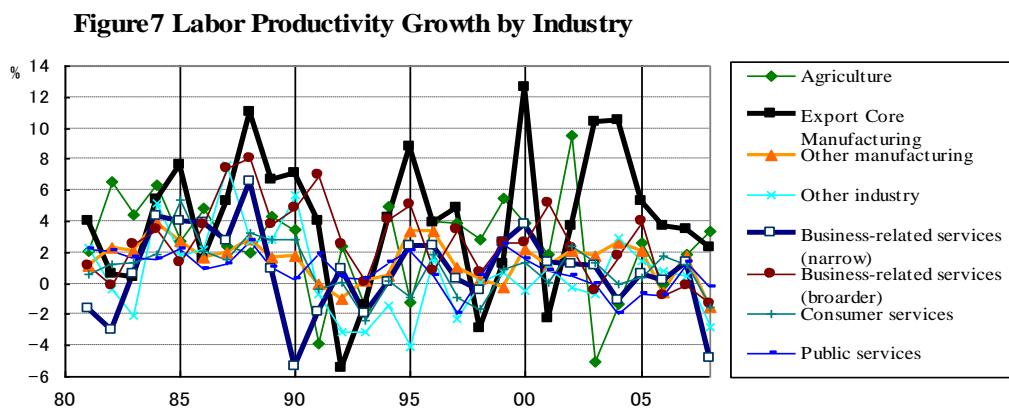
<sup>7</sup> The industries classified into “export core manufacturing”: “transportation equipment”, “general machinery”, “electronic and electrical equipment”, “precision machinery and equipment” have the higher ratio of export to output from 1980 to 2008.



Source: RIETI, JIP Database.



Source: RIETI, JIP Database.



Source: RIETI, JIP Database.

As for “the productivity regime”, the growth rates of labor productivity by industry are seen in Figure 7. The “export core manufacturing industry” shows the high growth of labor productivity with large fluctuations, while that in the “other manufacturing” stays at a relatively low level. Innovation and the increasing return to scale have worked effectively in “the export core manufacturing industry”. On the contrary, the growth rate of labor productivity in the service industry is low in general, but the “business-related service” in both narrow and broader sense shows the relatively higher growth rates in the service industry. In general, the productivity growth differentials between “the export core manufacturing industry” and the other industries are the remarkable structural characteristics in the disproportional export-led growth in the Japanese economy.

#### **4. Institutional Changes and the Transformation of the Growth Regime**

Since the 1990s, the Japanese economy has experienced stagnant economic growth and the transformation of the growth regime. This was caused by institutional changes in both the financial system and wage-labor nexus without the re-establishment of the mode of *régulation*. In this situation, de-industrialization has been accelerated with institutional changes and changing international economic relations to the Asian economies..

##### **4.1 Institutional changes and the transformation of the growth regime in Japan**

Major institutional changes occurred in the Japanese economy in the period from the 1990s to the early 2000s. Especially, the financial system and the employment system changed very rapidly, and this was influenced by excess capital stock, excess non-performing loan and excess employment.

First of all, the excess capital stock, which was the result of over accumulation in the second half of the 1980s, put a heavy pressure on the production system, firm organization and inter firm relations in the manufacturing industry, making them transformed gradually in the 1990s. In fact, Japanese firms pursued the scraping of capital stocks, the closing of factories, the rationalization of firm organization and the reorganization of subcontracting networks. In this situation, various business activities in manufacturing firms were externalized as business-related services.

Second, non-performing loan influenced the balance sheet of Japanese firms in the prolonged recession in the 1990s, especially, the financial crisis caused by the “Japanese Big Bang” in 1998. This led to a contraction of credit creation even with expansionary

monetary policies. In this situation, the main bank system and cross share holding were weakened with expanding financial services.

Third, excess employment was accumulated in the prolonged recession in the Japanese economy in the 1990s. As we have seen in Figure 2, labor hoarding in large firms led to the increase in wage share in the period. In this situation, Japanese firms increased non-regular workers to reduce wage costs. Furthermore, job security was weakened, and even regular workers were fired in the manufacturing industry in the early 2000s. This happened not only in the non-export goods manufacturing industry with stagnant productivity growth but also in “the export core manufacturing industry”. Especially, this was reflected by the sharp increase in labor productivity in the electrical machinery industry, and “the export core manufacturing industry” in general, which we have seen in Figure 6. Furthermore, the Spring Offensive (SHUNTO), the Japanese traditional wage negotiation system, collapsed with weakening trade union, and this depressed wages in all the industries. These institutional changes led to a sharp fall in wage share as we have seen in Figure 2.

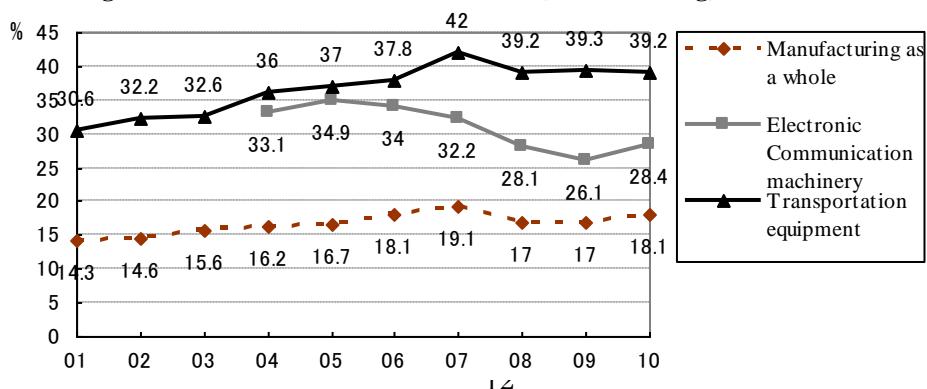
#### 4.2 Increasing oversea production of Japanese firms

Japanese firms’ FDI in Asia has increased very sharply since the 1990s. Especially, Japanese firms in the export core industry have extended their production networks in East Asia, and accordingly, intermediate goods trade has increased very rapidly in this region. In this situation, Japanese multinational firms, which were concerned with domestic economic issues, came to have their own strategies to extend their business activities which are relatively independent of domestic interests in Japan.

Figure 8 shows the ratio of oversea production of the Japanese manufacturing firms. The ratio did not decrease so much even after the Supreme crisis in 2008, and the ratio was 18.1% for the manufacturing industry as a whole and 39.2 % for the transportation machinery industry in 2010. The oversea production may be one factor to

accelerate de-industrialization in Japan.

**Figure 8 The Ratio of Oversea Production (Manufacturing)**



## 5. De-industrialization and the Manufacturing-service Linkages

### 5.1 Types of de-industrialization mechanism

In the long-lasting recession in the 1990s, the growth regime was transformed due to excess capital stock, the financial crisis, weakening job security and the expansion of international production networks. In this situation, productive activities were reorganized in Japanese firms, and this led to changes in intermediate input structures. For example, the externalization of business activities the manufacturing industry to the business-related service industry increased as a form of business process outsourcing and leasing, which influenced on the input structures of the manufacturing industry.

**Table 2 Four Types of De-industrialization**

	Output		Labor productivity		Employment	
	Manufacturing	Services	Manufacturing	Services	Manufacturing	Services
<i>Positive de-industrialization</i>	Increase or unchanged	--	Large increase	--	Decrease or unchanged	Increase
<i>Negative de-industrialization</i>	Decrease	--	--	--	Decrease	Increase
<i>De-industrialization by manufacturing-service linkages</i>	Increase	Increase	--	--	--	Increase
<i>De-industrialization by long-term shifts in demand from the manufacturing to the services</i>	--	Increase	--	--	Decrease	Increase

Note: "--" indicates the direction of the change is not specified

In the theoretical framework of de-industrialization in Rowthorn and Wells (1987), which is introduced in Section 2, two types of de-industrialization are explained. The one is “*positive de-industrialization*” which is caused by productivity growth differentials between the manufacturing industry and the service industry. In this case, higher productivity growth in the manufacturing industry brings about a shift of employment from the manufacturing industry to the service industry. The other is “*negative de-industrialization*” which is caused by stagnant output in the manufacturing

industry in recession. In this case, employment moves from the manufacturing industry to the service industry with increasing unemployment.

Rowthorn and Wells analyzed de-industrialization in terms of relative share of employment at the macroeconomic level. However, when we analyze changes in output and employment at the industrial level, we must introduce other two types of de-industrialization in our analysis. The third type of de-industrialization is caused by structural changes in the manufacturing industry with changing intermediate inputs from the business-related service industry. This third type may be called “*de-industrialization by manufacturing-service linkages*”.<sup>8</sup> The fourth type of de-industrialization is caused by a long-term shift of demand with changes in the productive system and the lifestyle, which may be called “*de-industrialization by long term shifts in demand from the manufacturing to the services*”. Table 2 summarizes changes in output, labor productivity and employment in four types of de-industrialization.

De-industrialization occurs with a different pattern in different industries. In particular, the mechanism of “positive de-industrialization” works in the growing manufacturing industries, while that of “negative de-industrialization” works in the declining manufacturing industries.<sup>9</sup>

## 5.2 An Input-Output analysis of manufacturing-service linkages

In order to investigate “de-industrialization by manufacturing-service linkages”, we investigate factors to cause structural changes in intermediate inputs into the manufacturing industry. R. Franke and P. Kalmbach developed the analytical framework to study de-industrialization in Germany, taking account of intermediate inputs in the *Input-Output Analysis*. We follow their methods to study changes in input structures in the manufacturing industry from 1980 to 2008 in Japan, using the data of JIP Database 2011. We investigate changes in input matrix which shows how much intermediate goods are put into an industry when it produces one unit of product. In particular, we focus on the intermediate input of services to the manufacturing industry to produce one unit of product. .

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<sup>8</sup> We should take into account the “subsystem dynamics” (Landesmann and Scazzieri 1996) in the manufacturing industry in the study of de-industrialization.

<sup>9</sup> R. Rowthorn and J. Wells used “positive de-industrialization” and “negative de-industrialization” to describe a structural change in the economy as a whole, but we use these terms to explain the pattern of structural change at the industrial level

R. Franke and P. Kalmbach introduce the distinction between “input coefficient matrix” and “technology matrix” in their method in the *Input-Output Analysis*. The Input coefficient matrix is decomposed into two matrices as follow.

$$A = H \circ A_T, \text{ element-wise defined as } a_{ij} = h_{ij} \cdot a_{Tij} \quad (1)$$

where matrix  $A$  is input coefficient matrix, and matrix  $A_T$  is technology matrix whose entry  $a_{Tij}$  indicates the quantity of good  $i$  that is technologically required per unit of output  $j$ . Matrix  $H$  is a matrix indicate the domestic share of intermediate inputs whose entry  $h_{ij}$  is the share of its intermediate inputs of good  $i$  that sector  $j$  purchases in home country.

**Table 3 Impact of Technical Change in Export Core Manufacturing**

	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005
Export core manufacturing	0.25%	0.68%	1.02%	0.41%	0.69%
Other manufacturing	-0.41%	-0.07%	-0.85%	-0.31%	-0.88%
Business-related services in a narrow sense	-0.04%	1.50%	1.66%	1.57%	1.99%
Business-related services in a broader sense	-0.04%	-0.17%	0.66%	2.27%	-0.28%
Consumer services	0.05%	0.29%	-0.53%	-0.17%	-0.32%
Public services	-0.03%	-0.14%	-0.41%	-0.04%	0.10%

**Table 4 Impact of Technical Change in the Other Manufacturing**

	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005
Export core manufacturing	-0.08%	0.22%	1.04%	0.60%	1.29%
Other manufacturing	-0.30%	-0.05%	-1.10%	-0.04%	-0.47%
Business-related services in a narrow sense	-0.43%	2.44%	1.17%	1.89%	2.65%
Business-related services in a broader sense	-0.17%	0.27%	0.78%	1.86%	0.56%
Consumer services	-0.08%	0.43%	-0.54%	-0.20%	-0.19%
Public services	-0.11%	-0.11%	-0.38%	-0.03%	0.12%

In our analysis, input coefficients are divided into technical coefficients and domestic input coefficients, and we focus on only changes in technical coefficients. In our analysis, we estimate only the effect of a change in technical coefficient of the manufacturing industry, “the export core manufacturing industry” and “the other manufacturing industry”, respectively, on the output of other industries, keeping the

input structures unchanged in the other industries. This shows the effect of structural changes in either of the manufacturing industries on the other industries, including its spillover effects.

Table 3 and Table 4 show the result of our analysis, and we find some important characteristics of the structural changes in the manufacturing industry. In particular, changes in output in each industry induced by a change in technical coefficients in “the export core manufacturing industry” are shown in Table 3. An increase in the intermediate input of “the export core manufacturing industry” has positive effect on the output of its own, and has negative effect on the output of “the other manufacturing industry”. In other words, interdependence within “the export core manufacturing industry” has been strengthened which means “the export core manufacturing industry” has its own “subsystem dynamics”. Furthermore, an increase in the intermediate input of “the export core manufacturing industry” leads to an increase in the output in “the business-related service industry in a narrow sense”. In short, structural changes in “the export core manufacturing industry” has led to a increase in its own output and the business-related industry, while it has caused a decrease in the output of the other manufacturing industry.

We can see the effect of a change in technical coefficients in “the other manufacturing industry” on each industry in Table 4. The change has induced an increase in the output of “the export core manufacturing industry” and “the business-related service industry in a narrow sense”, but this has not cause an increase in the its own output. In other words, “the other manufacturing industry” does not have stronger intra-industrial linkages.

In short, the export core manufacturing industry” plays an leading role in the Japanese economy, inducing the increase in the output of “the business-related service industry in a narrow sense” as a backward linkage effect. This effect has been stronger recently. In this regard, de-industrialization has been brought about not only by changes in output and productivity growth but also by the structural changes in intermediate input into “the export core manufacturing industry”. The shares of “the export core manufacturing industry” and “business-related service industry” have increased with the stronger indirect effect of demand creation in both industries since the 1990s. Moreover, these economies have higher productivity growth. Therefore, these industries have been leading industries, influencing the other industries, in the Japanese economy, so these will also play an important role in the growth regime in the future.

## **6. Structural Changes in the Manufacturing Industry and De-industrialization**

## 6.1 Factor decomposition of output changes and de-industrialization

In order to investigate the relationship between structural changes in the manufacturing industry and de-industrialization, we decompose the output changes into those in domestic final demand, export, import, technical coefficient and the domestic share of intermediate inputs..

By using the Leontief inverse matrix  $B = (I - A)^{-1}$ , we can decompose the increase in output vector  $x$  into a change in an increase in domestic final demand, export, import, technical coefficient and domestic share of intermediate inputs. The theoretical formula is as follows.

$$\begin{aligned}\Delta x &= B^0 \Delta y + (B^1 - B^0) \Delta y + B^0 (H^0 \circ \Delta A_T) x^0 + [B^1 (H^1 \circ \Delta A_T) - B^0 (H^0 \circ \Delta A_T)] x^0 \\ &\quad + B^0 (\Delta H \circ A_T) x^0 + (H^1 - H^0) (\Delta H \circ \Delta A_T^0) x^0 \\ y &= y^{dfd} + y^{ex} - y^{fim}\end{aligned}\tag{2}$$

Where vector  $y$  is final demand, vector  $y^{dfd}$  is domestic final demand, vector  $y^{ex}$  is export, and vector  $y^{fim}$  is import as final demand.

The results of analysis are summarized for the periods: the stable growth in the 1980s, the long-term recession in the 1990s, the recovery in the first half of the 2000s and the recession with the financial crisis in the second half of the 2000s in Tables 5. The mechanism of de-industrialization changed together with the transformations of the growth regime for each period.

Table 5 shows decomposed factors of output growth in each industry for 1980-1985, 1985-1990, 1990-1995, 1995-2000, 2000-2005, 2005-2008. Export contributed very much to the growth in 1980-1985, but with decelerating export due to the appreciation of yen after the Plaza accord, domestic demand came to contribute in the bubble boom in 1985-1990. The sufficient demand, both export and domestic demand, had a countervailing effect on the potential process of de-industrialization in Japan. Although there were fears that the hollowing-out of industry occurred with the de-localization of productive activities in Japan in the late 1980s, the absolute level of manufacturing employment was sustained only with its slightly decreasing relative share due to the increase in service employment (see Figure 9). In this period, the character of de-industrialization is not caused by a shift of employment from the manufacturing industry to the service industry but the increase in the output of the service industry due to the expansion of domestic demand.

**Table 6 Decomposition of Output Growth**

1980–1985	Output Growth	Contribution					
		Domestic final demand	Export	Import	Technological Coefficient	Domestic share of intermediate inputs	Residual
1 Agriculture	0.04%	0.05%	0.01%	-0.01%	-0.04%	0.04%	-0.01%
2 Export core	0.74%	0.38%	0.36%	-0.01%	0.01%	0.01%	0.00%
3 Other manufacturing	0.62%	0.69%	0.18%	-0.09%	-0.10%	0.04%	-0.11%
4 Other industry	-0.02%	0.00%	0.02%	0.05%	0.01%	0.05%	-0.14%
5 Business-related services in a narrow sense	0.43%	0.28%	0.05%	-0.01%	0.12%	0.00%	-0.01%
6 Business-related services in a broader sense	0.30%	0.22%	0.10%	-0.01%	-0.02%	0.03%	-0.03%
7 Consumer services	0.72%	0.59%	0.03%	0.00%	0.06%	0.03%	0.02%
8 Public services	0.46%	0.46%	0.01%	0.00%	-0.01%	0.00%	-0.01%
Total	3.29%	2.67%	0.77%	-0.09%	0.04%	0.20%	-0.29%

1985–1990	Output Growth	Contribution					
		Domestic final demand	Export	Import	Technological Coefficient	Domestic share of intermediate inputs	Residual
1 Agriculture	0.00%	0.08%	0.01%	-0.04%	-0.06%	0.03%	-0.02%
2 Export core	0.98%	0.72%	0.21%	-0.12%	0.12%	0.01%	0.04%
3 Other manufacturing	0.67%	1.13%	0.11%	-0.37%	-0.16%	0.09%	-0.15%
4 Other industry	0.90%	1.00%	0.02%	-0.08%	-0.21%	0.36%	-0.19%
5 Business-related services in a narrow sense	0.61%	0.48%	0.05%	-0.09%	0.14%	0.04%	0.00%
6 BUSINESS RELATED SERVICES IN A BROADER SENSE	0.69%	0.63%	0.03%	-0.08%	0.06%	0.05%	0.00%
7 Consumer services	0.84%	1.01%	0.03%	-0.09%	-0.10%	0.03%	-0.04%
8 Public services	0.25%	0.33%	0.01%	-0.01%	-0.05%	0.00%	-0.02%
Total	4.94%	5.39%	0.45%	-0.88%	-0.26%	0.60%	-0.38%

1990–1995	Output Growth	Contribution					
		Domestic final demand	Export	Import	Technological Coefficient	Domestic share of intermediate inputs	Residual
1 Agriculture	-0.06%	0.00%	0.01%	0.00%	-0.07%	0.01%	0.00%
2 Export core	0.02%	-0.07%	0.15%	-0.08%	0.06%	-0.04%	-0.01%
3 Other manufacturing	-0.15%	-0.02%	0.10%	-0.14%	-0.13%	0.05%	-0.01%
4 Construction	-0.04%	-0.10%	0.01%	-0.04%	-0.04%	0.13%	-0.01%
5 Business-related services in a narrow sense	0.25%	0.13%	0.03%	-0.01%	0.08%	0.01%	0.01%
6 Business-related services in a broader	0.55%	0.25%	0.02%	-0.01%	0.26%	0.03%	0.01%
7 Consumer services	0.24%	0.26%	0.01%	0.00%	-0.04%	0.01%	-0.01%
8 Public services	0.35%	0.36%	0.00%	0.00%	-0.01%	0.00%	0.00%
Total	1.16%	0.80%	0.33%	-0.29%	0.13%	0.21%	-0.02%

1995–2000	Output Growth	Contribution					
		Domestic final demand	Export	Import	Technological Coefficient	Domestic share of intermediate inputs	Residual
1 Agriculture	-0.01%	0.00%	0.01%	0.00%	0.00%	-0.01%	0.00%
2 Export core	0.36%	0.19%	0.28%	-0.18%	0.14%	-0.07%	0.00%
3 Other manufacturing	-0.27%	-0.04%	0.13%	-0.08%	-0.12%	-0.13%	-0.02%
4 Construction	-0.19%	-0.22%	0.02%	0.00%	0.13%	-0.10%	-0.02%
5 Business-related services in a narrow sense	0.37%	0.14%	0.05%	-0.04%	0.23%	-0.02%	0.00%
6 Business-related services in a broader	0.14%	0.08%	0.13%	-0.06%	0.03%	-0.04%	-0.01%
7 Consumer services	0.10%	0.15%	0.03%	-0.02%	-0.04%	-0.01%	-0.01%
8 Public services	0.27%	0.26%	0.00%	0.00%	0.02%	0.00%	0.00%
Total	0.76%	0.57%	0.64%	-0.38%	0.39%	-0.39%	-0.06%

2000–2005	Output Growth	Contribution					
		Domestic final demand	Export	Import	Technological Coefficient	Domestic share of intermediate inputs	Residual
1 Agriculture	-0.02%	0.00%	0.01%	-0.01%	-0.01%	-0.02%	0.00%
2 Export core	0.59%	0.42%	0.45%	-0.30%	0.12%	-0.08%	-0.02%
3 Other manufacturing	-0.26%	0.10%	0.23%	-0.17%	-0.15%	-0.22%	-0.05%
4 Other industry	-0.19%	-0.13%	0.03%	-0.03%	0.21%	-0.16%	-0.10%
5 Business-related services in a narrow sense	0.42%	0.20%	0.08%	-0.04%	0.25%	-0.05%	-0.02%
6 Business-related services in a broader sense	0.14%	0.24%	0.12%	-0.05%	-0.05%	-0.09%	-0.04%
7 Consumer services	0.06%	0.17%	0.04%	-0.03%	-0.09%	-0.02%	-0.02%
8 Public services	0.31%	0.31%	0.00%	0.00%	0.01%	-0.01%	0.00%
Total	1.04%	1.32%	0.95%	-0.63%	0.29%	-0.64%	-0.25%

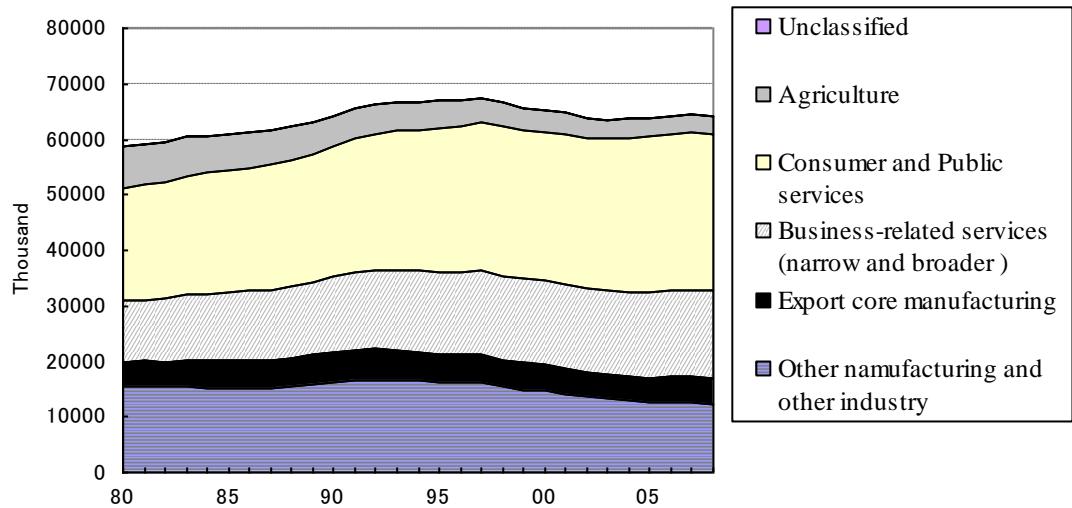
2005–2008	Output Growth	Contribution					
		Domestic final demand	Export	Import	Technological Coefficient	Domestic share of intermediate inputs	Residual
1 Agriculture	0.01%	0.00%	0.01%	0.01%	0.04%	-0.05%	-0.01%
2 Export core	0.77%	0.66%	0.20%	-0.26%	0.32%	-0.14%	-0.01%
3 Other manufacturing	-0.18%	0.00%	0.21%	-0.01%	0.04%	-0.36%	-0.07%
4 Other industry	-0.22%	-0.19%	0.03%	0.02%	0.33%	-0.27%	-0.14%
5 Business-related services in a narrow sense	0.12%	0.06%	0.12%	-0.05%	0.18%	-0.15%	-0.05%
6 Business-related services in a broader sense	-0.16%	-0.10%	0.25%	-0.02%	-0.13%	-0.13%	-0.04%
7 Consumer services	0.10%	0.13%	0.02%	0.02%	-0.03%	-0.03%	-0.01%
8 Public services	0.11%	0.11%	0.01%	-0.01%	0.01%	-0.01%	0.00%
Total	0.56%	0.67%	0.86%	-0.28%	0.77%	-1.14%	-0.33%

## 6.2 De-industrialization and shifts in employment structures

The transformation of growth regime and changes in the mechanism of de-industrialization have an influence on employment structures in a different ways in the different periods. As we explained in Section 2, we investigate shifts in employment to analyze the growth rates of output, labor productivity.

Table 7 shows the annual growth rates of output, labor productivity and employment in each industry. When the growth rate of output is larger than the growth rate of labor productivity, employment decreases in the sector. On the contrary, when the growth rate of output is less than the growth rate of labor productivity, employment increases in the sector. Therefore, we can investigate the shift in employment in a sector, seeing the growth rates of output and labor productivity. Of course, these rates of growth are not independent, and they are rather brought about by the “cumulative causation” between output growth and productivity growth with “subsystem dynamics” in the economy as a whole.

**Figure 9 Structural Changes in Employment**



Source: RIETI, JIP Database

**Table 7 Output Growth, Productivity Growth and Employment Growth**

(Annual rate)

		1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2008
<b>Export core manufacturing</b>	Output	6.96%	7.56%	0.17%	2.73%	4.05%	4.70%
	Labor Productivity	3.55%	6.30%	1.90%	3.81%	5.40%	3.14%
	Employment	3.29%	1.18%	-1.70%	-1.04%	-1.29%	1.51%
<b>Other manufacturing</b>	Output	2.31%	2.59%	-0.65%	-1.32%	-1.45%	-1.07%
	Labor Productivity	2.41%	1.99%	0.58%	1.32%	1.93%	-0.14%
	Employment	-0.09%	0.59%	-1.22%	-2.61%	-3.32%	-0.93%
<b>Other industry</b>	Output	-0.13%	6.56%	-0.33%	-1.59%	-1.75%	-2.35%
	Labor Productivity	1.31%	4.20%	-2.52%	-0.08%	0.89%	-0.51%
	Employment	-1.42%	2.27%	2.25%	-1.51%	-2.61%	-1.85%
<b>Business-related services in a narrow sense</b>	Output	5.60%	6.90%	2.73%	3.67%	3.60%	0.98%
	Labor Productivity	0.81%	1.67%	-0.10%	1.70%	0.64%	-1.18%
	Employment	4.75%	5.14%	2.84%	1.93%	2.95%	2.18%
<b>Business-related services in a broader sense</b>	Output	2.84%	6.27%	4.72%	1.05%	1.06%	-1.26%
	Labor Productivity	1.65%	5.55%	3.71%	2.02%	2.56%	-0.76%
	Employment	1.17%	0.69%	0.98%	-0.95%	-1.46%	-0.50%
<b>Consumer services</b>	Output	3.60%	4.08%	1.24%	0.51%	0.30%	0.58%
	Labor Productivity	2.08%	2.51%	-0.71%	0.31%	0.82%	0.47%
	Employment	1.49%	1.53%	1.96%	0.20%	-0.51%	0.11%
<b>Public services</b>	Output	3.95%	2.15%	3.30%	2.33%	2.46%	0.86%
	Labor Productivity	1.93%	1.22%	1.18%	0.60%	-0.27%	0.12%
	Employment	1.98%	0.92%	2.10%	1.72%	2.74%	0.74%

Source: RIETI, JIP Database

In the 1980s, there was a growth differential between “the export core manufacturing industry” and “the other manufacturing industry” in the Japanese economy, but the Japanese economy had expanding domestic demand with the positive growth rates in both industries in the export-led growth regime. Therefore, de-industrialization did not occurred explicitly in terms of employment in this period.

In the 1990s, however, the differential was kept at lower growth rates between “the export core manufacturing industry” and “the other manufacturing industry” in the long-lasting recession. Employment decreased with the mechanism of “positive de-industrialization” in “the export core manufacturing industry”, and decrease more remarkably with the mechanism of “negative de-industrialization” in “the other manufacturing industry”. On the contrary, employment increased in “the business-related service in a narrow sense” with the mechanism of “de-industrialization by manufacturing-service linkages”. Business process outsourcing was accelerated, producing more service employment in this period. Therefore, even in the period of 2005-2008 which includes the global financial crisis, “business-related service in a narrow sense” kept such a high growth rate as 2.18% with a strong relation to “the export core manufacturing industry”.

Employment which is discharged from the manufacturing industry is absorbed into the service industry. Since the 1990s, employment has continuously increased even with a decrease in labor productivity in services. In other words, all the service industries

except “business-related service in a broader sense” absorbed employment as a “sponge of employment” and showed positive growth rates of employment even in the period of 2005-2008 including the world financial crisis.

The absorption of employment by the service industry is socially preferable as it contributes to the retention of employment in the whole economy. However, this may often leads to a decrease in per capita incomes with decreasing labor productivity. In fact, workers who were fired by manufacturing firms were often reemployed as non-regular workers by smaller firms in “the business-related service industry. In this situation, polarization occurred between the manufacturing industry with high productivity and the consumer service industry with low productivity with the weakening coordinating mechanism of wages and employment. This was a phenomenon specific to the economic growth induced by “the export core manufacturing industry” in the 2000s, which had not seen even in the export-led growth in the 1980s. After the Japanese economy was hit by the Suprime crisis in 2008 and the earthquake in 2011, “the export core manufacturing industry” was damaged, exacerbating the polarization of the Japanese economy and society.

## 7 Concluding Remarks

We analyzed both transformations of growth regime and de-industrialization in Japan after the 1980s within the framework which integrates the growth regime in the *régulation* theory and the *Input-Output Analysis* of de-industrialization.

First, the Japanese economy experienced a transformation of growth regime in the long-lasting recession in the 1990s. During the recovery process after 2002, a new growth regime was not established with a fully fledged mode of *régulation*, even though the profit rare recovered with a sharply decline in wage share. The Japanese economy maintained the export-led nature, but the core mechanisms to promote productivity growth and the coordinating mechanisms have been weakened remarkably with gradual instructional changes. Furthermore, only depending on export, the Japanese economy has been stagnant, and the accumulation rate has remained at very low levels.

Second, large differentials in the output growth and productivity growth exist between the “export core manufacturing industry” and the “other manufacturing industry”, and the structural linkages of the “business-related service” with “the export core manufacturing industry” are much stronger than the “consumer service industry”. In the 1990s, the “export core manufacturing industry” supported economic growth under the conditions of stagnant domestic demand, and this induced a growth of the

business-related services through intermediate demand from the “export core manufacturing industry”. The delocalization of productive activities became very active in “the export core manufacturing industry”, but Japanese firms did not decrease output in this industry so much, keeping positive relations between FDI and export until the middle of the 2000s. However, when the Japanese economy was hit by the Subprime crisis in the 2008, both export and industrial outputs fell very sharply, causing severe unemployment problems..

Third, the process of de-industrialization has shown following characteristics in the Japanese economy. In the 1980s, de-industrialization was mitigated by the expansion of export demand and domestic demand, and only “de-industrialization by long-term shifts in demand from the manufacturing to the services” was observed in the bubble boom. In the long-lasting recession in the 1990s, “positive de-industrialization” proceeded in “the export core manufacturing industry” with higher productivity growth, and “negative de-industrialization” occurred in “the other manufacturing industry” with stagnant demand. Therefore, a polarization proceeded in terms of output and employment in the Japanese economy. Furthermore, the mechanism of “de-industrialization by manufacturing-service linkages” continued to be stronger after the 1980s, and became very remarkable in the 1990s. Therefore, de-industrialization has been accelerated in terms of employment in the Japanese economy since the 1990s.

Fourth, as for structural changes within the manufacturing industry, intra-manufacturing linkages has become stronger especially in “the export core manufacturing industry” since the 1990s. Furthermore, the output of “the business-related service industry” increased with technical coefficient effect and domestic demand effect, and the output of the “consumer service industry” also increased with the expansion of domestic final demand. In this situation, workers who were discharged by “the export core manufacturing industry”, “the other manufacturing industry” and “the other industry” were absorbed by the service industries often as non-regular workers. After the Subprim crisis in 2008, however, the output of “the export core manufacturing industry” decreased drastically, and accordingly, “the business-related service industry” lost its employment absorbing capacity very rapidly, causing severe employment problems.

Under these conditions, it is very important to construct the backward linkages of “the export core manufacturing industry” with proper institutional coordinating mechanisms in the domestic economy as well as to create more employment with better working conditions in not only the business-related service industry but also the consumer and public service industries.

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