Comparative Analysis on the Industrial Environment of Electronic Information Manufacturing Industry between China and Japan

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Abstract. This paper, based on the input-output table of China and Japan, uses the method of correlation ratio to measure the inter-industry correlation intensity and conducts comparative analysis on the development scale of electronic information manufacturing industry between China and Japan, upstream and downstream correlated industries and the correlation intensity difference, in order to discuss the development strategy in the electronic information manufacturing industry in China from the perspective of industrial environment. The research has shown that: The upstream industries of China-Japan electronic information manufacturing industry contain both the traditional manufacturing industry and the productive services, and the productive services are in the majority in the upstream industries of the electronic information manufacturing industry in China and the correlation intensity is higher than that of Japan; The upstream and downstream of Japan’s electronic information manufacturing industry are obviously influenced by the government’s official business and the correlation between its downstream and high-tech industries is far higher than that of China. The core components of the upstream of China’s electronic information manufacturing industry are mainly driven by imports and the downstream terminal products are mainly promoted by export demand. Therefore, the improvement of the innovation ability of China’s electronic information manufacturing industry is inseparable from the improvement of the environment, market and policy environment of the upstream and downstream industries.

Introduction

Electronic information manufacturing industry is the strategic commanding point of global industry competition, which has the characteristics of high knowledge intensity, high capital intensity, high output added value and low resource consumption. The developed countries occupy the links of high added value and high profits in the global value chain relying on their pioneering advantages in the fields of research and development design, technology heights, capital intensity, etc. of electronic information manufacturing industry. For a long time, a very important reason for China’s “large but weak” manufacturing is the relative weakness of electronic information manufacturing industry. Therefore, it is currently an important strategic choice for China’s electronic information manufacturing industry that how to shift from “Made in China” to “Made in China in Wisdom” to promote upgrading of the industrial structure. Based on this, it is necessary to use effective and reliable data to analyze the development scale and structure and the industrial environment of China’s electronic information manufacturing industry in order to summarize the universal laws of the development of electronic information manufacturing industry, and point out the shortages, the reasons and the improvement direction of the development of China’s electronic information manufacturing industry through comparative analysis. And the aim is to provide some reference and inspiration for the country to deeply implement innovation-driven strategy and realize the grand blueprint of “Made in China 2025”.

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Literature Review

There are relatively many researches on the development status of electronic information manufacturing industry, but few researches on its industrial environment. Let’s sort out the research contents of electronic information manufacturing industry at home and abroad in recent years. In domestic researches, Tao Yuxiang et al. analyzed the development experience of the United States, the European Union, Japan, South Korea and other countries in actively promoting the electronic information manufacturing industry and sorted out the development policies and measures of the typical countries, such as the United States, Russia, Britain, Germany, Japan, South Korea, in electronic information industry, and gave enlightenment to the development of China’s electronic information industry and put forward the corresponding countermeasures and the suggestions[1]. Cai Yongzhi analyzed the transformation and upgrading of industrial cluster in the electronic information manufacturing industry in China from the perspective of global value chain, and based on this, put forward the upgrade ideas of the industrial cluster of China’s electronic information manufacturing industry[2]. Zhou Xiaoke et al. evaluated the research and development efficiency of electronic information manufacturing industry in Taiwan and the mainland from 2003 to 2012 based on DEA-Tobit model and analyzed the influence factors of research and development efficiency, and the empirical study indicated that average size of enterprises in the industry had significantly negative correlation with the research and development efficiency of electronic information manufacturing industry in Taiwan and the mainland; The degree of openness of the industry market and the government’s financial support for enterprises’ R&D activities were positively correlated with the research and development efficiency of electronic information manufacturing industry in Taiwan and the mainland, but both of them were not significant[3]. In the foreign research results, Pavitt believed that the electronic information manufacturing industry was based on scientific knowledge and the frequency of product and process innovation was higher[4]. Malerba and Bastos believed that universities provided new technologies and methods for enterprise research and development, which were the source of innovation in electronic information manufacturing industry[5-6]. The influence of universities and research institutions on the industry came from cooperative R&D, under which knowledge not only can be converted into technology, but also may create new knowledge in the cooperation process, and Fritsch and Cheng believed that the research institutions mainly acted on the early stage of the innovation process and provided new ideas for enterprise innovation[7-8]. Bauer made an analysis of the relationship between market force, innovation and efficiency in the communications industry in the United States and argued that enterprises with moderate market forces were more innovative and efficient[9]. Kamieniecki et al. investigated the competitiveness of the high-tech industries in states of the United States by calculating the indicators of high technology industry resources, their utilization of resources, etc.. Raab et al. calculated the technological innovation efficiency of high-tech industries in 50 states in the United States in 2002 from the perspective of regional difference and ranked them[10]. Linda et al. pointed out that the industrial cluster factors were more important to the location selection of the foreign-funded enterprises in the electronic information manufacturing industry[11].

In conclusion, the relevant researches of electronic information manufacturing industry mainly focus on the field of empirical research, covering the industry development policy, industry cluster, technological innovation, research and development innovation, the technical efficiency and other aspects of electronic information manufacturing industry. But there are also the following shortcomings: First, the existing researches generally use the econometric method or theoretical exposition, and the method of input-output table is rarely used to study on the latest development of electronic information manufacturing industry; Second, it is not enough to summarize the universal laws of the development of electronic information manufacturing industry based on the comparative analysis of a few developed economies; Third, the different data sources and different tabulation apertures of the input-output tables of China and other economies affect the reliability of the comparative analysis conclusion; Forth, there are few comparative researches on the electronic information manufacturing industry between China and Japan among the existing researches, and the development difference and the correlation of electronic information manufacturing industry of
the two major economies cannot be analyzed in depth. To this end, this paper carries out the research by using the data of a total of 680 input-output tables of 43 economies, including China, from 1995 to 2014 in the World Input Output Database (WIOD), China’s input-output table of 2012 and Japan’s input-output table of 2011.

Development Scale and Composition of Electronic Information Manufacturing Industry

Development Scale of Electronic Information Manufacturing Industry

The world input-output tables (WIOTs) of WIOD are the most comprehensive input-output tables among countries covering the country, industry and time, which provide the data of a total of 645 national input-output tables (NIOT) from 28 EU countries and 15 major countries from 2000 to 2014 for this paper to carry out research. This table provides effective data support through calculation at current prices. The 43 economies include the world’s major countries and regions, covering nearly 90% of the global economic aggregate and nearly 70% of the global population, and their samples are representative enough. In addition, in spite of the different tabulation apertures and different tabulation years of the statistics departments of the economies, NIOT adopts the unified method and aperture to fill the data gaps in non-tabulated years, making the input-output tables of the economies continuous in time and consistent and comparable in aperture. Besides, another advantage of the input-output tables of NIOD compared with the original statements released by National Bureau of Statistics of the People’s Republic of China is that the former distinguishes domestic self-produced sources from imported sources of the products used by various industries of electronic information manufacturing industry. On the basis of using higher-quality data, the research of this paper not only strengthens the research conclusions of predecessors, but also puts forward different analysis results for some important issues.

Figure 1. The scale of electronic information manufacturing industry of the 43 economies from 2000 to 2014.

According to Figure 1, it can be seen from the development scale of electronic information manufacturing industry of the 43 economies that the eight economies of the United States, Japan,
China, South Korea, Taiwan, Germany, Mexico, Switzerland rank the top eight, with the production scale of over USD60 billion per year, among which the annual production capacity in electronic information manufacturing industry of the United States, China and Japan has reached USD100 billion. The electronic information manufacturing industry is one of the fastest-growing industries that has made a significant contribution to economic growth after China’s entry into WTO. And it can be seen from Figure 1 that the production capacity of China’s electronic information manufacturing industry was USD130,447 million in 2000, which was almost 1/3 of that of Japan, and China’s electronic information manufacturing industry had lagged behind Japan from 2000 to 2004. However, the lagging productivity gap decreased year by year, and China’s electronic information manufacturing industry has been developing at a high speed since 2000 and struggling to catch up. And the production capacity of China’s electronic information manufacturing industry surpassed that of Japan in 2004 and continued to maintain rapid growth. The production scale of the electronic information manufacturing industry in Japan has been in the unstable development stage of fluctuations since 2000, and the production of Japan’s electronic information manufacturing industry also fell sharply after the financial crisis in 2009 with the ratio reaching 18.77%. In the following three years, there was a certain recovery period of development, but it has decreased year by year since 2012, decreasing from USD328.66 billion in 2012 to USD251.75 billion in 2014. The substantial increase in production of China’s electronic information manufacturing industry forms a sharp contrast with Japan’s gentle development trend. The sales revenue of China’s electronic information manufacturing industry of RMB317.17 billion exceeded Japan’s RMB294,233 million in 2004, and surpassed the United States in 2005, becoming the world’s largest manufacturer in electronic information manufacturing industry. As of 2014, the production of China’s electronic information manufacturing industry achieved USD1,583,061 million.

Composition of Electronic Information Manufacturing Industry in China and Japan

The input-output tables of Japan’s 190 industries released by Japan statistics window (www.e-stat.go.jp), are only updated to 2011, and China’s input-output tables stem from the input-output tables of 2012 compiled by the National Economic Accounting Department of National Bureau of Statistics, covering the detailed data of 135 industries. The electronic information manufacturing industry can be divided into five specific industries by referring to the national economic industry classification standards of China in 2012 and Japan in 2011 and combining the economic activities represented by the electronic information manufacturing industry segments of China and Japan, and in turn, they are (1) electronic computer and auxiliary equipment manufacturing industry; (2) communication equipment manufacturing industry; (3) manufacturing industry of radio and television equipment, radar and supporting equipment and audio-visual equipment; (4) electronic components manufacturing industry; (5) other electronic equipment manufacturing industry. Although the names of the electronic information manufacturing industry segments of China and Japan are different, there is no difference in the economic activities represented.

Through analyzing the corresponding industry production capacity of the electronic information manufacturing industry of the two big economies of China and Japan according to their respective industry composition by Figure 1 and Figure 2 respectively, it is easy to find that the production capacity of Japan’s domestic electronic information manufacturing industry is far from that of China, the main reason for which is that Japan began to vigorously develop foreign investment from the 1970s and 1980s, and increased the direct foreign investment year by year from USD ten billion per year at the beginning to USD one hundred billion per year at the beginning of the 21st century. And according to incomplete statistics, Japan’s outward foreign direct investment was nearly USD130 billion in 2011. Japan moves a large number of manufacturing industries abroad, including China, which causes the gradual decline in domestic manufacturing industries and the constant decline in the production capacity in electronic information manufacturing industry. As shown in Figure 2: In 2011, the total production capacity of electronic information manufacturing industry in Japan was USD267,029 million, including the domestic production capacity of USD76,335.9
million in electronic components, USD91,674.1 million in other electronic equipment, USD26,842.7 million in the manufacturing industry of radio and television equipment, radar and supporting equipment and audio-visual equipment, USD39,123.1 million in communication equipment manufacturing industry and USD33,053.4 million in electronic computer and auxiliary equipment manufacturing industry. However, with the constant deepening of reform and opening to the outside world, China constantly expands foreign cooperation and undertakes the direct foreign investment projects from the world to China, including a large number of electronic information manufacturing industry transferred projects from Japan, and they are generally low end joint production or for the sake of China’s cheap labor, which is also one of the important reasons for China’s rapid development in electronic information manufacturing industry. This is consistent with the results shown in Figure 1-2 above. As shown in Figure 3: In 2012, the total production capacity of electronic information manufacturing industry in China was USD102,701,301.3 million, including the domestic production capacity of USD29,939,495.1 million in electronic computer and auxiliary equipment manufacturing industry, USD19,380,718 million in communication equipment manufacturing industry, USD11,430,180.9 million in the manufacturing industry of radio and television equipment, radar and supporting equipment and audio-visual equipment and USD3,302,218.6 million in other electronic equipment manufacturing industry.

![Figure 2. Scale of electronic information manufacturing industry in China and Japan.](image-url)
Analysis of Correlation Intensity between Upstream and Downstream of Electronic Information Manufacturing Industry in China and Japan

The Measurement Methods of Correlation Intensity between Upstream and Downstream of the Industry

In the previous researches on correlated industries and correlation intensity, the quite common measurement methods are the direct correlation ratio method of Luukkainen and the indirect correlation ratio method\textsuperscript{13-14} of Hill and Brennan, of which Luukkainen set the correlation intensity of the industry on itself to 0 in defining the cluster scope of several important industries in Finland, used the rest industries to calculate the mutual direct correlation ratio $Rel$, believed that the $Rel$ values can be divided into three levels by 20%, 14% and 8%, and industries with a value of less than 8% were excluded from the cluster scope so as to filter out industries with little correlation intensity. Thereinto, the ratios of backward direct correlation and forward direct correlation can be obtained respectively by formula (1) and (2):

\[ Rel^B = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}} \quad (i = 1, 2; \ n), \quad (1) \]

\[ Rel^F = \frac{h_{ij}}{\sum_{j=1}^{n} h_{ij}} \quad (j = 1, 2; \ n), \quad (2) \]

there into,

\[ a_{ij} = \frac{z_{ij}}{x_j}, \quad h_{ij} = \frac{z_{ij}}{x_i} \quad (i, j = 1, 2; \ n) \]

In the above formula, $a_{ij}$ is the direct consumption coefficient of $j$ industry on $i$ industry, which represents the direct consumption of $i$ industry for $j$ industry to produce unit product. $h_{ij}$ is the direct distribution coefficient of $i$ industry to $j$ industry, which represents the product share that $j$ industry can be distributed in the unit output of $i$ industry, also known as the output coefficient. Hill and Brennan used the complete consumption coefficient and the complete distribution coefficient to calculate the indirect correlation ratios $Asso$ among 193 divisions, and included the divisions with both the forward and backward correlation ratios of more than 0.5% or the total correlation ratio of more than 0.1% in the industry cluster. The backward indirect correlation ratio and forward indirect correlation ratio can be obtained respectively by formula (3) and (4):

\[ Asso^B = \frac{b_{ij}}{\sum_{i=1}^{n} b_{ij}} \quad (i = 1, 2; \ n), \quad (3) \]

\[ Asso^F = \frac{g_{ij}}{\sum_{j=1}^{n} g_{ij}} \quad (j = 1, 2; \ n), \quad (4) \]

there into,

\[ b_{ij} = a_{ij} + \sum_{k=1}^{n} a_{ik} a_{kj} + \sum_{k=1}^{n} \sum_{s=1}^{n} a_{ik} a_{sk} a_{kj} + \sum_{k=1}^{n} \sum_{s=1}^{n} \sum_{t=1}^{n} a_{ik} a_{st} a_{sk} a_{kj} + \cdots \quad (i, j = 1, 2; \ n) \]

\[ g_{ij} = h_{ij} + \sum_{k=1}^{n} h_{ik} h_{kj} + \sum_{k=1}^{n} \sum_{s=1}^{n} h_{ik} h_{sk} h_{kj} + \sum_{k=1}^{n} \sum_{s=1}^{n} \sum_{t=1}^{n} h_{ik} h_{st} h_{sk} h_{kj} + \cdots \quad (i, j = 1, 2; \ n) \]

In the above formula, $b_{ij}$ is the complete consumption coefficient of $j$ industry on $i$ industry, which represents the complete (direct and indirect) consumption of $i$ industry product for $j$ industry to produce one unit end product. $g_{ij}$ is the complete distribution coefficient of $i$ industry to $j$ industry.
industry, which represents the increment of the total output value of \( j \) industry caused by the increment of one unit in \( i \) industry.

**Calculation of the Correlation Intensity between Upstream and Downstream of the Electronic Information Manufacturing Industry in China and Japan**

According to the data of the national input-output tables (NIOT) of the world’s two major economies of China and Japan, the values of the correlation intensity \( R_{B_1} \), \( R_{F_1} \), \( A_{B_1} \) and \( A_{F_1} \) of electronic information manufacturing industry with all other industries are calculated respectively in accordance with the above formula. Then, according to research needs, this paper deems the industries with both the \( R_{B_1} \) value and the \( A_{B_1} \) value ranking the top ten or one of the \( R_{B_1} \) and the \( A_{B_1} \) values ranking higher as the upstream correlated industries of electronic information manufacturing industry, and deems the industries with both \( R_{F_1} \) value and the \( A_{F_1} \) value ranking the top ten or one of the \( R_{F_1} \) and the \( A_{F_1} \) values ranking higher as the downstream correlated industries of electronic information manufacturing industry, and the results are as shown in Table 1 and Table 2.

| No. | Name of Industry | \( A_{B_1} \) | \( R_{B_1} \) | Name of Industry | \( A_{F_1} \) | \( R_{F_1} \) |
|-----|-----------------|--------------|-------------|-----------------|--------------|-------------|
| 1   | Culture and office machinery manufacturing | 23.15%       | 38.51%      | Instrument and meter manufacturing industry | 51.47%       | 34.45%      |
| 2   | Software and information technology services | 18.99%       | 24.01%      | Commercial machinery | 22.89%       | 14.22%      |
| 3   | Instrument and meter manufacturing industry | 17.79%       | 24.48%      | Electrical machinery and equipment manufacturing | 14.58%       | 8.67%       |
| 4   | Professional technique service | 13.08%       | 14.80%      | Motor vehicles, electronic products and daily products repair | 12.52%       | 7.04%       |
| 5   | Telecommunications and other information transmission services | 11.16%       | 11.26%      | Office supplies | 5.49%        | 2.87%       |
| 6   | Neighborhood services | 8.36%        | 9.65%       | Automobile manufacturing | 5.10%        | 1.36%       |
| 7   | Research and experimental development | 7.60%        | 8.70%       | Other manufactured industrial products | 3.13%        | 1.71%       |
| 8   | Commercial services | 5.94%        | 4.88%       | General and special equipment manufacturing | 2.63%        | 0.85%       |
| 9   | Technology promotion and application services | 5.87%       | 6.31%       | Transportation equipment manufacturing | 2.12%        | 0.59%       |
| 10  | Electrical machinery and equipment manufacturing | 5.75%       | 4.08%       | Official business | 1.36%        | 0.45%       |
| 11  | General and special equipment manufacturing | 5.62%       | 6.39%       | Leasing industry | 1.82%        | 0.02%       |
| 12  | Transportation equipment manufacturing | 5.16%       | 4.77%       | Image, voice and text information production | 0.95%        | 0.33%       |
| 13  | Metal products, machinery and equipment repair services | 5.12%       | 3.86%       | Research and experimental development | 0.96%        | 0.32%       |
| 14  | Ecological protection and environmental governance | 4.72%       | 3.87%       | Construction industry | 0.97%        | 0.22%       |
| 15  | Software and information technology services | 3.80%       | 2.12%       | | 0.76%        | 0.16%       |
Table 2. Downstream industries and correlation intensity of the electronic information manufacturing industry in China and Japan.

| No. | Name of Industry                          | China          | Name of Industry                          | Japan          |
|-----|-------------------------------------------|----------------|-------------------------------------------|----------------|
|     |                                           | Asso<sup>F</sup> | Re<sup>F</sup>                            | Asso<sup>F</sup> | Re<sup>F</sup> |
| 1   | General and special equipment manufacturing | 6.62%          | 5.50%                                     | 8.74%          | 4.70%          |
| 2   | Electrical machinery and equipment manufacturing | 5.46%          | 5.49%                                     | 8.06%          | 9.66%          |
| 3   | Construction industry                      | 4.20%          | 0.67%                                     | 6.93%          | 7.85%          |
| 4   | Commercial service industry                | 2.67%          | 2.88%                                     | 6.48%          | 8.11%          |
| 5   | Automobile manufacturing                    | 2.68%          | 1.32%                                     | 5.59%          | 7.55%          |
| 6   | Professional technique services            | 2.62%          | 2.86%                                     | 2.75%          | 1.80%          |
| 7   | Software and information technology services | 2.56%          | 3.30%                                     | 2.36%          | 1.58%          |
| 8   | Instrument and meter manufacturing industry | 1.77%          | 2.14%                                     | 2.24%          | 1.03%          |
| 9   | Telecommunications and other information transmission services | 1.46%          | 1.53%                                     | 1.60%          | 0.42%          |
| 10  | Electricity, heat production and supply     | 1.64%          | 0.05%                                     | 1.10%          | 0.01%          |
| 11  | Chemical raw materials and chemical products manufacturing | 1.57%          | 0.19%                                     | 0.82%          | 0.31%          |
| 12  | Ferrous metal smelting and rolling processing industry | 1.54%          | 0.06%                                     | 0.78%          | 0.01%          |
| 13  | Wholesale and retail                       | 1.44%          | 0.72%                                     | 0.75%          | 0.26%          |
| 14  | Transportation equipment manufacturing      | 1.39%          | 0.93%                                     | 0.62%          | 0.35%          |
| 15  | Mining industry                            | 1.20%          | 0.25%                                     | 0.56%          | 0.25%          |

Data Source: It is sorted out and calculated according to the relevant data of 2012 China Input-Output Table and 2011 Japan Input-Output Table.

Analysis of the Difference between Upstream and Downstream Correlated Industries and Correlation Intensity

Using the data from the Table 1 and Table 2 and centering on electronic information manufacturing industry, this paper puts the upstream industries above and downstream industries below, and draws a figure (as shown in figure 3) of the upstream and downstream industries and correlation intensity of electronic information manufacturing industry in China and Japan according to the size of the values of $Asso^U$ and $Asso^F$, in which the lines represent industry correlation, and the directions of arrows represent the input and the corresponding figures represent the correlation intensity values among industries.
Figure 3. Comparison between upstream and downstream correlated industries and correlation intensity of electronic information manufacturing industry in China and Japan.

Through the difference analysis of the top 15 industries, the correlation between the electronic information manufacturing industry and its upstream and downstream industries can be clearly observed, and it can be learned what upstream and downstream industries of electronic information manufacturing industry are and how the correlation works. It can be known from Figure 3 that there are significant differences in both the upstream and downstream correlated industries and the correlation intensity of electronic information manufacturing industry of China and Japan: The upstream industries of electronic information manufacturing industry of China and Japan include both the traditional manufacturing industry and the productive services of low, middle and high levels, with stronger correlation with modern service industry; However, the correlation intensity between electronic information manufacturing industry and productive services in the two major economies is quite different. Both upstream and downstream of Japan’s electronic information manufacturing industry are driven by government business (including the central and local), and that is to say, the promoting effect of the government’s public procurement policy needs is obvious.

The main difference between upstream industries and correlation intensity of electronic information manufacturing industry of China and Japan is that the top 10 upstream industries in Japan’s electronic information manufacturing industry are the instrument and meter manufacturing industry, commercial machinery manufacturing, electric machinery and equipment manufacturing, motor vehicles, electronic products and daily products repair, office supplies, automobile manufacturing, other manufactured industrial products, general and special equipment manufacturing, transportation equipment manufacturing and official business, with the successive correlation intensity of 51.47%, 22.89%, 14.58%, 12.52%, 5.49%, 5.10%, 3.13%, 2.63%, 2.12% and 1.36%; and the top 10 upstream industries in China’s electronic information manufacturing industry are culture and office machinery manufacturing, software and information technology services, instrument and meter manufacturing industry, professional technique services, telecommunications and other information transmission services, leasing industry, neighborhood services, research and experimental development, commercial services, and technology promotion and application services, with the respective correlation intensity of 23.15%, 18.99%, 17.79%, 13.08%, 11.16%, 8.36%, 7.60%, 5.94%, 5.87% and 5.75%, which shows that the upstream industries of the electronic information manufacturing industry of China are knowledge-intensive productive services which provide knowledge, technology and information services, and the upstream industries of Japan are mostly manufacturing industries which provide components,
instruments and meters. However, we know that Japan’s R&D production technology of precision instruments is world-leading, and it can be seen from the Table that the correlation between the instrument and meter manufacturing industry and the electronic information manufacturing industry is the strongest, with the correlation intensity of 51.47%, but that of China is only 17.79%. But according to the Table, the correlation intensity between the electronic information manufacturing industry and research and experimental development of China is 5.94%, which is significantly higher than 0.96% of Japan. And the correlation intensity with software and information technology services is 18.99%, significantly higher than 0.76% of Japan, including the correlation intensity of 13.08% with professional technical services and 5.75% with technology promotion and application services. It can be seen that, in the process of accelerating the opening-up and with the foreign investment process of multinational companies, China has absorbed the high-end technologies through learning by doing and improved its ability of independent innovation. For the electronic information manufacturing industry with high knowledge intensity, high capital intensity and large output added value, it is necessary to vigorously invest human capital and knowledge capital to enhance the ability of innovation creativeness of enterprises. Grubel and Walker believed that the productive services integrated the professional human capital and knowledge capital into the field of production through the intermediate input in manufacturing, to improve the enterprise innovation ability and continuously enhance the technology content and differentiation level of products. Pavitt argued that electronic information manufacturing industry is based on scientific knowledge, and its cooperation with universities and public research institutions in fundamental research, application research and human capital and other aspects is its source of innovation.

The main difference between downstream industries and correlation intensity of electronic information manufacturing industry of China and Japan is that, firstly, the downstream industries of Japan’s electronic information manufacturing industry show a strong background of government services compared with that of China. For example, the correlation intensities of Japan’s electronic information manufacturing industry with official business, medical care and health, and railway, ship, aerospace and other transportation equipment manufacturing industries are respectively 2.36%, 1.10% and 0.62%. And in the top 15, its correlation intensity with medical care and health is much higher than that (only 0.34%) of China, which has a lot to do with Japan’s early welfare policies and accords with the status quo of the aging of Japan’s population. The public service policy is an important policy tool affecting the innovation direction and speed, which can effectively reduce the risks of innovative enterprises to enter the market, and has a great pull for the development of electronic information manufacturing industry in Japan. Secondly, the correlation of Japan’s electronic information manufacturing industry with high technology industry is much higher than that of China. Although the downstream industries of electronic information manufacturing industry of both China and Japan include knowledge-intensive high-tech industries of automobile manufacturing, instrument and meter manufacturing industry and electric machinery and equipment manufacturing, the correlation intensity difference is very big: The correlation intensities of electronic information manufacturing industry of Japan with these industries are respectively 8.74%, 5.59% and 8.06%, while the correlation intensities of that of China are only 2.68%, 1.77% and 5.46%. It is evident that the correlation intensities of Japan’s electronic information manufacturing industry with automobile manufacturing, instrument and meter manufacturing industry, electric machinery and equipment manufacturing are about 3 to 4 times of that of China, and its correlation intensity with commercial machinery is also greater than that of China. Hauknes et al. Believed that the close interaction with the downstream users is the important mechanism of the enterprise innovation, which can help enterprises to understand the needs of downstream users so as to assess the direction of the enterprise technology innovation, especially when the high technology industries (downstream users) have rich knowledge and complex and strict requirements for the desired product quality and performance. Therefore, the interaction with the high technology industries (downstream users) affects the innovation and development of electronic information manufacturing industry, while the interaction of China’s electronic information manufacturing industry with the high technology industries is far less than that of Japan.
Further Analysis of Electronic Information Manufacturing Industry Segments

There are differences in technology level, value-added and profitability in each link of the industrial chain, so there are key links and general links. According to the importance degree of each link on the development of the industrial chain, the electronic information manufacturing industry can be divided into two categories of the electronic components manufacturing and electronic equipment manufacturing, of which the former provides core components for the electronic information manufacturing industry and is a key link in the electronic information manufacturing industry and the latter engages in the processing and assembly of the terminal and peripheral equipment, and is the general link of the industrial chain. In addition, the value-added rate is an important indicator reflecting the value-added capacity of the industry, and the import and export rate is the indicator reflecting the market structure of the industry development and the dependence on international trade. In accordance with the above methods, the electronic information manufacturing industry of China and Japan is segmented, and the value added rates and import and export rates of the industry segments are calculated respectively. The results are shown in Table 3.

Table 3. The value-added rates and import and export rates of the electronic information manufacturing industry segments of China and Japan.

| Country (Year) | Industry Segment               | Value-added Rate | Export Rate | Import Rate |
|----------------|--------------------------------|------------------|-------------|-------------|
| China (2012)   | Electronic components          | 43.14%           | 28.57%      | 65.61%      |
|                | manufacturing                 |                  |             |             |
|                | Electronic equipment           | 13.72%           | 58.77%      | 17.33%      |
|                | manufacturing                 |                  |             |             |
| Japan (2011)   | Electronic components          | 25.81%           | 41.85%      | 22.91%      |
|                | manufacturing                 |                  |             |             |
|                | Electronic equipment           | 2.52%            | 28.68%      | 58.42%      |
|                | manufacturing                 |                  |             |             |

Data Source: It is sorted out and calculated according to the relevant data of 2012 China Input-Output Table and 2011 Japan Input-Output Table.

As can be seen from Table 3, the value-added rates of 43.14% and 13.72% in the electronic components manufacturing and electronic equipment manufacturing of China are far higher than that of Japan (25.81% and 2.52% respectively). However, the import rate of China’s electronic components manufacturing reaches 65.61%, which is far higher than its export rate of 28.57%, while the import rate of electronic equipment manufacturing is 17.33%, far below its export rate of 58.77%. On the contrary, the import rate of Japan’s electronic equipment manufacturing is 58.42%, far higher than the export rate of 28.68%. China’s electronic components manufacturing trade has been in deficit for a long time, and there may be a trend of further increase in the later stage, which indicates that the demand for electronic components is greater than supply in China. It can be seen from the above data that although the value-added rates in the electronic components manufacturing and electronic equipment manufacturing of China are higher than that of Japan, with significant improvement of the position in the global electronic information products and constant enhancement of the position in the high-end manufacturing, the upstream supply of core components of China’s electronic information manufacturing industry is still largely dependent on import, and the development of key high-end technology link is still strongly dependent on foreign technology, and the terminal electronic products of the downstream of the electronic information industry chain mainly rely on export, with a relatively strong reliance on foreign markets. The separation of the key components and the terminal products of China’s electronic information manufacturing industry in production link may be the important reason for the different value-added abilities in the electronic information manufacturing industry between China and Japan, which, to a certain extent, shows the low-end position of China’s electronic information manufacturing industry in the international division of industry. From the perspective of the composition of above import and export trade flows, it can be seen that China’s dependence on individual economies is still high.

The new international division of labor under the background of economic globalization is the value chain division of labor under the factors cooperation. The multinational companies outsource
and transfer the non-core manufacturing links of electronic information industry to the external suppliers and then get these products by outsourcing, and the production outsourcing becomes the mainstream way of the international industrial transfer. The low-end position of China’s electronic information manufacturing industry in international industrial division determines its technological choice, market selection and upstream and downstream industry environment. However, China vigorously invests in research and development and technical support by energetically promoting innovative and intelligent manufacturing, and enhances the correlation intensity with high technology industries by improving from the upstream of the industrial chain and catching up to reach the international level of high technology and high standard, but it will take time to meet international high standards and requirements. Thus, the situation in the above Table appears, namely the upstream of China’s electronic information manufacturing industry gathers the productive services with high correlation intensities, including software and information technology services, professional technique services, telecommunications and other information transmission services, leasing industry, neighborhood services, research and experimental development, commercial services, technology promotion and application service, etc.. However, the correlation intensity of the downstream of China’s electronic information manufacturing industry with the high technology industries is not high, which may be related to the development strategy of undertaking international transfer industry and engaging in processing and manufacturing links in the division of labor of the international industrial chain adopted by China. At the same time, it can be realized that it will take time for the upstream high technology industries and productive services with high correlation intensities to develop and improve if they plan to fully exert their functions.

**Conclusion and Recommendation**

There is a big difference in the upstream and downstream industry environment of electronic information manufacturing industry between China and Japan: The upstream industries of electronic information manufacturing industry of China and Japan include both the traditional manufacturing industry and the productive services of low, middle and high levels, with strong correlation with modern service industry; The correlation intensities between the electronic information manufacturing industry and productive services in the two major economies are quite different. Both the upstream and downstream of Japan’s electronic information manufacturing industry have been driven by the government’s official business, and its correlation intensity with the downstream high-tech industries is much higher than that of China. The knowledge-intensive services of upstream of Japan’s electronic information manufacturing industry, such as research and experimental development and software and information technology services, provide technical feasibility for the development of the industry, and the pulling effect of the upstream government’s official business (including the central and local) and the interaction between the downstream and high technology industries and the government’s policies provide market feasibility and the direction of the technology innovation for the industry development. However, Japan’s aging of population and enterprise mechanism of lifetime employment create huge hidden trouble for the sustainability of technological innovation. China vigorously invests in foundation research and technological innovation to spare no efforts to pursue the international level, so that the upstream industry environment in the electronic information manufacturing industry in China has shown some improvement, but the technical transformation achievements of its downstream are not in proportion with the investment obviously, still dominated by low-end manufacturing, with low correlation intensity with high technology industries, which is far from that of Japan. It can be seen that the technology, market and policy environment of the electronic information manufacturing industry in China restrict its improvement in innovation ability and competitiveness to a certain extent.

There is also a big difference in the import and export rates of the industry segments of electronic information manufacturing industry between China and Japan: The core components of China’s electronic information manufacturing industry upstream mainly rely on the import, and the downstream terminal products mostly rely on the export, but most of Japan’s terminal products rely
on the import, which has a lot to do with China’s development strategy of undertaking the transfer industry at the present stage. China’s low-end position in the international industrial value chain, determines the technology selection and the upstream and downstream industry environment of its electronic information manufacturing industry, but China has encouraged technological innovation in recent years and vigorously promoted the upgrading of industrial structure to turn “Made in China” to “Made in China in Wisdom”, so the upstream industries have shifted from the traditional manufacturing industry to high technology industries and productive services. But this is contradictory to the relatively low correlation intensity between the electronic information manufacturing industry and its downstream high technology industries. It can be seen that the reality of low industrialization level in China determines that the international transfer industry must be undertaken to develop the electronic information manufacturing industry, and the upstream and downstream industry environment and technology market environment under the strategy further restrict the high-end development of electronic information manufacturing industry. And it takes time to digest and verify the transformation of technological innovation achievements. In addition, the value-added rate of China’s electronic components manufacturing industry has also been significantly improved, and the strategy of invigorating the country with science and technology and policies and regulations that have been vigorously advocated, have achieved initial success. The following is to continue to firmly improve the basic conditions such as technology, education, policies and regulations, and provide environmental support for the overall development of the national economy and the innovation of electronic information manufacturing industry.

Moreover, the industry environment of Japan’s electronic information manufacturing industry provides a more targeted idea for the development of the industry in China: On the one hand, we should energetically develop the productive services, especially the knowledge-intensive services, strengthen the cooperation between the electronic information manufacturing industry and universities and public research institutions, purchase high-tech products or services to improve the investment, promote the practical application ability of high-end technologies, and effectively apply the research results to enterprise products to transform them into innovative achievements that can create value, so as to promote the industry innovation of the electronic information manufacturing industry; On the other hand, we should formulate targeted public procurement policies to reduce the risks of innovative enterprises entering the market, expand their market scale and promote their technological innovation.

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