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An analysis of the characteristics of Japanese industrial sectors from 2005 through 2011

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Abstract. The purpose of the current study is to analyze the characteristics of Japanese industrial sectors from 2005 through 2011. The study employs the analysis tools from the Input-Output (IO) analysis, namely the indices of the power of dispersion, and the sensitivity of dispersion. The study focuses on the thirteen industries. The characteristics are described by the quadrants of analyzed charts. The results show that industries 3 and 9, manufacturing, and transport and postal services, respectively, placed the quadrant I on the analysis period. The fact shows that, from 2005 through 2011, these industries had strong influences on the Japanese economic activities, and received high impacts from the external aspects. In other words, the industries have great potency for the Japanese economy. Thus, the Japanese government should prioritize the industries development. From the results one can also view that, from 2005 through 2011, almost all Japanese industries had no the quadrant change. The fact describes that the characteristics of almost all Japanese industrial sectors on the period of analysis did not change.

1. Introduction

Industrial sectors have notable roles on the economy of one country. The roles can be observed on the micro and macro aspects. On the former aspect, the roles can be viewed from the economic interactions between industries and households. On the other hand, using the aggregate level, the latter one is described by the interactions between industries and government.

One can say that the roles itself cannot be separated from the unique characteristics of industrial sectors because it might explain how they behave in the economic system. Therefore, an analysis of the characteristics of industries can also be seen as an effort to know the roles. Further, the suggestions for improving the economic conditions of analyzed country might be generated from the analysis.

The examples of previous studies which discuss the analysis are [1], [2], [3], [4], [5], [6], [7], [8], [9], and [10]. The mentioned previous studies, however, focus on the particular industries. In other words, the research focuses on the analysis for the whole sector of specific country is still needed. The research is needed in order to obtain the whole view regarding the characteristics of the industries of analyzed country so the suggestions for enhancing its economic conditions can be made properly. The current study is conducted in order to fulfill the gap.

The purpose of the study is to analyze the characteristics of Japanese industrial sectors from 2005 through 2011. The period of analysis is aligned with the newest data. One can argue that the economic situations of Japan in both years were different because the earthquake and tsunami were happened in Japan in 2011. The study employs the Input-Output (IO) analysis as an analysis tool because it is a suitable instrument in explaining the characteristics. The rest of this paper is explained as follows. Section 2 scientifically explores the methodology of the current study. Section 3 describes the results of calculations. The discussions for the results are also done on the section. The next section, section 4, gives the conclusions of the study, and suggestions for the future researches.



2. Methodology

This part scientifically describes the methodology of the current study. The first step of the methodology is to explore the data sources of the study. The data sources are the Japanese IO tables for 2005 and 2011. The tables are obtained from [11] and [12], respectively. Both tables consist of thirteen industrial sectors, and use the producer's prices. The second step is to describe the industrial sectors of Japan used in this study. Table 1 shows the industries. The difference between the industries on both data resources can be seen on sector 9. More specifically, the name of the sector on the former data source is "Transport" while on the latter one is "Transport and Postal Services".

The third step is to conduct the calculations in order to know the characteristics of Japanese industrial sectors on the analysis period. The methods utilized in the calculations are the (1) index of the power of dispersion, and (2) index of the sensitivity of dispersion. Both methods are the analysis instruments from the IO analysis. The former index is used to analyze the strength of one specific sector in influencing entire industries. A stronger influence is aligned with the higher index value. The detail of the index is described by [13] as follows:

$$\text{Index of the power of dispersion by sector} = \frac{b_{*j}}{\bar{B}} \quad (1)$$

where the numerator is each sum of column in the table of inverse matrix coefficients while the denominator shows the mean value of the entire vertical sum in the table of inverse matrix coefficients. More specifically, the equations of numerator and denominator are explained as follows:

$$b_{*j} = \sum_i^n b_{ij} \quad (2)$$

$$\bar{B} = \frac{1}{n} \sum_j b_{*j} = \frac{1}{n} \sum_i \sum_j b_{ij} \quad (3)$$

where b_{ij} and n are the Leontief inverse value from sector i to sector j , and total number of analyzed industrial sectors, respectively.

Table 1. Japanese industrial sectors used in this study.

Sector Number	Sector Name
1	Agriculture, forestry, and fishery
2	Mining
3	Manufacturing
4	Construction
5	Electricity, gas, and water supply
6	Commerce
7	Finance and insurance
8	Real estate
9	Transport and postal services ("Transport" for 2005)
10	Information and communications
11	Public administration
12	Services
13	Activities not elsewhere classified

The latter index is applied to analyze the sensitivity of the specific sector to the external influences. A greater sensitivity is aligned with the higher index value. More specifically, one specific sector is called more sensitive to the influences from the external aspects if it has a greater index value. The detail of the index is described by [13] as follows:

$$\text{Index of the sensitivity of dispersion by sector} = \frac{b_{i*}}{\bar{B}}. \quad (4)$$

In this index, the numerator is each sum of row in the table of inverse matrix coefficients while the denominator explains the mean value of the entire horizontal sum in the table of inverse matrix coefficients. Further, the equations of the numerator and denominator of the index are described as follows:

$$b_{i*} = \sum_j^n b_{ij} \quad (5)$$

$$\bar{B} = \frac{1}{n} \sum_i b_{i*} = \frac{1}{n} \sum_i \sum_j b_{ij}. \quad (6)$$

In order to get a compatibility sense with the previous index, equation (5) is slightly modified from the original source. More specifically, the part describes the total number of discussed industries, n , is added into the equation. As with the previous explanation, b_{ij} is the value of Leontief inverse from sector i to sector j . The next step is to analyze the characteristics of Japanese industrial sectors on the analysis period. Conclusions of this study, and suggestions for further researches are explored on the final step.

3. Results and analysis

Figures 1 and 2 plot the discussed sectors, and combine both indices used in this study in one chart for 2005 and 2011, respectively. More specifically, the horizontal axis of the chart describes the values of the index of the power of dispersion while the vertical axis places the values of another index. The chart has four quadrants. Each discussed sector has a particular quadrant in the chart.

Each quadrant has unique characteristics. More specifically, the quadrant I is a place where the values of both indices are more than one. In other words, the industries include in this quadrant are those most affected by the external aspects as well as have strong influences on the entire industries. The opposite phenomena can be viewed on the sectors which include in the quadrant III. On the other hand, quadrant II is an area where the value of the index of the power of dispersion is less than one while the value of another index is more than one. One can argue that the industries include in this quadrant are those which have weak influences on the entire industries but they receive high impacts from the changes of external aspects. The opposite characteristics are owned by the industries which include in the quadrant IV.

Based on the information in both figures, one can say that sectors 3 and 9 placed the quadrant I on the analysis period. From table 1, the sectors are manufacturing, and transport and postal services industries, respectively. The name of sector 9 for 2005 is transport. The fact shows that, from 2005 through 2011, the industries had strong influences on the Japanese economic activities, and received high effects from the external aspects. Therefore, the Japanese government should prioritize the industries developments on the future based on the fact.

Tables 2 and 3 summarize the quadrants of analyzed sectors in 2005 and 2011, respectively. Based on the information in these tables, one can argue that, from 2005 through 2011, almost all Japanese industries had no the quadrant movement. The movement on the analysis period was owned by the sector 7, finance and insurance. More specifically, on the analyzed period, the movement of the sector was happened from quadrant II to quadrant III. The fact explains that the characteristics of almost all Japanese industrial sectors on the period of analysis did not change. Obviously, although this is an interesting fact, the further analysis is needed in order to explain whether the Japanese economic activities on the period had significant changes or not. One of the reasons is the earthquake and tsunami were happened in Japan in 2011.

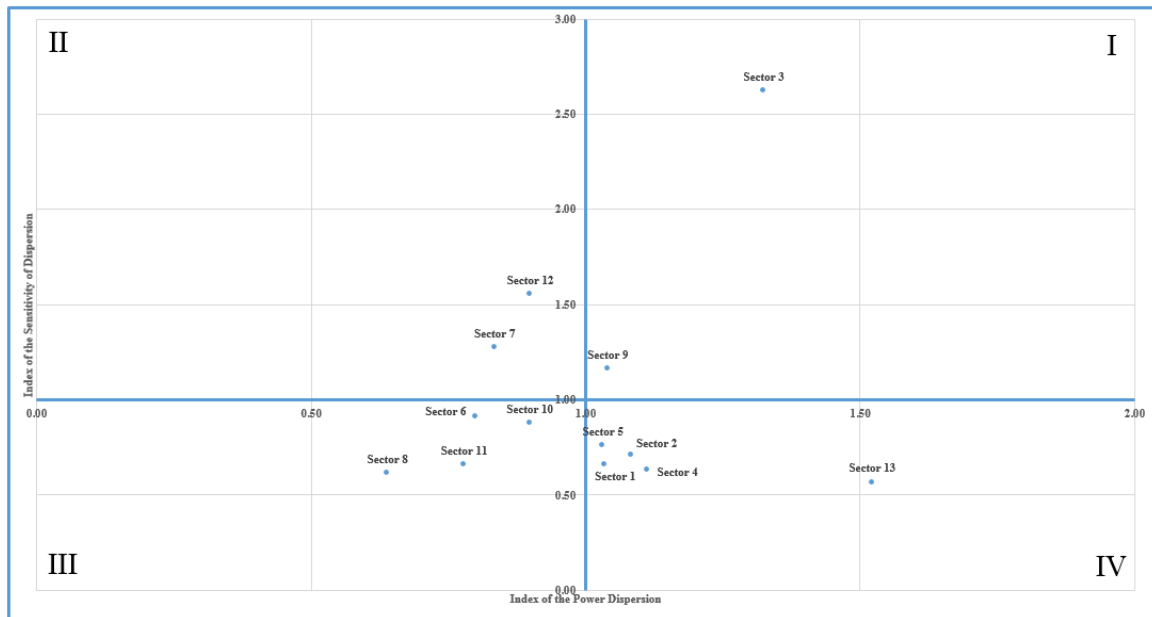


Figure 1. The quadrants for Japanese industrial sectors based on the indices of the power of dispersion, and the sensitivity of dispersion, 2005.

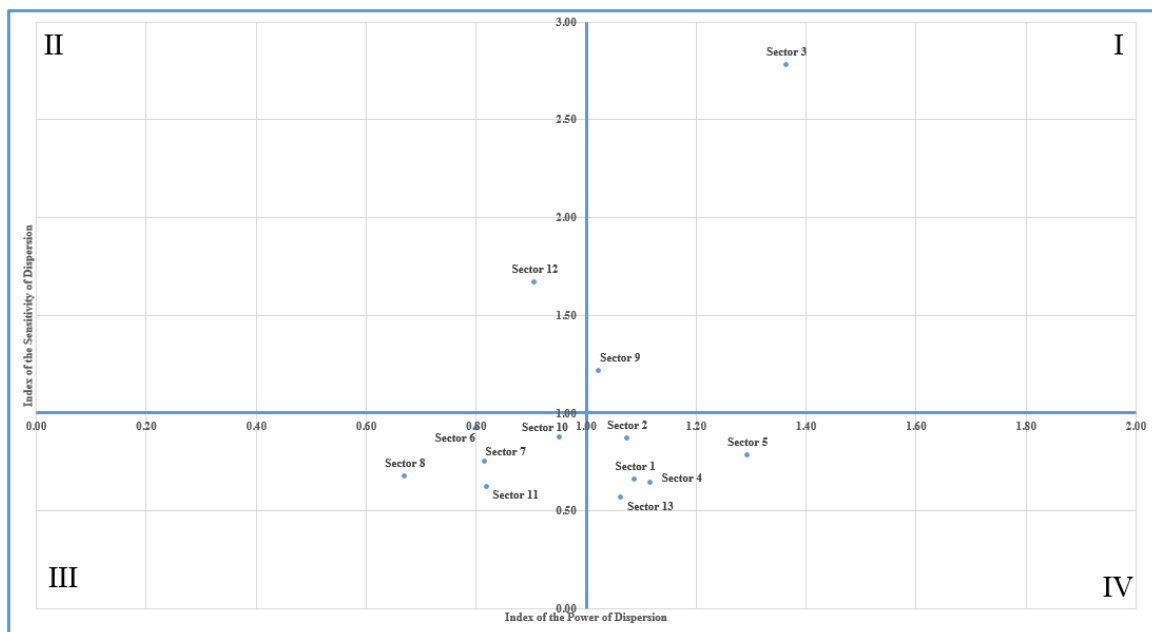


Figure 2. The quadrants for Japanese industrial sectors based on the indices of the power of dispersion, and the sensitivity of dispersion, 2011.

Table 2. The quadrants of Japanese industrial sectors, 2005.

Sector Number	Sector Name	Quadrant
1	Agriculture, forestry, and fishery	IV
2	Mining	IV
3	Manufacturing	I
4	Construction	IV
5	Electricity, gas, and water supply	IV
6	Commerce	III
7	Finance and insurance	II
8	Real estate	III
9	Transport	I
10	Information and communications	III
11	Public administration	III
12	Services	II
13	Activities not elsewhere classified	IV

Table 3. The quadrants of Japanese industrial sectors, 2011.

Sector Number	Sector Name	Quadrant
1	Agriculture, forestry, and fishery	IV
2	Mining	IV
3	Manufacturing	I
4	Construction	IV
5	Electricity, gas, and water supply	IV
6	Commerce	III
7	Finance and insurance	III
8	Real estate	III
9	Transport and postal services	I
10	Information and communications	III
11	Public administration	III
12	Services	II
13	Activities not elsewhere classified	IV

4. Conclusions and further researches

This study analyzes the characteristics of Japanese industrial sectors from 2005 through 2011. The study employs the analysis tools from the IO analysis, namely the indices of the power of dispersion, and the sensitivity of dispersion. The study focuses on the thirteen industries. The characteristics are described by the quadrants of analyzed charts.

The results show that industries 3 and 9, manufacturing, and transport and postal services, respectively, placed the quadrant I on the analysis period. The name of sector 9 for 2005 is transport. The fact shows that, from 2005 through 2011, these industries had strong influences on the Japanese economic activities, and received high impacts from the external aspects. In other words, the industries have great potency for the Japanese economy. Thus, the Japanese government should prioritize the industries development.

From the results one can also view that, from 2005 through 2011, almost all Japanese industries had no the quadrant change. The fact describes that the characteristics of almost all Japanese industrial sectors on the period of analysis did not change. The quadrant movement on the analysis period was owned by the sector 7, finance and insurance. More specifically, on the analyzed period, the movement of the sector was happened from quadrant II to quadrant III.

The understanding regarding the characteristics of Japanese industrial sectors is obtained from the current study. However, the study utilizes the aggregated industries. In other words, the study is still far from explaining the whole view about the characteristics. The view is needed in order to know better the conditions of Japanese national economy so the comprehensive policies for improving those in the future can be developed. Therefore, as a further research, the study proposes the same analysis for the disaggregated Japanese industries.

The other suggested further research from the study is to make an international comparison using the same analysis. The comparison can be done among developed as well as developed-developing countries. The comparison might explore the characteristics of the industries of compared countries so the similarities and differences among those can be investigated.

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