

Competitiveness of the Japanese, Korean, and Chinese Automobile Industries

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Abstract

This paper aims to analyze the international competitiveness of Japanese, Korean and Chinese automobile industries. Analyzing the statistics on production, sales and import/export, we try to clarify the competitiveness of each country and the differences among them. We analyze the global competitiveness of these three countries' automobile industries considering not only domestic production but also overseas production and exports.

As conclusions, firstly from a viewpoint of global competitiveness, Japan and Korea are different from China. Japan's and Korea's automobile industries have high competitiveness, while China's does not.

Secondly, though China is the biggest automobile nation in terms of Producer Country Base, Chinese manufacturers depend deeply on their domestic market. Moreover, 50% of the automobile market in China is occupied by foreign manufacturers due to the relatively weak technology development capability of the Chinese manufacturers. Exports and overseas production by Chinese automobile manufacturers are still relatively low.

Introduction

The automobile industry has been developing remarkably in the East Asian countries—Japan, Korea, and China—in recent years. In terms of domestic production, China produced 22.12 million vehicles in 2013, more than any other country in the world. Japan is the third largest, at 9.55 million. Korea ranks fifth, at 4.52 million.¹ Out of the top five automobile industries, three are in East Asia. This momentum will not stagnate; production in China will increase to around 25 million by the late 2010s.

This paper aims to analyse the international competitiveness of the Japanese, Korean, and Chinese automobile industries. Analysing in detail the production, sales, and import/export statistics, we clarify the competitiveness of each country and the differences among them.²

There are many existing research studies on the competitiveness of the East Asian automobile industries.³ These studies analysed many aspects of automobile makers, such as their development, production, distribution, finance, supply chains, organizational capability, industrial policies of government, and historical process. There is, however, little research

about how the international competitiveness of a country's automobile industry as a whole can be examined quantitatively. Most existing research only introduces production and export numbers as numerical indices of international competitiveness; these numbers are, however, based only on 'Producer Country Base' (later described). This paper analyses the total international competitiveness of the Japanese, Korean, and Chinese automobile industries.

Before starting the analysis, we define some important terms.

(1) International Competitiveness

We analyse competitiveness not only in the domestic market but also in the global market. Therefore, speaking of Korea automobile industry, we analyse the production not only in Korea, at 4.52 million vehicles,⁴ but also in the global market, at 7.57 million vehicles,⁵ including the number produced overseas.

(2) Automaker Nationality Definition

A domestic automaker is defined as follows: its world headquarters must be located in its own country, its main operations such as development and production must be located locally, it has its own vehicle brands and distributes them by itself, and the majority of its stock is not held by a foreign automaker.

Here, we clarify the definition with some actual cases. In the case of Renault Samsung in Korea, the majority of its stock is held by Renault of France (holding ratio: 70.1 per cent), and it accepts some directors from Renault. Renault and Nissan Motors of Japan have initiatives in vehicle development and production; all of the models of Renault Samsung are derivatives of Nissan and Renault models. Therefore, we define Renault Samsung as French, not Korean. For the same reason, GM Korea is a US automaker. On the other hand, in the case of Shanghai Volkswagen of China, Volkswagen of Germany has initiatives for developing the vehicles of Shanghai Volkswagen, so Shanghai Volkswagen is defined as a Germany maker (holding ratio: 50 per cent). Similarly, Mitsubishi Fuso Truck and Bus in Japan is a German automaker because Daimler holds 100 per cent of its stock.

(3) Producer Country Base [PCB] and Maker Base [MB]

In this paper, we use two bases for a country's vehicle production. These are Producer Country Base [PCB] and Maker Base [MB]. For PCB, when we consider 'how many vehicles a country produces', we count the number of vehicles produced in its country, ignoring the automaker, whether domestic (Hyundai Motor) or foreign (Renault Samsung). We include the number of the vehicles produced by both domestic and foreign makers. On the other hand, we do not include the number that a domestic maker (Hyundai Motor) produces in a foreign country (for example US); its production is included in that of the foreign country (US). The PCB is usually used by each country's Automobile Manufacturer Association, such as KAMA or JAMA, and published as the domestic production of each country. For example, in Korea it was 4.52 million vehicles in 2013.

For MB, the production of a country is the aggregate number of vehicles that domestic

makers produced globally, not only in home country but also in foreign countries.. In the case of Japan, Toyota Motor⁶ produced 9.87 million vehicles globally in 2013, and Nissan Motors produced 4.72 million; Honda produced 4.25 million. Aggregating these numbers of all Japanese domestic makers, we can get the Japanese MB: 25.50 million in 2013. It consists of a domestic production of 9.44 million and an overseas production of 16.06 million. These numbers exclude the production in Japan by the subsidiary companies of foreign makers. Similarly, in the case of Korea, we exclude the production of GM Korea, Renault Samsung, SsangYong Motor, and Tata Commercial from the Korean production by MB.

(4) Numerical Index of Global Competitiveness

We use various kinds of figures as the numerical index of a country's international competitiveness. Among these figures, we give top priority to the MB numbers.

However, in the case of China, there might be bias due to the huge domestic market. China has huge production and sales number, but almost all of which are produced and sold in China. Chinese makers could export only 1.05 million vehicles and develop only their overseas production of less than 0.3 million vehicles in 2013.

Therefore, our methodology, in which we give top priority to global production and sales by MB, should be complemented

by the other aspects. However, we think that a country's MB global production and sales are still the most important numerical indices of a country's global competitiveness.

Table 1. Production by PCB and MB in 2013

Country	Producer Country Base		Maker Base	
	Production (10 k)	Ranking	Production (10 k)	Ranking
China	2212	1	1133	4
USA	1105	2	1392	2
Japan	955	3	2550	1
German	565	4	1308	3
Korea	452	5	757	5
India	388	6	179	8
Brazil	345	7	—	—
Mexico	307	8	—	—
Canada	238	9	—	—
Russia	218	10	67	9
Top10 subtotal	6785	80.5%		
Global total	8429	100.0	8429	100.0

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Source: FOURIN(2014a), FOURIN(2014b), and FOURIN(2014c).
All of Tables and Figures are based on these.

1. Production and Export Numbers

(1) Producer country Base

Based on the PCB production shown in Table 1, China holds the first place, and Japan the third, with Korea ranking fifth, as mentioned above. Clearly, these three countries play an important role in world automobile production.

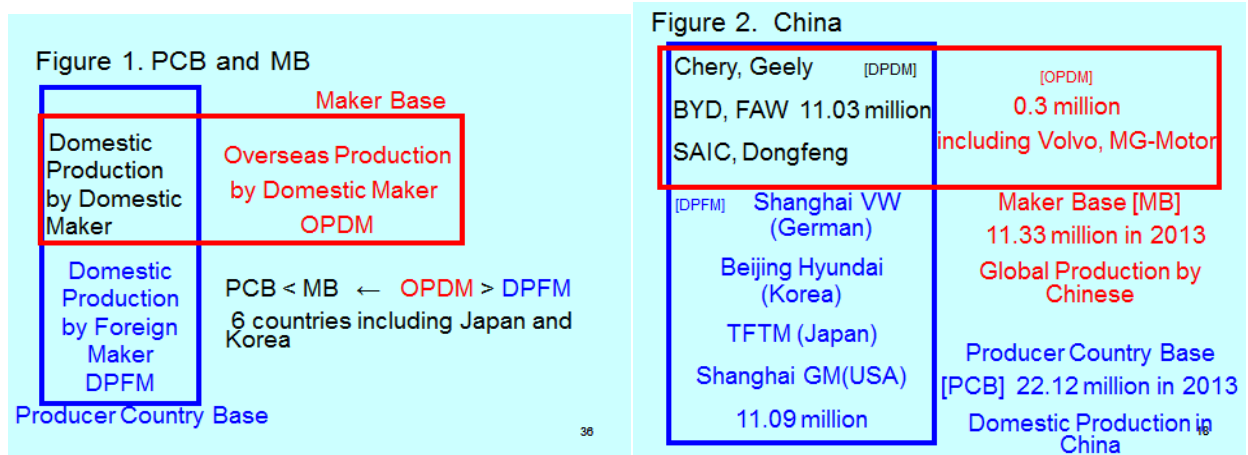
(2) Maker Base

Next, taking a look at the MB production in Table 1, we find many differences between

PCB and MB. Remarkably, there are six countries whose MB production is much lower than PCB production. These six countries are China, India, Brazil, Mexico, Canada, and Russia. The reason is that domestic makers' total production does not include a major share of each country's PCB production because foreign automakers build their assembly plants in these six countries and have a pretty big production share. On the other hand, domestic makers of these five countries do not have an overseas production base. Even if they do have factories in foreign countries, their number is too small to compensate for the loss from foreign makers' production in these countries.

As shown in Figure 1, when Overseas Production by Domestic Makers [OPDM] is smaller than Domestic Production by Foreign Makers [DPFM], the MB production is smaller than the PCB production.

From Table 1, we find that MB production in Brazil, Mexico, and Canada is drastically low compared to PCB production. The MB production of these three countries all approach zero. The situation in India is not so extreme; its MB production is about one-third of its PCB production.



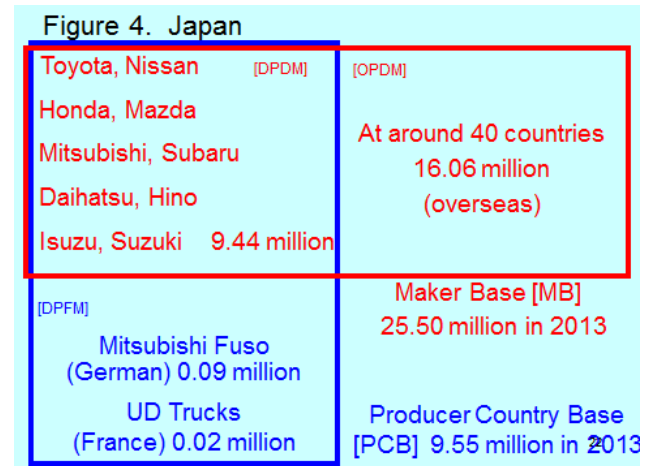
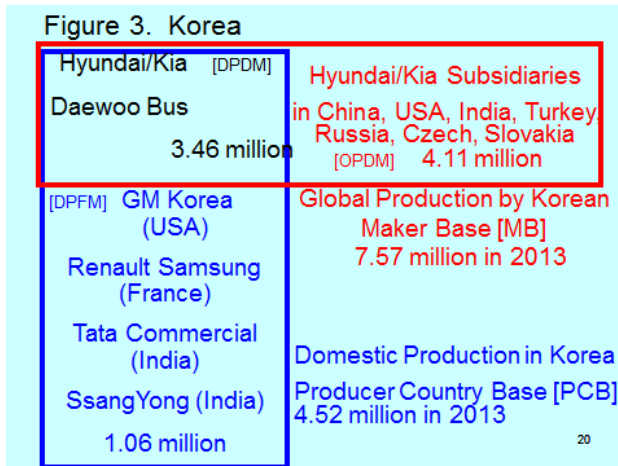
China has been gradually overcoming this deficiency, but we can still find such trends in China. As shown in Figure 2, China's PCB production is 22.12 million vehicles; however out of these, around 11.09 million vehicles are produced under licence from foreign makers.⁷ The production of Chinese domestic makers' original brand by MB is around 11.33 million vehicles.

However, production by Chinese domestic makers in foreign countries is still small. Shanghai Motor bought SsangYong Motor in 2005, but withdrew in 2009. Similarly, Shanghai Motor did not restart full-scale assembling at MG-Motor (MG Rover)—which it had bought—until 2010. Even if we include the production of Volvo, which was bought by Geely, Chinese total overseas production by MB was less than 0.3 million in 2013. Therefore, MB production by China globally was around 11.33 million in 2013, as shown in Figure 2.

Next, we consider countries whose MB production is higher than their PCB production. In these countries, total domestic production by domestic makers accounts for a large share of each country's PCB production. In addition, the domestic makers' total overseas production is so large that they can compensate for the vehicles produced by foreign automakers in their home countries. In Table 1, we can find four such countries (Japan, the US, German, and Korea). We can also add France and Italy, which does not appear in Table 1. At present, only

these six countries, among 200 countries/areas worldwide, have a higher production based on MB than on PCB.

Here we show the PCB and MB production in Korea (Figure 3) and in Japan (Figure 4).



(3) Export

From Table 2, the biggest exporter is Japan (4.84 million), followed by France (4.80 million), Germany (4.48 million), Korea (2.77 million), and Spain (2.08 million). There are two East Asian countries among the top five.

(4) Export Surplus and Trade Specialization Index

Here, we take a look at the export surplus and the trade specialization index in order to evaluate the competitiveness of Korea and Japan. From Table 3, Japan (3.46 million) holds the first place in export surplus, followed by France (2.67 million) and Korea (2.08 million). Korea holds the third place, ranking above Germany, since Korean imports (0.07 million) are extremely small compared to its exports (2.77 million).

Moreover, Korea is the number one country in terms of the trade specialization index. This index is calculated as follows: $[\text{Export} - \text{Import}] \div [\text{Export} + \text{Import}]$. The closer to 1.0 this index is, the more

Table 2 Export

Country 国	Export			
	2010 (10k)	Ranking	Export Ratio (%)	Ranking
Japan	484	1	50.3	6
France	480	2	234.1	1
German	448	3	75.8	4
Korea	277	4	74.9	5
Spain	208	5	87.0	2
Mexico	192	6	81.7	3
USA	111	8	14.3	—
China	55	9	3.0	—
Brazil	77	10	21.1	—
India	58	11	16.4	—
Total top 10	2390		32.7	

Export Ratio : $\text{Export} \div \text{Production}$ ⁶

Table 3 Export Surplus and Trade Specialization Index

Country	Export Surplus (10k)	Ranking	Trade Specialization Index	Ranking
Japan	346	1	0.915	2
France	267	2	0.525	3
Korea	208	3	0.937	1
Spain	118	4	0.371	4
German	112	5	0.185	—

Trade Specialization Index = $(\text{Export} - \text{Import}) \div (\text{Ex} + \text{Im})$
(In terms of the number of the vehicles)

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specialized a country's exports. The closer to -1.0 this index is, the more specialized the country is in imports. Korea's index is extraordinarily high at 0.94. At 0.92, Japan has a high index, as well, occupying the second place in the world.

However, as shown in Table 4, the US, Italy, and UK have import surpluses of 4.58 million, 1.16 million, and 0.87 million, respectively, and their trade specialization indices are -0.67, -0.6, and -0.258, respectively.

These figures indicate the countries' weakness in international automobile trade competitiveness.

Table 4 Import Surplus and Trade Specialization Index

Country	Import Surplus (10k)	Ranking	Trade Specialization Index
USA	458	1	-0.674
Italy	116	2	-0.604
UK	87	3	-0.258
Russia	49	4	-0.803
China	26	-	-0.191

China is -0.57 in terms of monetary amounts.

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(5) Differences between Japan/Korea and China

As explained above, Japan and Korea are highly competitive in the export market. China, however, is completely different. As already mentioned, China produced 22.12 million vehicles in 2013, but most of the vehicles produced in China are sold domestically. China exported only 1.05 million vehicles in 2013. The expansion of domestic production is mostly dependent on domestic demand. On the other hand, China imported 1.20 million vehicles in 2013. The import surplus is 0.15 million in terms of the number of vehicles. However, considering the import surplus in monetary terms, its imports (USD49.1 billion) are four times its exports (USD13.9 billion) because the average unit price of the vehicles imported is expensive at USD40,945 and the average unit price of the vehicles exported is cheap at USD13,263. Moreover, China's trade specialization index is -0.067 in terms of the number of vehicles and -0.556 in terms of the amount of money.

Therefore, China is completely different in terms of international competitiveness. China, which is deeply dependent on domestic demand, is quite different from Japan and Korea, which are not only utilizing their domestic market but also penetrating foreign markets by both exporting vehicles and building overseas production bases.

2. Use in Operation and Diffusion Ratio

(1) Use in Operation

In terms of building global competitiveness, it is an important condition that domestic sales are large enough to enjoy economies of scale. Domestic sales are closely related to use in operation (i.e. vehicle population). If we get to know the vehicle population in each country, we can approximately estimate annual domestic sales by dividing the vehicle population by average replacement years.⁸ Therefore, the larger the vehicle population of a

country, the larger would be its annual sales; the country can then achieve the basic conditions for global competitiveness. With this as a given, what are the factors that determine a country's vehicle population? The main factors are population, income level, and the proportion of automobiles among all transport vehicles. For example, as shown in Table 5 and Table 6, the US has an eminently high vehicle population (248.6 million) because of its large population (314.7 million), high income level (GDP per capita of USD47,300), and high dependence on automobiles. The US share is 25.8 per cent of the world vehicle population (965.3 million). If we divide its vehicle population of 248.6 million by 13 years, we get a figure of 19.1 million vehicles per year. This figure is several times that of any other country,

Table 5 Use in Operation

Country	Use in Operation (10k)	Ranking	Share (%)
USA	24856	1	26.9
Japan	7381	2	8.4
China	6118	3	3.4
German	4463	4	5.5
Italy	4132	5	4.3
Russia	3951	6	3.5
France	3749	7	4.0
UK	3522	8	3.9
Brazil	2964	9	2.6
Spain	2763	10	2.8
Top10 total	63899		65.4
Korea	1733	14	1.7
Global total	96526		100.0

Table 6 Diffusion ratio of Automobile

Country	Use in Operation Per 1000 persons (vehicle)	Population (million)	GDP per capita (US dollar)
USA	790	314.7	47284
Japan	580	127.2	42820
China	45	1345.8	4382
German	543	82.2	40631
Italy	690	59.9	34059
Russia	280	140.9	10437
France	602	62.3	41019
UK	572	61.6	36120
Brazil	153	193.7	10816
Spain	615	44.9	30639
Top10 total	263	2433.2	
Korea	359	48.3	20591
Global total	141	6829.0	¹⁰

allowing the US to build a solid base for its automobile industry to be globally competitive.

It is not well known that Japan is the second largest country in terms of vehicle population. Japan has 73.8 million vehicles in use because of its large population (127.5 million) and high income level (GDP per capita of USD 42,820).

However, China's vehicle population, at 61.2 million, has come close to Japan's because though the income level is quite low at USD4,380, the population is overwhelmingly large at 1.35 billion people. In the future also, its vehicle population will continue to increase with the economic growth of China.

On the projection of the vehicle population in China, if the GDP per capita reaches USD10,000, the vehicle population will reach a level of around 200 vehicles per 1,000 persons. We project this from Table 6, which shows that Russia (USD10,400) has 280 vehicles per 1,000 persons and Brazil (USD10,800) 153 vehicles per 1,000 persons.

If China reaches the level of 200 vehicles per 1,000 persons, the vehicle population will be 300 million based on a population of 1.5 billion. If we divide 300 million vehicles by 13 years, annual sales will be 23.1 million vehicles. This is enough for the automobile industry in China to achieve economies of scale only from its domestic demand.

Regarding Korea, its population (4.83 million) is bigger than that of Spain but smaller than that of the UK (61.6 million) or France (62.3 million). However, it comes near the Western European standard size. Based on this population size, Korea will be able to expand its vehicle population to the Western European standard size in the future. However its income level is low at present, and the Korean vehicle population (17.3 million) remains at around half that of Western European countries.

(2) Domestic Sales—Springboard for International Competitiveness

As explained before, one of the preconditions for automakers to expand global sales is that they have their own sufficiently large domestic market and, at the same time, they command a relatively high market share there. Generally, if they cannot sell in the domestic market, it would be difficult to export to the overseas market as well. Moreover, it would be much more difficult to build an overseas production base.

From Table 7, China's domestic sales in 2010, at 18.06 million vehicles, ranked first in the world. According to the above perspective, however, Chinese domestic makers account for only around half of its domestic market as seen in Figure 2.

The other half is supplied by foreign makers who assemble and sell vehicles in China. Domestic sales in Japan are the third largest, at 4.96 million vehicles; Japanese domestic makers accounted for more than 90 per cent of domestic sales. Domestic sales in Korea are not so small at 1.56 million vehicles; Korean domestic makers also account for more than 90

Table 7 Domestic Sales

Country	2010 Domestic Sales		
	Domestic Sales (10k)	Ranking	Share (%)
China	1806	1	26.0
USA	1177	2	17.0
Japan	496	3	7.1
Brazil	357	4	5.1
German	320	5	4.6
India	303	6	4.4
UK	229	8	3.3
France	271	7	3.9
Italy	217	9	3.1
Russia	211	10	3.0
Top10 subtotal	5387		72.8
Korea	154	12	2.1
Global total	7403		100.0

Table 8 Import and Import Ratio

Country	Import (10k)	Ranking	Import Ratio (%)
USA	569	1	53.7
German	246	2	60.7
UK	212	3	85.1
Italy	154	4	65.3
France	121	5	44.5
China	81	6	4.5
Russia	55	7	26.3
Brazil	49	8	13.8
Japan	16	—	3.5
India	—	—	—
Subtotal	1503		
Korea	7	—	4.8

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per cent of the domestic sales. Japanese and Korean automakers have acquired an eminently high market share in relatively large domestic markets. This is one of the preconditions for expanding global sales.

(3) Import Sales and Import Ratio—Extremely Low in Japan and Korea

From the import volume and the import ratio in Table 8, one can clearly recognize a common feature of the three countries—China, Japan, and Korea—their extremely low import ratio. Compared to European countries, whose ratios are between 45 and 85 per cent, as seen in Table 8, China's is 4.6 per cent, Japan's 3.5 per cent, and Korea's 4.8 per cent. Automakers who are located domestically account for a sales share of more than 95 per cent. However, makers who are located domestically are not necessarily domestic makers. In China, around half of the domestic sales are accounted for by foreign makers who are located and produce the vehicles in China.

Why, then, are the import ratios low in these three countries? The reasons are completely different between China and Japan/Korea. In China, imported vehicles numbered between 30,000 and 80,000 due to the prohibitive duty and the restriction on the automobile import in

the 1990s, before its entry into the WTO. After its entry into the WTO in 2001, the Chinese government reduced the tariff to 25 per cent. However, this rate is still high compared to the European (10 per cent), US (2.5 per cent for cars and 25 per cent for light trucks), Japanese (0 per cent), and Korean (8 per cent) tariffs. China's 25 per cent tariff acts as a substantial import barrier. China's import has remained at 600,000 to 900,000 vehicles in the 2000s. This is the reason the import quantity and the import ratio are low in China.

However, the reasons for Japan and Korea are completely different from those for China. In both countries, foreign makers consider the luxury market important. However, both markets mostly consist of compact vehicles. As a result, luxury markets are small. Foreign makers cannot acquire a large market share in Japan and Korea, which is why import ratios remain low in these countries.

By making the import ratios low, both Japanese and Korean makers can acquire a high market share in each country and then build one of the preconditions for global competitiveness.

Conclusion

Our conclusions are as follows:⁹ Firstly, from the viewpoint of international competitiveness, Japan and Korea are different from China. Japan's and Korea's automobile industries have high competitiveness, while China's does not. Chinese manufacturers are excessively dependent on the Chinese domestic market, and are very weak in terms of exports and overseas production.

Secondly, the global competitiveness of Japanese and Korean automobile industries has resulted from the large size of their home market and their high market share there; both countries have a relatively low percentage of imports in their home market. The number of vehicles sold and the total vehicle population in Japanese and Korean home markets are comparable to those in major European countries. Japanese and Korean automakers use their domestic market as a springboard to penetrate the global market. Moreover, they are very strong in the area of exports. Therefore, with high domestic sales, accompanied by a large volume of exports, they can enjoy economies of scale.

Thirdly, though China is the biggest automobile manufacturer in terms of PCB, Chinese manufacturers depend heavily on their domestic market. Moreover, around half of the market in China is held by foreign manufacturers because of the relatively weak technology development capability of Chinese domestic manufacturers.

Lastly as the implications of this paper, I would like to add three points. Firstly, PCB-MB Analysis can apply into other industries. For example, in motorcycle industry of Japan, MB is huge, but PCB is negligible. And in steel Industry of Japan, MB is bigger than PCB, but its gap is small. Secondly I would like to reconsider the concept of competitiveness of 'a nation'. For example, I have a primitive question to Porter M (1990). Is it based solely on PCB? Thirdly, I also reconsider the self-sufficiency ratio. For example I reconsider an expansive and comprehensive interpretation of 'self-sufficient' of natural sources or agricultural produce etc.

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Notes

- ¹ FOURIN(2014a).
- ² This paper is based on Shioji. H. (2008). Shioji (2008) mainly used and analysed the statistics of 2005. This paper updated the statistics to 2013 mainly and then revised parts of the previous book.
- ³ For example, Tsuchiya. Y. /Ohshika. T /Inoue. R. (2006).
- ⁴ FOURIN(2014b).
- ⁵ FOURIN(2014a).
- ⁶ This includes Daihatsu Motor and Hino Motor.
- ⁷ Estimation from FOURIN(2014c).
- ⁸ Average replacement years are different among countries. Usually, these are around 10 to 15 years. In this paper, we standardize the period to 13 years.
- ⁹ Many aspects remain to be studied for a full analysis of the international competitiveness of Japanese, Korean, and Chinese automobile industries. For example, we have to analyse these three countries' penetration into developed countries such as the US, overseas production, and so on. Further research is required to address these issues.