

Korean Automobile Industry's Production Network in Chinaⁱ

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Abstract

This paper examines the characteristics of the production network of Korean carmakers in China. It was found that Korean automotive firms in China are forming production networks around Beijing where Hyundai Motors is located. The production network of Korean automotive firms has changed from the vertical and closed structure into a more horizontal and open structure with the intensifying competition. This paper suggests that the government needs to select and raise the Korean firms' performance to enhance their competitiveness in China.

INTRODUCTION

In 2006, the Korean automobile industry ranked fifth largest automobile producer in the world, following Japan and the United States after making dramatically rapid progress since it started with almost no foothold in the industry about fifty years ago. Furthermore, the Korean automobile industry holds a prominent position in the national

economy. As of 2005, it accounted for 8.9 percent of the total employees, 11.5 percent of the gross output, 10.2 percent of the value added amount and 10.3 percent of the total export amount in Korea's manufacturing sector. Direct and indirect employment creation effects reached up 1.57 million employees, accounting for 10.38 percent of the total employment. Moreover, the trade surplus from the industry recorded 29.9 billion US dollars in 2006, making it the largest exporting industry of Korea.

Table 1: A Summary of Korean Automobile Industry

Year	Number of establishments		Number of workers		Gross output		Value of shipment		Export amount		Value added amount	
	firms	%	thousand	%	Bil. KW	%	Bil. KW	%	Bil. US\$	%	Bil. KW	%
	1985	882	2	81.7	3.35	3.3	4.26	3.3	4.26	5.4	1.8	1
1990	2,138	3.1	186.3	6.17	16.2	9.16	16.1	9.18	19.1	2.94	5.8	8.23
1995	3,070	3.19	220.6	7.47	35.1	9.62	34.5	9.62	82.9	6.63	13.1	8.2
2000	3,200	3.26	204	7.69	53.9	9.54	53.4	9.54	131	7.61	20.6	9.38
2005	3,848	3.28	253.5	8.85	97.8	11.48	97.9	11.54	293	10.3	32	10.24

Note: All the percentage figures present the proportions in the manufacturing sector except for the export amount in the whole industry.

Source: The Korea Automobile Manufacturers Association (2007).

In 1990s, the Korean automobile industry suffered from the restructuring process prompted by the bankruptcy of KIA automobile company and further catalyzed by the 1997 financial crisis. This process has been considerably changing the component procurement structure which occupies a core position in the car industry production network or value chain. In other words, a certain change has been taking place in the exclusive and single layer structure of division of labor caused by the vertical integration policy between domestic carmakers and the component suppliers since the

1980s.

At the same time, there is an indication of another change in overseas production network of the automobile industry. Recent years have witnessed Korean carmakers aggressively seeking out production bases overseas, especially in China. However, there are few actual analyses on the types of network structure in which these foreign invested carmakers are doing their component procurement, production, sales, research and development (R&D), and various value chain activities. Therefore, this study attempts to figure out the actual conditions of the production network of Korean carmakers in China.

To analyze the current situations and characteristics of the automobile components suppliers in China, this study utilized existing information on the current state (as of the end of 2006) of 126 automobile components suppliers invested in China and registered with the Korea Auto Industries Coop. Association (KAICA). Field research was also conducted by interviewing Hyundai Motors and several component suppliers in Beijing – taking into consideration that Korean auto companies are forming a production cluster in the said city. This field research provided this study with a rich resource to examine the production network of Korean companies in China and its characteristics.

This paper is mainly composed of three parts as follows: The first part, deals with the features of the domestic production network of Korean automobile industry and its recent changes. It was necessary to first look into the domestic production network because this could be the prototype used for the overseas production networks of the foreign invested companies. This section also discusses the drastic changes of the domestic production network after the economic crisis in 1997.

The second part includes basic information on the current situation of automobile

component suppliers in China based on data regarding main production bases, number of companies, location of industries, and features of the business relationships, among others.

The last part presents the result of the field interviews with the automakers and component suppliers in Beijing to examine their strategies in material sourcing, sales and production, and R&D.

1. THE DOMESTIC PRODUCTION NETWORK OF KOREAN AUTOMOBILE INDUSTRY

The Korean automobile industry has been showing a dramatic amount of growth since Sin Jin Motors started knock-down assembling in the 1960s. The automakers were first established, followed by the component suppliers, under the firm support of the government. Automakers were always in the lead over the component suppliers in terms of capital accumulation and technical capabilities so that the former nurtured the latter by training them on technologies and management skills. The Korean automobile industry greatly owed its success to efficient technical learning from foreign countries.

Component suppliers learned the general technologies such as business management and quality controls; meanwhile they received special technologies on the relevant components directly from their foreign affiliate companies. Under this kind of development process, the relationship between the carmakers and the component suppliers became a vertical transaction relationship where the carmakers built strong controls over the component suppliers. The accumulation of chronic problems such as exclusiveness of component supply structure and small scales of component suppliers

was the result of the vertical systematization policy.

The contract structure of Korean automobile industry before the financial crisis is basically characterized by the carmakers' component sourcing from their affiliates or subsidiaries, the exclusive structure of the vertical systematization, and single layer structure of division of labor.

First, before the financial crisis, core automotive components were procured by the *chaebol*ⁱⁱ affiliates and subsidiaries. Affiliates mean the companies that belong to the same company group and are directly related to each other in the group in terms of the capital ownership. Subsidiaries, on the other hand, are the component suppliers that belong to and are run by the relatives of the founders or controlling stockholders of the *chaebols* but have no ownership relations. Examples of the subsidiaries of the Hyundai group are Mando Machinery Cooperation, Halla Climate Control Corporation, and SungWoo Group. These affiliates and subsidiaries extensively dealt with related auto parts such as air conditioners, audio components, batteries, and the like as well as the capital intensive components such as gear, steering, braking and electrical parts. As of 1995, the supply from the affiliates and subsidiaries accounted for 41 percent- 46 percent of the total component supply (Cho, S.J. et. al. 2004).ⁱⁱⁱ The carmakers maintained a very closed component sourcing structure where they procured the core and related parts only through their affiliates and subsidiaries.

Second, the exclusive transactions were formed between the assembling companies and the component suppliers through the vertical systematization during the stage of passenger car development for export in 1980s. In 1995, 657 out of 1,150 component suppliers transacted with only one carmaker which means 57.1 percent of the total component suppliers were involved in exclusive transactions. Another 21.3 percent of

the component suppliers transacted with only two carmakers. The carmakers' strong control over the component suppliers resulted in this exclusive transaction structure. This system resulted in low benefit of scale and the component suppliers remained in small scale because each carmaker had its own set of exclusive component suppliers.

Table 2: The Number of Parent Companies of Component Suppliers Before the Financial Crisis

Unit: number of companies (%)

	1 company	2 companies	3 companies	4 companies	5 companies	6 companies or more	Total
1990	682 (66.9)	188 (18.4)	87 (8.5)	39 (3.8)	24 (2.4)	-	1,020 (100.0)
1995	657 (57.1)	245 (21.3)	109 (9.5)	59 (5.1)	40 (3.5)	40 (3.5)	1,150 (100.0)
1996	649 (58.2)	238 (21.3)	93 (8.3)	58 (5.2)	39 (3.5)	39 (3.5)	1,116 (100.0)
1997	619 (57.4)	236 (21.9)	87 (8.1)	59 (5.5)	37 (3.4)	41 (3.8)	1,079 (100.0)
1998	510 (55.0)	212 (22.8)	74 (8.0)	59 (6.4)	32 (3.4)	41 (4.4)	928 (100.0)
1999	570 (65.9)	158 (18.3)	80 (9.2)	57 (6.6)	-	-	865 (100.0)

Source: The Korea Automobile Manufacturers Association (2007).

Third, the division of labor had a tendency to a single layer structure before the 1997 financial crisis. In the past, the division of labor of Korean automobile industry appeared to form a two-tier structure where the primary and the secondary component suppliers were classified and incorporated around the carmakers. However in reality, the primary component suppliers that directly transacted with the carmakers were large in number. Before the financial crisis, Hyundai had 384 primary component suppliers, Kia had 265, Daewoo (Heavy Industries) had 415; these figures were much more than what the Japanese carmakers had: Toyota, 234 and Nissan, 191. Moreover, as of 1997 only 4.7 percent or 60 out of 1,276 primary component suppliers were large firms; meanwhile the most of them were small to medium enterprises, and 589 companies

(46.2%) even had less than 50 employees. The reason that the primary component suppliers were mostly small to medium firms was that the carmakers placed their orders by units and not by systems. Furthermore, the domestic component industry was weak in technological capabilities so that they could not produce system components.^{iv}

Thus, the contract structure of Korean automobile industry before the financial crisis was built on the vertical systematization and characterized by the exclusive transaction of single layered and closed structure. And yet considerable changes happened to the Korean automotive component industry and its supply structure. The depression of the automotive industry caused by the bankruptcy of Kia Motors in 1997 followed the restructuring of the carmakers, active investment of foreign capitals into the domestic component suppliers, reorganization of subsidiaries, modularization, and diversification of the business channel by the component suppliers.

First of all, the restructuring of the eight carmakers before the financial crisis ended up with only five, namely, Hyundai, Kia, GM Daewoo, Renault Samsung and Ssangyong. This big merger and acquisition among the carmakers changed the exclusive transaction structure which had been pointed out as a chronic problem of the Korean automobile industry. Also after the financial crisis, another factor contributed to the change of competition structure of the domestic automotive component industry; many foreign special component suppliers entered the Korean market which began to actively invest into the domestic component suppliers. The number of foreign invested firms (primary component firms) continued to grow; it was 148 in 2003, 176 in 2006.^v

Table 3: Number of Foreign Invested Firms

Year	Foreign invested firms (Primary component suppliers)	Domestic Firms	Total
2003	148	730	878
2004	163	750	913
2005	173	749	922
2006	176	726	902

Note: The classification of the foreign invested firms over the primary component suppliers began in 2003. Before 2003, the classification of primary or secondary suppliers was not applied to the foreign invested firms.

Source: The Korea Automobile Manufacturers Association (2007).

In addition, the previous component supply system run by the affiliates and subsidiaries was changed into the affiliates system and the modularization system at the same time. In case of Hyundai Motors that had many subsidiary transactions in the past, the subsidiary system has drastically been weakened after the bankruptcy of the Halla group that had control over the core component suppliers such as Mando Machinery Cooperation and Halla Climate Control Corp. Hyundai Mobis became the biggest component supply subsidiary of Hyundai Motors in place of Mando Machinery Cooperation. As a result, the component supply structure centered by the subsidiary based on the ownership has been formed such as Hyundai Kia Automotive Group with Hyundai Mobis, and GM Daewoo with Delphi (GM's 100% subsidiary). On the basis of this new subsidiary-centered component supply system, the production system began to be modularized.

Hyundai and Kia Motors began to promote the modularization of production system in 1999. This means delivering the assembled goods in modules which enables the common use, large scale production and outsourcing of the components.

Modularization propels the two-tier structure of component supply because the component firms disqualified as primary component suppliers can become the secondary component suppliers contracted by the bigger component suppliers. This new structure of component supply will become more distinctive if the modularization of domestic production system makes progress in the future.

Lastly, the diversification of the transaction channel of the component suppliers shows the eased tendency of exclusive transaction structure after the financial crisis. In 1990, the component suppliers of the four carmakers that had only one transaction partner reached 66.9 percent, but this proportion declined to 55.4 percent in 2001. By 2005, among the component suppliers of the seven carmakers (Hyundai, Kia, GM Daewoo, Ssangyong, Renault Samsung, Daewoo Bus, Tata Daewoo) half or 50 percent contracted with only one carmaker.

Four main factors led to the reduction of exclusive transaction in the automobile industry and diversification of the transaction channels: 1) Kia's merger with Hyundai promoted the opening of the transaction channel between the two carmakers' component suppliers so that the suppliers for Hyundai can take orders from Kia and vice versa; 2) GM and Renault which acquired Daewoo and Samsung fostered the transactions of their own component suppliers with the other domestic carmakers in order to introduce incentives for the self-development of the suppliers; 3) As the foreign special component suppliers advanced into the Korean market, the component suppliers themselves carved out new delivery channels; and, 4) The automotive component imports from developed countries like Japan and Germany, and including China have increased. In 2005, the import of automotive components recorded 3 billion US dollars, a 12.2 percent increase over the previous year. Most of the imports were mainly

composed of universal parts with low price and high-tech components of which the domestic suppliers lack the technological capabilities to develop.

Although the diversification of the transaction channel means the heightened competition in the component market, the phenomenon itself does not translate to strengthened autonomy or increased negotiation power of the component suppliers. Above all, the crossing component supply by the component suppliers of Hyundai and Kia that is attributed to the recent diversification of the transaction channel cannot be considered as real diversification because Hyundai and Kia are interrelated through ownership.^{vi}

Table 4: The Number of Parent Companies of Component Suppliers After the Financial Crisis

Unit: number of companies (%)

Year	1 company	2 companies	3 companies	4 companies	5 companies	6 companies or more	Total
1999	570 (65.9)	158 (18.3)	80 (9.2)	57 (6.6)	-	-	865 (100.0)
2000	528 (58.3)	209 (23.1)	95 (10.5)	74 (8.1)	-	-	906 (100.0)
2001	488 (55.4)	215 (24.4)	102 (11.6)	76 (8.6)	-	-	881 (100.0)
2002	427 (50.4)	210 (24.8)	102 (12.0)	62 (7.3)	30 (3.5)	17 (2.0)	848 (100.0)
2003	450 (51.3)	217 (24.7)	94 (10.7)	61 (6.9)	34 (3.9)	22 (2.5)	878 (100.0)
2004	459 (50.3)	222 (24.3)	111 (12.2)	63 (6.9)	36 (3.9)	22 (2.4)	913 (100.0)
2005	461 (50.0)	228 (24.7)	109 (11.8)	62 (6.7)	41 (4.4)	21 (2.3)	922 (100.0)
2006	460 (51.0)	218 (24.2)	98 (10.9)	68 (7.5)	39 (4.3)	19 (2.1)	902 (100.0)

Note: The numbers until 2000 represent only 4 carmakers: Hyundai, Kia, Daewoo and Ssangyong.

Source: The Korea Automobile Manufacturers Association (2007).

As the Daewoo group collapsed and the Hyundai group was divided after the financial crisis, the *chaebol* characteristics of the carmakers were weakened so that the long lasting business system of carmakers' transaction with affiliate companies

gradually disintegrated. Thus the old affiliate transaction system was changed into subsidiary/invested company's supply system to improve the transparency of contract deals. Consequently, the exclusive and single layered structure of division of labor in the past was eased. Also, the single layered division of labor was rapidly changed into a two-tier structure. However, with the stronger control of Hyundai motor group over the component market and the promoted modularization centered on the subsidiary companies, it does not seem that the vertical relationship between the carmakers and the component suppliers is developing into equal relations or the autonomy and negotiation power of the component suppliers are enhanced.

Table 5: Changes of the Component Supply Structure Before and After the Financial Crisis

Before the crisis	After the crisis
<ul style="list-style-type: none"> ▪ Component supply by the carmakers' subsidiary/affiliate companies 	<ul style="list-style-type: none"> ▪ Decline in transactions of affiliate firms due to the automobile industry restructuring and the establishment of component production systems centered around the subsidiary, invested companies based on ownership
<ul style="list-style-type: none"> ▪ Exclusive structure by the vertical systematization 	<ul style="list-style-type: none"> ▪ Reduced exclusive dealings and increased diversification of the transaction channel of the component suppliers
<ul style="list-style-type: none"> ▪ Single layered structure of division of labor 	<ul style="list-style-type: none"> ▪ Two-tier structure of component supply system by the modularization of production system after 1999

2. KOREAN AUTOMOTIVE COMPANIES' PRODUCTION NETWORK IN CHINA

2.1. Korean Automotive Companies' Advance into China and their Production

We will first look at the Korean carmakers' entry into the Chinese market. Hyundai

Motors which ranked seventh in the world automotive market in terms of car sales entered the Chinese market by establishing a joint venture, Wuhanwantong (武漢萬通) Automotive Limited Company with Dongnanqiche (東南汽車). In 2002, however, Hyundai withdrew from the Wuhanwantong partnership, transferred all the shares to Dongfengjituan (東風集團) and established a new joint venture Dongfeng Yueda Kia (東風悅達起亞).

Meanwhile, Kia Motors set up a joint venture, Yueda Kia Motor Limited Company (悅達起亞自動車有限會社) with the Yueda group in 1997 where each company owned a 50 percent stake. After Hyundai Motors' acquisition of Kia Motors, it acquired 20 percent share of Yueda Kia in September 2000. In March 2002, Hyundai, Kia, Dongfeng and the Yueda group agreed to set up a new joint venture named Dongfeng Yueda Kia Motors; Kia Motors owned a 50 percent stake, with Yueda and Dongfeng owning 25 percent each. By the end of 2002, Dongfeng Yueda Kia launched Qianlima (千里馬) modeled after Hyundai Motor's ACCENT.

On the other hand, in May 2002, Hyundai Motors established another joint venture, Beijing Hyundai Automotive Limited Company (北京現代汽車有限公司) with Beijingqiche (北京汽車) on a fifty-fifty share to try independently entering the Chinese automotive market. The new joint venture started production of SONATA in December 2002.^{vii,viii} Also for its global strategy 2010, Hyundai Motors plans to develop regional strategic car models by building a full line-up in China, managing self-sufficient plants including research institutes and sharing the platforms.

Table 6: Automotive Companies of Hyundai Motors Group in China (as of 2005)

		Shares	Starting Year	Main Models	Production capability in 2005
Hyundai	北京現代 汽車 (BHMC)	Hyundai 50% 北京汽車 50%	2002	SONATA AVANTE TUCSON	300 thousand (600 thousand in 2008)
	合肥江淮 汽車	Technology offer	2003	STAREX	90 thousand (plan to cooperate in commercial vehicle)
	榮成華泰 汽車	Technology offer	2000	GALLOPER TERRACAN	70 thousand (100 thousand in 2007)
	廣州現代 汽車	n.a.	2007 (plan)	Truck, Bus	(20 thousand, plan)
Kia	東風悅達 起亞	Kia 50% 東風 25% 悅達 25%	2002	千里馬, OPTIMA CARNIVAL	130 thousand (plan to establish second plant in 2007, 430 thousand)

Note: Rongchenghuatai Motors(榮成華泰汽車) is located in Shandong province and Jianghui Motors (江淮汽車) in Anhui province.

Source: The Korea Automobile Manufacturers Association (2007) p. 13; FOURIN (2006), p. 302.

Beijing Hyundai (北京現代) grew rapidly so that the annual sales recorded 290,000 in 2006 (sales ranking 5th, market share 7.2%). In 2005, sales reached 233,000 – ranking 4th and recording 7.4 percent market share. In terms of sedan passenger car, the company's sales ranked first in the Chinese market. It also took 73 percent market share in the Beijing taxi car business recording 22,500 in sales in 2005. Thus the Korean automotive companies' (Hyundai and Kia) market share in China rose to 12 percent. In contrast to the fast shrinking market share of EU in the Chinese automotive market, Korea and Japan are making a remarkable progress in recent years as shown in Figure 1.

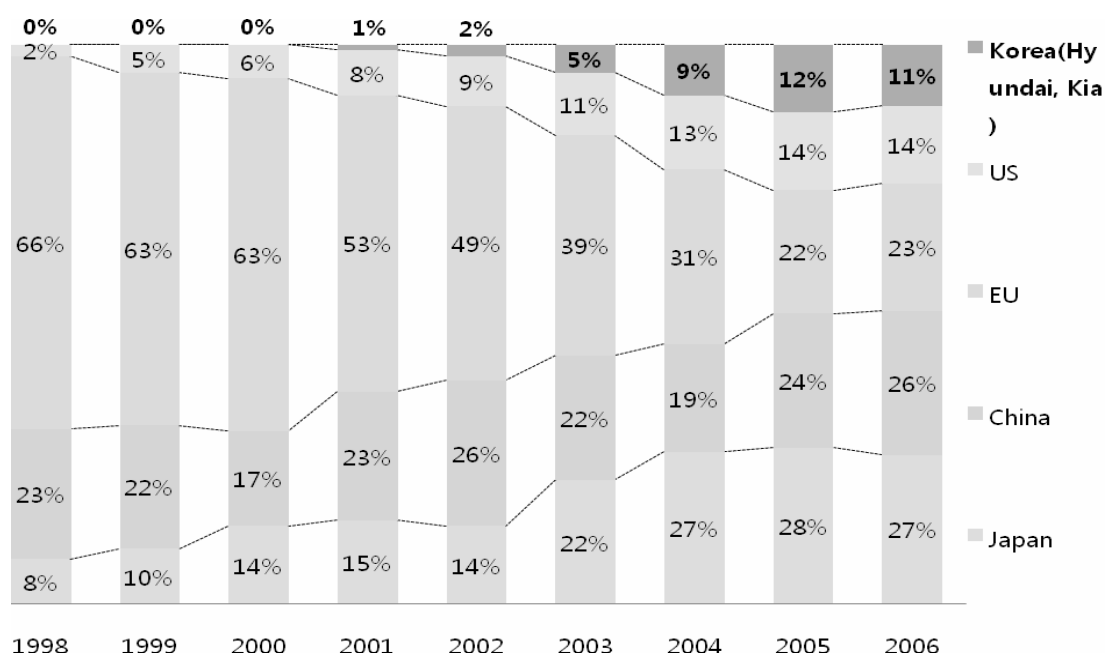
Table 7: Production and Sales of Beijing Hyundai (北京現代)

Unit: number of cars

		2002	2003	2004	2005	2006
Production	SONATA	1,046	54,348	41,451	47,175	49,379
	Elantra	-	765	108,707	173,756	168,268
	Tucson	-	-	-	9,754	27,973
	ACCENT	-	-	-	3	44,468
	TOTAL	1,046	55,113	150,158	230,688	290,088
Sales	SONATA	1,002	51,950	41,342	48,072	49,945
	Elantra	-	178	102,748	176,589	169,716
	Tucson	-	-	-	9,007	28,176
	ACCENT	-	-	-	-	42,174
	TOTAL	1,002	52,128	144,090	233,668	290,011

Source: Interview with Beijing Hyundai.

Figure 1: Market Shares of Various Countries in Chinese Automotive Market



Note: By October for 2006.

Source: A.T. Kearney (2007).

The remarkable development of the Korean carmakers in China like Beijing Hyundai (北京現代) may be attributed to the following factors: 1) expedient construction of the plants. For example, Beijing Hyundai could finish the construction of the plants and start production within three months after the ratification of its joint venture in September 2002; 2) capacity to immediately establish more plants and produce more cars to cope with the abrupt increase in demand. Five more models were produced in only four years from the first production of SONATA in December 2002 to the end of 2006. Over the years, production continuously increased so that in February 2003 it produced 50,000 cars; in March 2004, 150,000; and in July 2005, 300,000; 3) value was placed on automation and operation efficiency. The car body process automation reached 100 percent and hours per vehicle (HPV) representing the productivity of the assembly lines ranked first in all the Hyundai automotive plants overseas.^{ix}; 4) advance into the market jointly with the component suppliers. Therefore, the companies could build up competitive production base within a short time. This strategy was similar to the typical market entry strategies of Japanese carmakers into the North American automobile market.

In 2007, however, Beijing Hyundai was facing difficulties in car sales. Its sales goal in 2007 was originally 310,000 cars but had to be readjusted to 260,000, a reduction by 50,000 because the total car sales until August had reached only 146,000 (car sales ranking 8th). Several internal and external factors caused Beijing Hyundai to fall into this difficult situation. Internal factors were: inferiority in brand value, low accountability due to inconsistent price policy (delayed purchase with the expectation of lower price in the future), price positioning strategy lacking differentiated points (price differentiation problem among the cars in the same category produced by Beijing

Hyundai and DongfengYueda Kia), among others.

External factors were: the intensified competition among the carmakers in the Chinese market such as the preemptive price cut-down by GM and VW (Volkswagen),^x strengthening sales service by Toyota, aggressive strategies by introducing various models into the Chinese market, and catch-up of Chinese carmakers.

In order to cope with the hardship, Beijing Hyundai's strategies included price cutting for the short term; training of car dealers and expanding localized marketing, introducing new models by establishing second plants and enhancing the localization for the mid-term. For its long-term strategy, the company will pursue a dual price system divided into luxury and ordinary cars by enhancing the brand power and improving consumer satisfaction.^{xi}

Table 8: Lowering Prices of Several Carmakers in China

Carmaker	Model	Date	Lowering amount (Yuan)	Lowering percentage	Market price after lowering (Yuan)	Beijing Hyundai Market price(Yuan) / car model in rivalry
上海 GM	Rover	07. 1. 3	6,900	8.4%	74,900	79,800 / ACCENT
	Acceler	07. 3. 2	10,000	8.5%	99,000	
一汽 VW	Jetta	07. 3. 6	6,000	6.3%	69,000	99,800 / Elantra
	Bora		8,000	6.2%	123,800	
上海 VW	Santana	07. 3. 15	10,000	11.1%	79,800	120,000 / EF
	San 3000		11,000	10.1%	97,800	
東風 Nissan	TIENA	07. 3. 26	23,000	9.8%	205,800	107,800 / NF
	Tida		10,000	8.3%	104,800	99,800 / Elantra

Source: Beijing field research interview

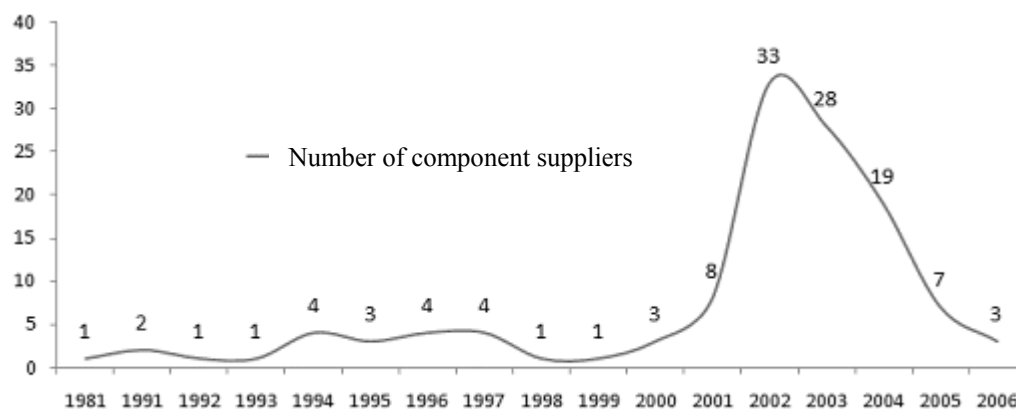
2.2 The Networking Structure in China

By the end of 2006, there were 126 component suppliers registered in the Korea Automobile Manufacturers Association that entered the Chinese market. Using the establishment of Beijing Hyundai in 2002 as the reference point, 33 companies went to China before then and 90 companies afterwards; the entry dates of the remaining 3 companies are unknown. Now we look at the networking structure among the carmakers and component suppliers in China mostly by examining the data of the above mentioned companies.^{xiii}

The number of component suppliers entering the Chinese market sharply increased in the watershed year of 2002 (refer to Figure 2). This is the same period Hyundai Motors started its operations in China. Therefore it can be interpreted that the component suppliers accompanied Hyundai Motors' entry into the country. Eighty (80) or 65 percent of the total component suppliers entered the Chinese market from 2002 to 2004.

By region, Korean component suppliers are concentrated in Beijing and the provinces of Shandong and Jiangsu (refer to Table 9). Hyundai and Kia motors entered into Beijing and Jiangsu, so it can be considered that the component suppliers went with them to these regions. The component suppliers in Shandong province are delivering to Hyundai and Kia Motors as well as exporting back to Korea. Fifteen (15) suppliers went to Shandong, 25 to Beijing, and 23 to Jiangsu from 2002 to 2004.

Figure 2: Automotive Component Suppliers' Entering Chinese Market by Period



Note: Three companies whose date of entering is unknown were excluded.

Source: Korea Auto Industries Coop. Association (KAICA).

Table 9: Regional Distribution of the Korean Auto Component Suppliers in Chinese Market (As of the End of 2006)

Unit: company (%)

	Shan dong	Beijing	Jinagsu	Tianjin	Shang hai	Liao ning	Guang dong	Zhe jiang	Hebei
Number of companies	33 (26.2)	30 (23.8)	27 (21.4)	8 (6.3)	5 (4.0)	5 (4.0)	4 (3.2)	3 (2.4)	3 (2.4)
	Gui zhou	Jilin	Hebei	Heilong jiang	Guang xi	Hong Kong	Total		
Number of companies	2 (1.6)	2 (1.6)	1 (0.8)	1 (0.8)	1 (0.8)	1 (0.8)	126 (100.0)		

Note: percentages in the parentheses.

Source: Korea Auto Industries Coop. Association (KAICA)

By employment scale, medium enterprises with 50-299 employees predominated, accounting for 54.7 percent of the total component suppliers; medium firms with 100-299 employees make up 35.7 percent; and large firms with more than 300 employees accounted for 21.4 percent. Compared to the number of domestic auto component

suppliers by the employment scale in the previous part of this paper,^{xiii} small companies take a large proportion in the domestic suppliers (domestic firms 28.7% > firms entering China 19.0%); meanwhile, there are more medium and large firms entering into China compared to their domestic counterparts (firms entering China medium firms 54.7% + large firms 21.4% > domestic medium firms 53.2% + large firms 18.1%). The reason that the big scale component suppliers entering China is relatively large in numbers is that they are actively taking advantage of cheap and sufficient human capital within country and also it seems that the component suppliers expanded their scale as Beijing Hyundai rapidly grew.

Table 10: Number of Firms by Employment Scale

Unit: number of companies (%)

	Small firms	Medium firms		Large firms		
	Less than 50 employees	50-99	100-299	More than 300 persons	n.a.	Total
Number of companies	24 (19.0)	24 (19.0)	45 (35.7)	27 (21.4)	6 (4.8)	126 (100.0)

Note: Classification of scale using the criteria of KAICA.

Source: KAICA

Considering the component firms going to China by the structure of shares, there are 76 companies with 100 percent shares (60.3%), and 21 firms which own 51-99 percent shares (16.7%). Taken together, we can see that the companies holding the right of management control reached 77.0 percent. Before 2002, 16 out of 33 invested firms had 100 percent shares (48.5%); after 2002, 60 out of 89 companies (67.4%) owned 100 percent (excluding 4 companies whose percentage of shares is unknown). It seems that

guaranteed sales channel by accompanying with the carmakers increased the cases of full investment.

Table 11: Distribution of the Firms Entering China by the Percentage of Shares

Unit: number of companies (%)

	1-49%	50%	51-99%	100%	n.a.	Total
Number of companies	18 (14.3)	7 (5.6)	21 (16.7)	76 (60.3)	4 (3.2)	126 (100.0)

Source: KAICA

According to the data on the number of transaction channels of 126 component suppliers, 58 companies (46.0%) have two channels and 53 (42.1%) have only one channel. Meanwhile a much smaller number, 7 companies, are doing business with 3 channels, and another 3 are dealing with 4 channels. Taking out the 5 companies whose business channels and entry dates are not known, the 121 component suppliers have 1.7 transaction channels on the average.

Table 12: Number of Transaction Channel of Korean Component Suppliers Entering into China

Unit: number of companies (%)

	1 company	2 companies	3 companies	4 companies	n.a.	Total
Total	53 (42.1)	58 (46.0)	7 (5.5)	3 (2.4)	5 (4.0)	126 (100.0)

Note: n.a. represents the case where the entry date and the number of transaction channels are not presented in the data source.

Source: KAICA.

However, it is necessary that we break down the transaction channels of these suppliers shown in Table 12 because the channels include other primary component suppliers and export overseas in addition to the carmakers. As shown in Table 13, in the transaction channels of 121 component suppliers in China, carmakers make up 71.3 percent, other primary component suppliers 14.8 percent, domestic export (buy-back) 8.4 percent, and foreign export 2.0 percent. The delivery percentage to Hyundai and Kia recorded 58.4 percent and the proportions of Chinese local firms, foreign carmakers in China and primary component suppliers made up 5.0 percent, 7.9 percent, and 14.35 percent respectively.

There were 33 auto component suppliers before 2002 having an average transaction channel of 1.8. After 2002, as many as 88 new auto component suppliers entered the Chinese market with an average transaction channel of 1.6. Hyundai and Kia requested the latter group suppliers to go out with them from the early stage of Chinese business. Hyundai and Kia may have given a guarantee to them that they will buy much of the components produced in local area. This guarantee is thought to be one of the reasons for a lower transaction channel. In contrast to the latter group, the former group had longer time to pioneer much more local customers.

Table 13: Korean Component Suppliers Entering into China by Transaction Channels

Unit: number of companies (%)

	Entered before 2002	Entered after 2002	Total	Percent of Total
Carmakers				
Hyundai	15	51	66	32.7
Kia	10	42	52	52
Chinese local firms	7	3	10	5.0
Foreign firms within China	3	13	16	7.9
Primary component suppliers				
Korean firms	1	15	16	7.9
Chinese local firms	1	0	1	0.5
Foreign firms within China	6	7	13	6.4
Buy-back	8	9	17	8.4
Export	3	1	4	2.0
Others	6	1	7	3.5
Total	60	142	202	100

Note: 1) Including the multiple transactions of each company.

2) Others represent the cases of difficult classification.

3) Excluding 5 companies whose business channels and entry dates are not known.

Source: KAICA.

As of 2006, on the other hand, there were 89 firms doing business with Beijing Hyundai including 65 Korean component suppliers entering into China. In the early stage, 10 suppliers accompanied Beijing Hyundai and those that had entered the market before 2002 also became the company's local component suppliers. There were 35 companies located within Beijing, and 54 outside Beijing. If the companies in the vicinity of Beijing like Tianjin and Hebei provinces are taken into consideration, 49 companies (55 percent of the total firms are located within 40 km radius) are located near the Beijing production facility. Considering Beijing alone, 15 firms were in Shunyi (顺义) district where Beijing Hyundai is located.

In 2006, Beijing Hyundai's 89 component suppliers are hiring 40 thousand employees with a total purchase amount from these suppliers reaching 18.5 billion yuan. The localization percentage representing the component sourcing within China reached 80 percent due to the high modularization of component supply. Fifty percent (50%) of the total supply of 65 Korean component suppliers in China are components imported from Korea. The components produced by the suppliers in China are concentrated on functional parts with low price at the moment. Therefore Beijing Hyundai confronting the challenge of cut-throat price competition in the Chinese auto market is urged to promote component sourcing from local Chinese component suppliers.^{xiv}

Table 14: Beijing Hyundai's Component Suppliers in 2003~2006

	2003	2004	2005	2006
Number of partner companies	44	62	69	89
Number of employees	12 thousand	25 thousand	32 thousand	40 thousand
Purchase amount	27.2	96.6	136	185
Localization				
EF SONATA	72%	77%	79%	81%
ELANTRA	-	77%	79%	86%
NF SONATA	-	-	67%	77%
TUCSON	-	-	61%	70%
ACCENT	-	-	-	82%

Note: Number of partner companies includes Chinese local firms.

Source: Source book of Beijing Hyundai Motors Limited Company.

3. CASE STUDY: BEIJING PRODUCTION NETWORK

3.1. Overview

In September 2007, we carried out a field research on the Korean automotive firms invested into China by interviewing one carmaker, Beijing Hyundai(BHMC), and seven

auto parts suppliers to find out the companies' overview, their strategies for sourcing and sales, R&D, and production.. Primary component suppliers were located in Shunyi and Pinggu districts within Beijing and as shown in Table 15, component suppliers that accompanied Beijing Hyundai are A, C, D, and F companies. The characteristics of sourcing, sales, R&D, and production will be argued on the basis of the interview results from the seven component suppliers.^{xv}

**Table 15: General Information on the Interviewed Companies
(As of September 2007)**

Company	Location	Year of establishment	Shares (%)	Employees (persons)	Main parts	Sales channels
A	Pinggu	2002.10	100	375	Wheel Bearing, Ball Joint etc.	Hyundai (Hyundai Mobis), Kia, buy-back (5%)
B	Pinggu	2003.07	80	280	Intake Manifold, Cylinder Head	Hyundai, Kia
C	Pinggu	2002.11	100	350	Front & Rear Cross Member	Hyundai, Hyundai Mobis
D	Chaoyang	2002.09	100	20	Representative office (6 wholly owned corporations, 1 joint venture; total employees 1,200 persons)	Hyundai, Kia, GM, VW, etc.
E	Shunyi	2004.07	40	181	Seat	Hyundai
F	Shunyi	2002	100	929	Chassis & Driving Seat Module, I/P	Hyundai
G	Pinggu	2005.10	100	100	Power Steering Oil Pump	Hyundai (Hyundai Mobis), GM, Kia, Korean primary component suppliers
BHMC	Shunyi	2002.10	50	4,664	5 models including EF, NF etc.	

Note: Eight auto parts suppliers were interviewed but no meaningful interview result was obtained from one omitted firm

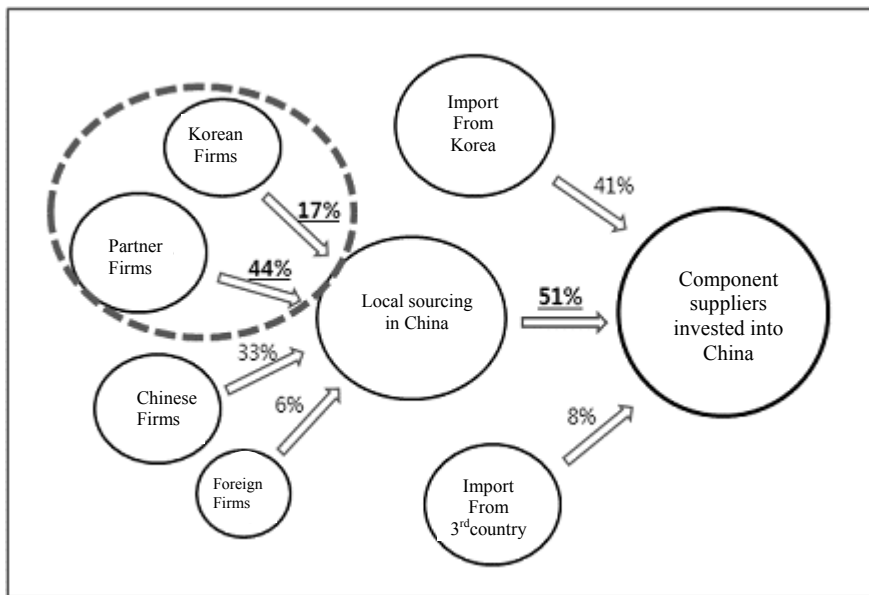
Source: Interview.

3.2 Sourcing Strategies

The sourcing structures of the seven interviewed component suppliers had the following characteristics:

- The local sourcing percentages recorded a relatively high 60-90 percent. The rest of the 10-40 percent components are mostly high tech components imported from Korea. Local sourcing here means both the sourcing from Korean firms invested into China and the local Chinese firms. From the interviews, we found that the proportion of the former type of local sourcing is higher than the latter (see Figure 3).^{xvi}
- As the price competition gets tougher, it is recommended to raise the local sourcing proportion, especially changing sourcing channels to local Chinese firms. In terms of the present product quality, Chinese local firms have little reliability, but in the future the sourcing channel conversion will be realized if the competitive Chinese firms are selected and raised.
- The sourcing structure between the carmakers and the component suppliers will be changed from vertical structure to an open one. With the intensified competition in the Chinese auto market, both the carmakers and the auto parts suppliers seem to recognize the probable change of the system well enough.

Figure 3: Sourcing Structure of the Automotive Component Suppliers in China



Source: Yang P.S. et al. (2007).

Table 16: Characteristics of the Sourcing Structure of Interviewed Component Supply Firms

Sourcing Strategies	
A	<ul style="list-style-type: none"> ▪ Sourcing 40 percent from Korea and 60 percent within China. Mostly sourcing from Korean component suppliers in China (Hisco, Northeast Steel, Chinese top 3 or 4 steel companies) ▪ Actively implementing localization under the guidance of the carmakers. 100 percent localization goal is not easy to achieve. ▪ To nurture the local firms by training the employees
B	<ul style="list-style-type: none"> ▪ From 2004 promoted localization of Korean components (90%), and imported the rest of 10 percent from Korea which could not be localized due to technological problems ▪ Doing business with 3 Chinese local firms and searching for additional local firms (no Japanese firms as business partners) ▪ Achieved 20 percent cost reduction by localization
C	<ul style="list-style-type: none"> ▪ 40 percent imports from Korea, 60 percent local sourcing (1 Chinese firm, and the rest (7) are Korean firms such as Hisco, Pyeonghwa Industry, etc.); no sourcing business with Japanese firms (tried in vain in 2005) ▪ Having difficulties in sourcing from Korean firms due to high cost ▪ Having difficulties in changing into local Chinese firms to reduce costs because the facilities and designs should be changed. Due to pressure to reduce costs, Korean component suppliers trying localization but will be realized only in 2008 when the new models will be launched.
D	<ul style="list-style-type: none"> ▪ Chinese local sourcing 80 percent, imports from Korea 20 percent (ultra precise products etc.) Among 80 percent of local Chinese sourcing, 70 percent from Korean secondary vendors (raw materials), 30 percent from Chinese local firms (steel plates). Steel plates are to be sourced from local firms. ▪ 7 corporations sourcing from 71 suppliers (35 Korean firms, 20 Chinese firms, 16 American and Germany foreign invested companies; no Japanese firm due to the high price and closed business style) ▪ Local Chinese firms offering 10-20 percent lower price, but not reliable in terms of quality and delivery. Foreign firms offering high price. Trying a group negotiation with the multiple raw material partner companies in order to cut down cost. ▪ Training the quality controls by dispatching engineers to the partner companies. ▪ No business done with Japanese firms though investigating the possibility of changing the sourcing channel into Japanese firms
E	<ul style="list-style-type: none"> ▪ Local sourcing 90 percent, knock down imports 10 percent. Products not necessarily reliable are first localized. ▪ Sourcing from 9 Korean firms such as KOLON, 4 local firms such as Qingdao Huata, and 3 foreign firms including Delphi (total 16 companies) ▪ Localizing sourcing for cost reduction ▪ Big gap exists between Chinese central government laws and local regulations
F	<ul style="list-style-type: none"> ▪ Component suppliers such as Sejong, Dimos, Halla Climate Control Industry, KCC, Hanil Ehwa, Samlip etc. entered Beijing with the carmakers. Only 2 companies out of 32 sourcing firms are genuinely local Chinese firms (Shandong Shuixing, Jinzhou Hanluo). 90 percent of localization. ▪ The competitiveness of the cars lies in the material (sash) and due to the time problem, mostly relied on Korean firms. The competitiveness of local Chinese firms is weak in sash, but after developing a new model, planning to select and raise the local firms. ▪ Pursuing the change of sourcing strategy from vertical structure to an open one in the future
G	<ul style="list-style-type: none"> ▪ Korean invested firms in China 60 percent (located in Tianjin), importing the rest of the 40 percent (60% localization at the moment will be increased to 80%) ▪ Price and quality are the difficulties in sourcing. Chinese materials at the moment are not reliable in quality. ▪ No sourcing from Japanese firms

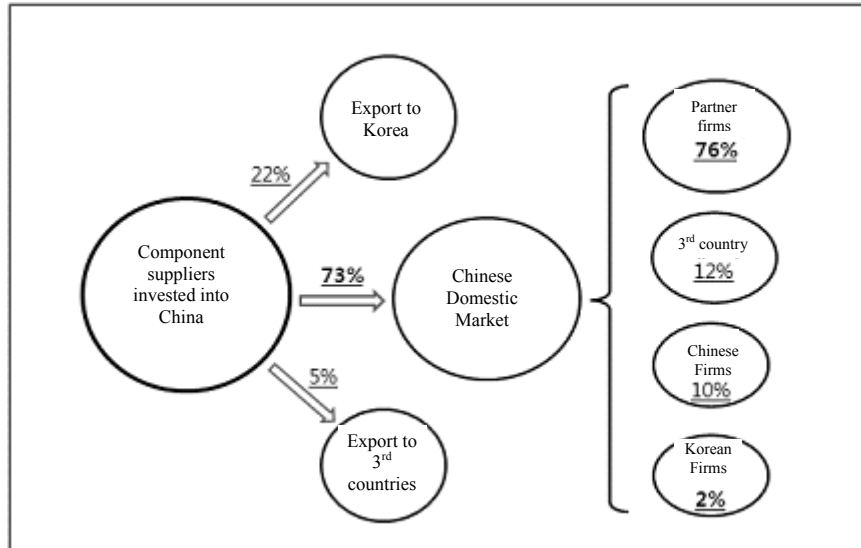
Source: Interviews

3.3 Sales Strategies

The sales structure of the seven interviewed component suppliers, on the other hand, was characterized as follows

- The proportion of sales to Hyundai and Kia is very high. In case of D company that is equipped with its own R&D institute and G company whose headquarter develops the sales channels, however, they are selling products to foreign firms in China and Chinese local firms in addition to Hyundai and Kia. On the other hand, the above mentioned survey result of 22 Korean auto parts suppliers in China showed that the sales in the Chinese domestic market accounted for 73 percent, with sales to the Korean carmakers and the component suppliers making up 76 percent, 2 percent respectively. To sum up, the sales is composed of buy-back 22 percent, Korean carmakers and component suppliers in China 56.9 percent, foreign firms in China 8.8 percent, Chinese local firms 7.3 percent and export overseas 5 percent (see Figure 4).
- Each component supplier is trying to develop new sales channels as Beijing Hyundai that grew rapidly until 2006 slowed down in business performance in 2007. However, it does not seem easy to find new sales channels because of the conservative features of the carmakers, lack of information, and the unreasonable demand of Chinese firms to compromise the price. Another big difficulty on the sales is the cost reduction.

Figure 4: Sales Channels of Auto Parts Suppliers in China



Source: Yang P.S. et al. (2007).

Table 17: Characteristics of the Sales Structure of the Interviewed Component

Suppliers in China

Sales Strategies	
A	<ul style="list-style-type: none"> ▪ 95 percent sales to Hyundai and Kia. 1.5 percent for buy-back to Korea, and 3.5 percent for global export. ▪ Trying to sell to Daimler Chrysler(BBDC), 奇瑞 Automobile, GM, Suzuki etc. ▪ Difficulties in developing sales channels due to the following: <ul style="list-style-type: none"> . Carmakers maintaining their existing partners suppliers . Lack of information . Price compromising and cultural differences in doing business with Chinese local firms ▪ Pessimistic outlook for sales to Japanese firms. Japanese firms doing business only among themselves.
B	<ul style="list-style-type: none"> ▪ Mostly sales to Hyundai and Kia, starting sales to local Chinese firm (Anhui province Hefei Automobile). Developing sales channels. ▪ Bad conditions of Chinese local firms' payment (3-6 months for bill clearing) ▪ No business with Japanese firms
C	<ul style="list-style-type: none"> ▪ 99 percent sales to Beijing Hyundai and Hyundai Mobis; the rest small amount to buy-back. ▪ Developing new customers (not easy due to the conservative automobile industry). Chinese local firms demanding unreasonably low price. ▪ Having intention to sell to Japanese firms but not likely to happen.
D	<ul style="list-style-type: none"> ▪ Hyundai 40 percent, Kia 25 percent, Shanghai GM 20 percent, Shanghai VW, Ha'erbin Hefei Automobile, Zhang'an, Qirui etc. (Expanding sales to Shanghai GM). 100 percent Chinese domestic sales. ▪ The biggest problem in sales is cost reduction. Sourcing localization and design change needed. The risk factor is the competitive relations with Korean primary vendors. ▪ Planning to expand exports to Korea, the US (GM Global project), EU etc. (30% expected in 2010) ▪ No sales to Japanese firms, and not likely to happen in the future
E	<ul style="list-style-type: none"> ▪ 100 percent sales to Beijing Hyundai (Daewoo and JCI sales to Kia). Sales to Beijing Hyundai with JCI according to the car models. No plans to export to Korea. ▪ Having difficulty in the price cut-down ▪ Planning to expand the sales channels
F	<ul style="list-style-type: none"> ▪ Depending on Beijing Hyundai for about 95 percent of its sales. Assembling module sales to Daimler Chrysler, Air bag sales to Nanjing Automobile
G	<ul style="list-style-type: none"> ▪ Direct sales to Hyundai (30%), Hyundai Mobis, GM, Mando, Dongfeng Yueda Kia, Beijing Benz (BBDC). The headquarter contracting with these firms. Less than 10 percent of buy-back. ▪ Doing business with Hyundai is more secure than developing other sales channels such as Chinese local firms who can abruptly break the business relations. Ultimately planning to develop new sales routes to Chinese firms and global firms like GM, etc. ▪ Difficulties in sales are cost reduction. But the competitiveness enhanced as complying with cost reduction. ▪ No sales to Japanese firms

Source: Interviews

3.4 R&D and Production Strategies

The R&D and production structure of the seven interviewed component suppliers was characterized as follows:

- Except for D company, the component suppliers are not equipped with R&D institutes. In other words, most of the firms have their R&D functions in Korea, and doing mass production of the components in China. It is said that the R&D function in China will be needed if the Korean carmakers production of cars in China reaches 1 million cars.
- The component suppliers have the capacity-lagging strategies that they follow with the carmakers' increase in production capacity in order to avert the risk. Thus the component suppliers expanded their production capacity as Beijing Hyundai grew. And most of them secured enough factory sites.

Table 18: Characteristics of the R&D and Production Structure of the Interviewed Component Suppliers in China

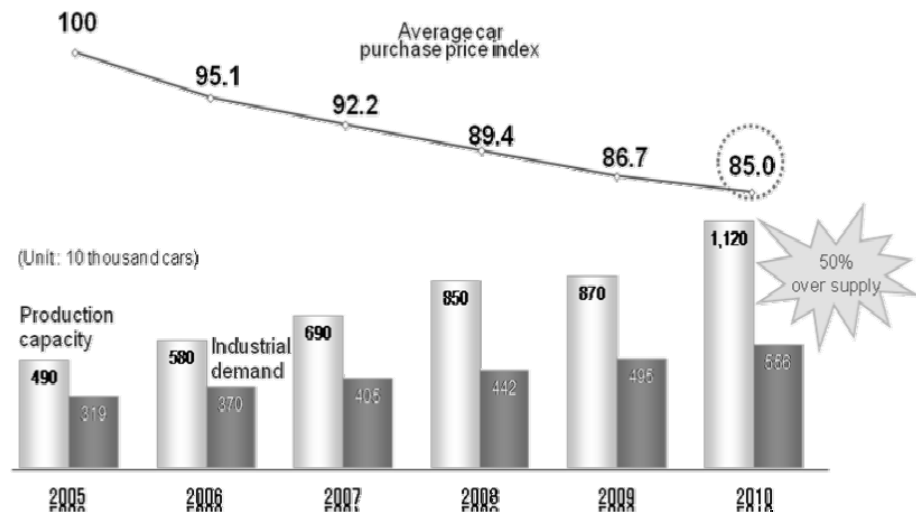
R&D and Production Strategies	
A	<ul style="list-style-type: none"> ▪ Production goal of 500 thousand cars in 2008, separately producing with the parent firm in Korea (No division of labor in the process) ▪ Primarily carrying out R&D with the carmaker together, and having 23 employees in the development department. ▪ Test taken in Korea and production done in Beijing ▪ With the production goal of quality equal to Toyota, price level equal to Chinese local firms, developing the models that are tailored for the demand of the Chinese domestic market
B	<ul style="list-style-type: none"> ▪ 100,000 in 2003; planning to produce 500,000 in 2007 ▪ B company owns 80 percent shares and Chinese Xinggufazhangongsi owns 20 percent. Set up a joint venture considering the possibility of listing. ▪ The quality problems in the early stage overcome by the training and technology enhancement with the support from Korean headquarter. ▪ R&D center in Korea. New product development in H/Q and mass production in Beijing. Local R&D center will be needed if 1 million cars are to be produced.
C	<ul style="list-style-type: none"> ▪ Division of labor with Korea H/Q in the production process (importing semi-finished products ▪ No self R&D function, and production only in Beijing. ▪ Cost reduction compensation method: Transferring the CR when purchasing, promoting localization, and suggesting CR plans to the carmakers ▪ Have intentions of dealing with Chinese local firms or foreign firms but retaining the plan in the case of Chinese local firms due to many risks
D	<ul style="list-style-type: none"> ▪ Having R&D institutes (7 expatriates, 80 engineers, 2 test fields) ▪ Production design in Korea H/Q, application to Chinese market in Beijing ▪ Easily recruited good employees in Beijing. ▪ No division of labor of with Korea H/Q, full production system in China. ▪ At the moment, market shares in Chinese auto taken up 7 percent by Korea, 30 percent by Chinese local firms, 27 percent by Japan, 23 percent by EU and 13 percent by the United States. Chinese local firms are expected to take more than 50 percent with the support of the Chinese government. This will bring about the shrinking in market shares of Korea and the US, etc. ▪ Secured factory site for 1 million production capacity, and established 600,000 production capacity around Beijing.
E	<ul style="list-style-type: none"> ▪ located within 5 km from Beijing Hyundai ▪ Annually producing 250,000 as of now; capability of producing 400,000 cars maximum
F	<ul style="list-style-type: none"> ▪ Annual production capability of 300,000 cars (module factory 300,000/year; I/P factory 600,000/year)
G	<ul style="list-style-type: none"> ▪ Annual production capability of 1.4 million cars

Source: Interviews.

4. CONCLUSIONS

The outlook for the Chinese automobile market is that cut-throat competition among around 110 joint ventures and local automotive companies left the carmakers with a huge oversupply brought about by the aggressive expansion of production facilities. Thus the average purchase price of passenger cars is projected to continue to drop until 2010 (see Figure 5). In this scenario, the high quality and cost competitiveness of the vehicles and automotive components will be the decisive factors for business success. And these success factors will be largely dependent on the extent of localization of the automotive firms.

Figure 5: The Outlook for Price Cut-down in Chinese Automotive Market



Source: Interview with Hyundai Motors.

On the other hand, the carmakers entering into China plan to expand their production capacity according to an increment of the Chinese market demand and this

will change the structure of component sourcing in the end. In other words, enlarged production capacity will demand more component suppliers so that the carmakers can expand or change their sourcing firms. At this time, the imperative points for selecting sourcing firms will be the localization of the component sourcing for price competitiveness. However, Chinese local firms cannot meet the quality specifications as of now. Therefore it is necessary to select and raise the local firms.

Also, the Korean component suppliers that accompanied the carmakers into China need to localize their sourcing firms and diversify the sales channels as the conditions of the carmakers are changing. Especially concerning the diversification of the sales channels, they should develop new sales routes to the Chinese local firms with rapid growth, to foreign enterprises with global network, and expand the exports overseas.

The Korean government should also intervene for the joint advance of small and medium enterprises (SMEs) into China, provide the necessary field information, and support the business matchmaking fairs to select and nurture the superior local firms.

In terms of the cooperation between Korea-Japan firms in China, it is not likely for Korean component suppliers to sell their products to Japan carmakers because of the great distance from Beijing to Guangzhou where Japanese companies are establishing clusters and there are many Japanese components suppliers accompanying the Japanese carmakers. And yet certain types of cooperative models should be found to avoid excessive competition between the two countries in Chinese market in the future. In addition, regional economic integration like Korea-China-Japan free trade agreement should be achieved to reduce the trade cost within the region.

Lastly, in terms of the changes in the production network of the automobile industry, the trend will be very similar both at home (Korea) and in China in the future.

This means that the production network with strong exclusiveness will be changed into more open or western style production network. The reason is that in the early stage of investment of Korean automotive industry into China, the domestic production network was transplanted into China the way it was, but it seems that with the rapid changes in the business environment, the production network in China is also experiencing the reduction in exclusive dealings and the expansion of component sourcing partners just as the domestic production network.

NOTES

- ⁱ This paper is the modified and completed version of Chapter 5 in Jung and Lee (2007).
- ⁱⁱ Korean term for a conglomerate of many companies clustered around one parent company.
- ⁱⁱⁱ See Cho, S.J. et al. (2004), pp. 137-138.
- ^{iv} On the other hand, Bok, D.K. (2002) found that foreign investment into Korean component firms was not significantly related to the change of component supply structure, i.e., increase of the number of firms the component suppliers transacted with, since the foreign firms invested into component suppliers that were already transacting with multiple assembling companies.
- ^v Cho, S.J. et al. (2004), pp. 152-154.
- ^{vi} Daewoo Motors established joint ventures in Guilin (桂林) in 1994 and in Yantai (煙台) in 1996. But owing to the bankruptcy of the group, the automotive business of the Daewoo group was acquired by General Motors and other companies.
- ^{vii} Mostly referenced from Lim, K.T. (2003), pp. 214-219.
- ^{viii} There are two Korean carmakers in China, Beijing Hyundai and 東風悅達起亞, but due to information access limitations, this paper only deals with Beijing Hyundai.
- ^{ix} HPV (Hours Per Vehicle) is the value of total hours spent on the production, production management, maintenance, quality control and support, etc. divided by the total number of produced cars; the lower the value is, the higher the productivity.
- ^x The field research in Beijing found that the prices of 49 models in China were lowered 7.9 percent on the average.
- ^{xi} Oh J.S. (2007)

- ^{xii} Korean export of automotive components to China has a very high annual growth of 102.6 percent on the average after 2001, and has shown a 34-fold increase from 2001 to 2006. The imports recorded an increase of 22.7 times over the same period. This owes very much to Hyundai Motors' and its related component suppliers entry into the rapidly growing Chinese car market.
- ^{xiii} The criteria for the SME of domestic auto component suppliers are 50-299 employees or less than 8 billion KW of capital stock; for firms entering China, only the number of employees is considered. Therefore, the comparison to the domestic firms just takes the employment scale into account.
- ^{xiv} Beijing Hyundai Motors interview
- ^{xv} On the interview result of one carmaker (BHMC), refer to the chapter 2 'Korean Automotive Companies' Production Network in China'.
- ^{xvi} Another survey result showed that 22 auto component suppliers' localization of material sourcing was 51% on the average and the proportion of Korean component suppliers reached 61%. The localization percentage reflected in this interview is higher than that of the survey because the interviewed firms mainly doing business with Beijing Hyundai had to increase local sourcing proportion to keep up with the demand of the rapidly growing Beijing Hyundai. Please see Yang P.S. et al. (2007).

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