Development of the Chinese Automobile Industry And The Strategy of Modern Japanese Automobile Parts Makers

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Introduction

From its inception the development of the Chinese automobile industry has continually drawn worldwide attention. The primary automobile makers in Japan, Europe, and the U.S.A. have paid close attention to the future prospects of the Chinese automobile market and have been vigorously competing on the national level as well as on local production projects. While the automobile markets of the advanced nations have been approaching the saturation stage, the Chinese market has been deemed the greatest market left in the world, thus the Japanese automobile industry has been working wholeheartedly for inclusion in the competition. It is, however, also true that there is a serious obstacle limiting the export of complete motor vehicles to China. Because the Chinese government is extremely interested in increasing the home production ratio through the protection and fostering of its own automobile industry, it has established a high rate of tariff and thereby built a high barrier against the import of motor vehicles[1].

In the middle of the 1980s, in order to address the problem, the leading European

Table 1 Firm Number, Total Production Volume and Market Share of the Two Main Companies in China's Automobile Industry (1953–1993)

Year	Number of auto makers	Total production volume	FAW's		SAW's		Imports	Holdings
			Volume	Share	Volume	Share		
1953	1	0	0				10,884	n.a.
54	1	0	0				16,918	n.a.
55	1	61	61	100			15,199	n.a.
56	1	1,654	1,654	100			11,240	n.a.
57	1	7,904	7,904	100			2,225	120,500
58	8	16,000	14,922	93			30,158	n.a.
59	14	19,601	16,469	84			15,619	n.a.
1960	16	22,574	17,407	77			17,744	223,826
61	16	3,589	1,146	32			1,458	240,007
62	17	9,740	7,602	78			3,178	247,992
63	18	20,579	17,665	86			2,484	261,346
64	19	28,062	24,251	86			3,914	271,603
65	21	40,542	34,155	84			12,151	289,873
66	22	55,861	46,605	83			12,925	322,904
67	22	20,381	15,068	74			8,314	374,446
68	25	25,100	16,673	66			5,946	384,939
69	33	53,100	37,277	70			3,039	436,413
1970	45	87,166	50,336	58			10,976	487,557
71	47	111,022	60,050	54			11,637	542,896
72	49	108,227	58,035	54			14,206	642,792
73	49	116,193	57,857	50			18,863	717,583
74	49	104,771	40,202	38			27,871	825,226
75	52	139,800	60,359	43	n.a.		25,286	946,833
76	53	135,200	56,784	42	n.a.		18,248	1,100,463
77	54	125,400	42,273	34	n.a.		15,993	1,250,827
78	55	149,062	58,227	39	5,123	3	25,367	1,429,229
79	55	185,700	63,002	34	14,541	8	32,226	1,565,678
1980	56	222,288	66,000	30	31,500	14	51,083	1,680,960
81	57	175,645	60,002	34	37,503	21	41,575	1,873,049
82	58	196,304	60,507	31	51,711	26	16,077	2,053,174
83	65	239,886	67,200	28	60,106	25	25,156	2,227,130
84	82	316,367	78,416	25	70,173	22	88,743	2,433,713
85	114	443,377	85,003	19	83,431	19	353,992	2,887,126
86	99	372,753	61,607	17	87,292	23	150,052	3,574,463
87	116	472,538	62,038	13	104,673	22	67,182	4,122,939
88	115	646,951	80,846	12	114,542	18	99,233	4,776,382
89	119	586,936	76,224	13	120,892	21	85,554	5,274,663
1990	117	509,242	69,358	14	107,952	21	65,430	5,835,865
91	120	708,820	83,467	12	122,489	17	98,454	6,114,089
92	124	1,061,721	144,700	13	164,203	15	208,532	6,917,354
93	124	1,296,778	170,021	13	180,221	14	268,532	n.a.

(Volume in number of units, share in%)

Source: Lee Chunli "From Lean Production to Lean Industry: Strategic Choices for the Chinese Automobile Industry", a paper presented for the "China Automobile Development Seminar", Beijing, China, 25 October, 1994.

(1) Number of auto makers and total production volume: from Zhongguo Qiche Gongye Nianjian 1991, *The Chinese Automobile Industry Yearbook, 1991,* 111, 124.

(2) The production volumes of FAW (from 1978) and SAW, and the import and holding volumes: from Qiche Gongye Guihua Cankao Ziliao 1992, Reference material of *The Automobile Industry Planning 1992,* 118–19, 238–39, 214–15.

(3) FAW's production volume (to 1977): from Jilin Shehui Jingji Tongji Nianjian 1987, *Jilin Statistical Yearbook of Society and Economy 1987,* 160. The total production volume of Jilin Province was equal to FAW's production volume up to 1977.

(4) Others: from *China Auto, February,* 1994.

and American automobile makers established joint ventures and began local assembly. Then in 1989, China announced its interest in the "Big Three and Small Three" project which was a passenger car home production plan dependent on foreign capital. The only Japanese automobile maker participating in the "Big Three and Small Three" project was Daihatsu, which only provided technology whereas the European and American participants were involved in joint ventures. Thus, it is clear that the Japanese automobile makers' strategy for competing in China had been behind from the very start.

As of 1992, the Chinese automobile industry, which was started in 1952 at the First Automobile Works (FAW) in Changchun, had reached an annual production of 1,000,000 units. In 1993 it is assumed to have reached 1,300,000 units.

Thus, as far as annual production capacity is concerned, China has rapidly risen to being the third largest automobile manufacturign country in Asia, after only Japan and Korea. Yet despite this impressive figure, the Chinese automobile industry has a fundamental problem with the production setup in China; unlike their competitors in advanced automobile manufacturing nations, China has not yet established an efficient division-of-labor system. As a result, the annual production capacity of each automobile maker in China has been left at a very low level. (The exceptions are the government-managed FAW and SAW (Second Automobile Works, later renamed Dong Feng Motor Corp.) and the other foreign capital-based "Big Three and Small Three" makers.

In summary, while it is true that the two big central government makers producing commercial trucks and buses have achieved a high degree of capital concentration, and the foreign capital-based passenger car makers operate a relatively well integrated production system, most of the other local government-managed automobile makers remain extremely small and inefficient. Similarly, Chinese automobile parts makers are mostly minor enterprises, except for the "Big Three and Small Three" makers and related enterprises. Thus, the random foundation of the automobile makers and the underdevelopment of the automobile parts makers have been the neck against the establishment of Japanese automobile and automobile parts makers.

In the first chapter the development to date of the Chinese automobile industry will be analyzed in order to define the characteristics of the technology transfer to China of the Japanese automobile parts industry. The second chapter will outline the general trend of the technology transfer and also explain in more detail a case study of the Koito Manufacturing Company, Ltd., a well-known parts maker in Shanghai of the Toyata group.

I. Development of the Chinese automobile industry

The periodic outline of the development of the Chinese automobile industry is as

follows:

First period (1956–1965)	Recovery and foundation of the modern automobile industry.
Second period (1966–1976)	The Great Proletarian Cultural Revolution ("Cultural Revolution" hereinafter) and the decentralization of the automobile industry.
Third period (1977–1990)	End of the Cultural Revolution and consequent reorganization of the industry.
Fourth period (after 1991)	Period of high growth and establishment of a system for the production of 1,000,000 units per year.

1. First period (1956–1965)

The first period corresponds to the recovery of the Chinese economy in which the base of the automobile industry was built. The first great project was perhaps when the U.S.S.R. helped China to establish the FAW in Changchun which began manufacturing the Jie Fang truck with a set target of 30,000 units per year. This was epoch-making in that it was the first mass-production type of machine industry and the actual beginning of modern industry in China. Following the establishment of the automobile industry came the Great Leap Period (1958–1960), in which the production capacity of the automobile factories in Nanjing and Beijing was rapidly increased. From the beginning of the 1960s to around the middle of the decade automobile servicing and parts factories in Jinan and Shanghai were also rebuilt as automobile manufacturing factories. The production system was being steadily integrated. This also marked the beginning of local distribution in the automobile industry and as a result quite a number of factories were built by small to medium local makers.

In 1964 the China Automotive Industry Corporation[2] was established and issued a definitive statement on its policy of establishing a division of labor system for automobile manufacture. This resulted in the establishment of a government-sponsored central control system for the automobile industry.

Motor vehicle production in China in 1969 was 22,500 units, most of which were, however, trucks, the number of passenger cars being only 100. Thus the first period was the dawn of the Chinese automobile industry.

2. Second period (1966–1976)

In this second period, which coincided with the Cultural Revolution, the automobile industry underwent a dramatic change. The China Automotive Industry Corporation was dissolved. The central control system of the automobile industry, too, was dissolved and in 1972 a new policy of "one factory for one province" was promoted. This policy was promoted at the same time the "self-dependent rebirth" slogan and negated the system which had been established in the first period which had intro-

duced the regional manufacture by the division-of-labor plan. This resulted in forcing individual automobile makers to follow a production system integrated by province under which they were requested to undertake the manufacture of parts and carry through to final assembly. Thus, the introduction of the "one factory for one province" policy promoted the secondary, or local distribution of factories in China, from a regional division of labor to a regionally integrated manufacturing system.

The second period also saw the start of the so-called "Third Line Construction for Military Defense."[3] Important military bases were moved to mountainous regions for defense reasons, a reaction to the tensions of the East-West Cold War and the aggravated relations between China and U.S.S.R. During this period the Second Auto Works was established when many production facilities and talent were moved from Changchun, which is near the China-CIS border, to the mountains of Hubei. It was in this period that the uniquely Chinese automobile supply system was set in place, made up of the Big Two, the FAW in Changchun and the SAW in Hubei and the other small to medium automobile makers in each province. In this second period, although the number of small to medium makers increased rapidly due to local distribution, the regionally integrated manufacturing system of the Cultural Revolution had produced no tangible results, and the production of motor vehicle industry was generally stagnant. The number of automobiles manufactured in 1970 was 87,000, again most of them trucks, and the number of passenger cars, 200.

3. Third period (1977–1990)

In the third period the Chinese economy was freed from the dictates of the Cultural Revolution, and the automobile industry was reorganized and positioned to be the nation's key industry. At the Third Plenary Session of the 13th National Congress of the Communist Party of China the modernization line was defined. A revolutionary open door policy was proposed for the modernization of four economic sectors: agriculture, industry, national defense and science and technology. Thus was proposed the 6th five-year plan (1981–1985). It was roughly accomplished by the middle of the 1980s wherein a 7th five-year plan was proposed.

The 7th five-year plan was part of the Chinese government's ambitious economic development plan to expand the 1980 level of industrial and agricultural production fourfold by the start of the twenty-first century. It was proposed to increase car production to 1,000,000 units by 1990, this corresponding to four times that of the 1983 level. In another plan proposed by the State Planning Commission it was to be 600,000. The reason for such extraordinarily ambitious plans was at least partly due to the hopeless shortage of cars which had been continually getting worse.

In 1985 China's automobile production was only 420,000 units, while the year's demand for cars was estimated to be about 570,000, the shortage being thus 150,000 units.[4] China ended up importing 240,000 units in 1985, partly due to the Japanese car

boom which occurred at the same time. In that year the so-called Hainan Island car resale event occurred.[5] Around the middle of the 1980s the Hainan Island authorities gained an unfair profit from the massive import and resale of Japanese motor vehicles. The Hainan Island authorities took advantage of the deep-rooted demand-supply gap and the rapidly increasing demand for passenger cars, which were used as taxis for foreigners and official cars for high-ranking officers.

In order to expeditiously solve the automobile shortage, the Chinese government revived the China Automotive Industry Corporation in 1982, which had been dismantled during the Cultural Revolution. The China Automotive Industry Corporation was designed to be a nationwide organization for controlling the six "Automobile Joint Management Companies" and also the "Parts Joint Management Company." These would be reformed to become the "Big Seven Joint Management Companies" with the purpose of promoting a new enterprise grouping policy. Each of the six Automobile Joint Management Companies was given one nucleus factory and the necessary authority to manage the other automobile factories in their regions. More specifically they were made responsible for the structural improvement of the automobile industry and were expected to accomplish this by implementing the strategies of company integration, specialization, and the assimilation of foreign technological know-how.

The Big Seven Joint Management Companies were comprised of: (1) The Jie Fang Automobile JMC having jurisdiction over the three northeastern provinces (with the FAW as the nucleus factory); (2) The Jin-Jin-Ji Automobile Joint Management Company having cotrol over Beijing City, Tianjin City and Hubei Province (Beijing Automobile Company and the Beijing Second Automotive Company); (3) The Nanjing Auto Works (NAW) JMC having jurisdiction over Jiangsu, Anhui and Jiangxi Province (NAW); (4) The China National Heavy Duty Truck JMC having jurisdiction over Shaudong and Sichuan Province (Jinan Auto Works); (5) Shanghai Auto Works JMC having jurisdiction over Shanghai City (Shanghai Auto Works); (6) Dongfeng Automobile JMC having jurisdiction over Hubei, Hunan, and Guangdong Provinces (SAW).

The Chinese Parts Joint Management Company was set up to directly control the entire nation and to guide automobiles parts factories in each province. This was intended to eliminate the evil of the "one set-ism" of regional factories and thereby lower their hitherto unnecessarily high "own-making ratio"[6] to an acceptable level. The Chinese Parts JMC was also designed to emphasize the homogenization and standardization of parts production. The goal was meant to improve the performance and quality of parts through the fostering of automobile parts factories.

The China Automotive Industry Corporation reorganized the Big Seven Joint Management Companies to form the China National Automobile Industry Association. In 1988 the China Automotive Industry Corporation announced its "Automobile Industry Development Plan for 2000" making public its plan to increase the production of pas-

senger cars and commercial vehicles (trucks and buses) to 1,000,000 units each (2,000,000 total) by the year 2000. In 1989 the State Council planned the "Big Three and Small Three" project, with China Automotive Industry Corporation as the leader and promised the home-manufacture of passenger cars which had until then been largely dependent on foreign capital. The Big Three and Small Three project was designed for the protection and fostering of the six companies which would be the central enterprises of the Chinese automobile industry. External capitals not joining the project were to be excluded from the real local manufacturing activities in China.

The Big Three and Small Three are made up of the Big Three which are: (1) FAW-VW as a joint venture of FAW and VW; (2) Shenglong Motor Corporation as a joint venture of SAW and Citroën of France; (3) Shanghai VW (SVW) as a joint venture of the Shanghai Auto Works and Volkswagen of Germany; and the Small Three which are: (1) Beijing Jeep as a joint venture of the Beijing Automotive Factory and the American Motor Company (AMC)(purchased in 1987 by Chrysler); (2) Tianjin Daihatsu (supplying only technological know-how); (3) Guangzhou Peugeot Auto Company and Peugeot of France.

Thus the features of the Big Three and Small Three project are firstly that the joint foreign capitals are mostly European and American makers, and furthermore that VW of Germany was given an overwhelmingly advantageous position. It easy to grasp why the joint venture partner FAW is one of the two major companies in the

Table 2 Big Three & Small Three Project for Chinese Passenger Cars

as of 1993

		Current Model	Manufacturing Plan of Passenger Car
Big Three	1 FAW-VW (Changchun)	Truck Jie Fang 61,200 per year AUDI KD 6,000 per year	1. Audi 30,000 in 1995 2. Golf/Jetta 150,000 in 1995
	2 Shenlong (SAW-Citroën) (Hubei)	Truck Dong Feng 78,500 per year Heavy truck 35,400 per year	Citroën ZX 75,000 in 1998 (300,000)
	3 SVW (Shanghai)	VW Santana 35,000 per year	Santana 150,000 in 1995 + 150,000 in 2000 Local Content 70.4%
Small Three	1 Beijing Jeep (Beijing)	Beijing Jeep 54,700 per year Light Truck etc. 46,000 per year	Cherokee Local Content 61%
	2 Tianjin Daihatsu (Tianjin)	Daihatsu Mini Cab 10,000 per year Charade 30,000 per year "Tian Jin" 2 ton truck etc. 40,000 per year	Mini Cab Local Content 97% Charade Local Content 45.7%
	3 Guangzhou Peugeot (Guangzhou)	Peugeot 505 Wagon/Sedan 3,000 per year	Peugeot 504/505 75,000 cars in 1988

Source: Chinese automobile industry: Current state and view of the market, *TED Seminar Text No. 3C13, 1992,* p.29.

Chinese automobiles industry; the factories are in Changchun and Shanghai where the industrial base is relatively secure and, moreover, there exists the huge domestic market. Secondly, the European makers are interested in the joint venture production of passenger cars (including wagons and jeeps which are known to be higher in added value than commercial vehicles) and almost entirely monopolize the passenger car market in China and continue to enjoy extremely large profits. (Daihatsu, which has only supplied technological know-how, is the one exception among the Big Three and Small Three makers, receiving noticeably fewer profits.)

During the second period, in 1987, decentralization of authority was further promoted through the reorganization of the China Automotive Industry Corporation. In 1990 the China National Automotive Industry Corporation was reorganized and renamed the China National Automotive Industry Corporation, and the Big Three and Small Three project came to be the leading sector in the nation's automobile industry. In 1980 the number of automobiles manufactured was 5,400 passenger cars and 217,000 commercial vehicles but by 1990 the figures had fast risen to 51,000 passenger cars and a remarkable 420,000 commercial vehicles.

4. Fourth period (after 1991)

The fourth period was one in which the Chinese economy entered into a high growth period because of the introduction of the mechanisms of the market economy and the simultaneous start of an open door policy which would lead to China's acceptance to GATT again. For the automobile industry too, 1992 was epoch-making in that a production system able to produce 1,000,000 units per year was established. Another noteworthy feature of this period was that Japanese automobile makers started advancing into China as joint venture partners, although some of these cases were in the non-small car field and not included in the Big Three and Small Three. In 1992 Fuji Heavy Industries Ltd. decided to start production of the light passenger car "Rex" in Anshun of Guizhon province, while Mazda Corporation decided to start a joint venture production of "Luce," a van-truck, in Haikou of Hainan province. In 1993 the establishment of a number of joint venture productions were announced, namely the light truck "Carry" and the light passenger car "Alto" by the Suzuki Motor Co., Ltd. in Chongqing, in Sichuan province, and the light truck "Pickup" by Nissan in Zhengzhou in Henan province. Why, then, did the Japanese makers wait so long to enter China when the European and American makers had been there since the middle of the 1980s?

The first of the reasons was that China's automobile manufacturing policy gave exclusive priority to the Big Three and Small Three project in the passenger car sector. This resulted in hindering the participation of Japanese makers, except Daihatsu which had broken into the market early. Secondly, the Japanese automobile industry, including most parts makers, was anxious about the immature conditions of Chinese

joint venture laws, thus they hesitated because of the nation's unstable investment environment.[7] Thirdly, they preferred the export of complete vehicles and giving technological assistance to local vehicle assembly businesses, which were even then considered to have a number of unstable factors. After 1992, however, the Japanese automobile makers, confronted with the high yen and the stagnation of the already saturated markets in Japan, Europe, and America, decided to make a more concentrated effort at competing in the Chinese market.

For example, Nissan started export to China in 1972 by concluding a technological assistance contract with the FAW concerning the bodies of commercial vehicles. Nissan started production in 1993. Then, early in 1994, they set up joint venture companies with commercial car makers in the SAW group. One example was the Chinese Zhengzhou Light Truck Company which aimed to produce and sell commercial vehicles and decided to start manufacture of a light truck, the "Nissan Pickup", at about 5,000 cars per year. The company is quite willing to start local manufacture in China and has announced its plan to increase the annual production to 30,000 units.

In the fourth period the government introduced another ten-year plan for the economy and the eighth five-year plan for social development. Included were the following four points. From 1991–1995 the automobile industry was expected to: (1) accelerate the development of the passenger car and passenger car parts industry; (2) increase parts supply ability and home manufacturing ratio; (3) promote the prior investments of the joint ventures at FAW, SAW, and SVW; (4) encourage the automobile industry to grow to be the key industry in the Chinese economy. The state was hoping that the

Table 3 Major Automotive Factories

as of 1993

Factory	Model	Total volume (1,000 units)	No. of employees (1,000)	Year of Foundation	In house production (approx.)
First Auto Works Changchun, Jilin	Jie Fang Truck (4–6t) AUDI 100	83.5	62.9	1956	70%
Second Auto Works Shi Yan, Hubei	Dong Feng Truck (4–6t)	122.5	70 8	1975	80%
Nanjing Automotive Nanjing	Yaojin Truck (1–3t) IVECO	47.3	16.6	1958	80%
Jinan Auto Works Factory Jinan, Shandong	Huang He Truck (6–8t)	27.0	17.8	1960	40%
Beijing Automotive Factory Beijing	Beijing Jeep Cherokee	109 2	12 2	1966	50%
Beijing Second Auto Works Beijing	Beijing Truck (2t)	22 8	7.2	1966	40%
Shanghai Auto Works Shanghai	VW Santana	42.0	3.4	1921	40%

Source: Chinese automobile industry. Current state and view of the market, *TED Seminar Text No. 3C13, 1992,* p.28

rapid establishment of the parts industry would lead to the improvement of the home manufacture ratio of the entire automobile industry, with emphasis being on investment in the companies participating in the Big Three project tied in with foreign capital (125 companies as of 1992).

In addition it should be mentioned that in the medium truck sector FAW's Jie Fang and SAW's Dong Feng have both reached the stage of perfect home manufacture. In the small passenger car sector (1) about 70% has been reached by SVW's "Santana", (2) about 60% by Beijing Jeep's Jeep, and (3) about 50% by Tianjin-Daihatsu's Charade; but (4) it is about 40% by Guangzhou Peugeot Automotive Co.'s Peugeot 504/505, and with (5) Audi, Golf and Jetta of FAW-VW and (6) Citroën ZX of SAW-Shenlong Motor Co., the level is still below 10%.[8]

Table 3 shows the major automobile enterprises in the Chinese Automobile Industry as of 1993. It is also certain that in the future, in addition to the Big Three and Small Three (which is compromised of the "Central Big Three" passenger car plan and the "Local Small Three" passenger car plan), the "Two Light Car" plan and other home manufacture plans for light and small passenger cars will be further promoted.

II. Technology transfer strategy for China of the Japanese automobile parts industry

1. Outline of parts movement

As is apparent from the analysis so far made, the China strategy of the Japanese automobile makers is still far behind its European and United States competitors, at least with respect to passenger cars. It is widely assumed that because Japanese automobile makers made considerable foreign capital investment in North America in the 1980's that they had no reserve capital for investment in China. Japanese auto parts makers did likewise and thus failed to competitively invest in China until the 1990s.

Table 4, compiled by the Japan Auto Parts Industries Association (JAPIA) in March 1995, indicates the investment attitude of its members in China. Firstly, among the 26 member companies, the number of those which established local firms in the 1980s is only nine, whereas the others did the same later in the 1990s. Secondly, the number of those which established technology transfer was approximately the same as those which set up the local production of auto parts. Thirdly, the number of such companies is relatively large in the big cities near the automobile production bases such as Beijing and Shanghai, but these and other regions are all on the bases satisfying the given conditions in China. And finally, by examining the types of products being manufactured, it is evident that there is no tendency toward particular product groups. Rather, as the advance into China for parts makers continues, it can be assumed that the product groups will further diversify.

Table 4 Japanese Automobile Parts Manufactures in China

as of March 1995

	Established	Situation	Area	Products
TK Carburetors Co., Ltd.	1985	Know-how	Beijing	Dust-misters
Mikuni Kogyo Co., Ltd.	1986	Know-how	Beijing	Carburetors
Nippondenso Co , Ltd.	1987	Know-how	Siping	Tachometer, Guages
Harada Industry Co., Ltd.	1988	Maker	Dalian	Radio Parts
Yazaki Corp	1988	Maker	Tianjin	Windshied Wipers, Harnesses
SANDEN Corp.	1988	Know-how	Shanghai	Compressors, Clutches
SANDEN Corp.	1988	Know-how	Shanghai	Air conditioners
SANDEN Corp	1988	Know-how	Guangdong	Compressors, Clutches
Koito Manufacturing Co , Ltd	1989	Maker	Shanghai	Lighting Units
Yazaki Corp.	1990	Maker	Guangdong	Windshied Wipers, Harnesses
Riken Corp.	1990	Maker	Fujian	Cylinder Engine Blocks
Fujikura Ltd.	1991	Maker	Zhuhai	Windshied Wipers, Harnesses
Keihin Seiki Mfg. Co., Ltd.	1991	Know-how	Chongqing	Carburetors
Keihin Seiki Mfg. Co , Ltd.	1991	Know-how	Hubei	Carburetors
Ishikawa Gasket Co., Ltd.	1991	Maker	Yan Tai	Gaskets, Packing, Parts
GMB	1992	Maker	Shandong	Water Pumps
Metro Denso Co., Ltd.	1992	Maker	Hangzhou	Electric parts, Keys
Mikuni Corp.	1992	Know-how	Beijing	Carburetors
Nippon Seiki Co , Ltd.	1992	Know-how	Beijing	Meters
Nichirin Co , Ltd.	1993	Know-how	Shanghai	Air conditioners Assembling Hoses
Jidosha Denki Kogyo Co., Ltd	1993	Know-how	Guangdong	Motors for Wipers
Showa Aluminum Co., Ltd	1993	Know-how	Guangzhou	Parts for Air conditioners
Yuasa Battery Co., Ltd.	1993	Maker	Tianjin	Batteries
Ishikawa Gasket Co., Ltd.	1993	Maker	Yan Tai	Clutches, Brakes
Zexel Corp.	1993	Know-how	Hunan	Air conditioners
Alpine Electronics, Inc	1994	Maker	Dandong	Electronic Equipment

Source: Japan Auto Parts Industries Association.

2. Case study of Shanghai Koito Automotive Lamp Co., Ltd. (Shanghai Koito)

(a) General outline

The Shanghai Automotive Lamp Works, formerly the Shanghai Koito Automotive Lamp Co., Ltd., has received technological guidance from the Japan Koito Manufacturing Co., Ltd. since 1982 and was then established as a joint venture enterprise on February 28, 1989. The investment ratio was 50% from the Shanghai Automotive Industry Corp., 45% from Japan Koito and 5% from the Toyota Trade Co., Ltd. The Shanghai Automotive Industry Corp. invested the original facilities (building and equipment) for the Shanghai Automotive Lamp Works, and the Japanese partner invested the capital. Some of the background details of this joint venture tie-up are as follows:

(1) the current Chinese technical level for the home manufacture of lamps (for the VW Santana) was quite low;

(2) the Chinese partner lacked the capital funds for the purchase of the necessary

facilities and the acquisition of technological know-how.

The Shanghai Koito factory site had been 7,989 m^2 with as much as 15,599 m^2 of floor space, but the complicated and inefficient design of the production flow had made further development of the plant virtually impossible. Presently, therefore, the company has purchased 58,000 m^2 of land about 30 km away and is planning to build a new factory with 36,000 m^2 of floor space. The work has not started yet but is scheduled to be completed by August 1995. The move to the new factory is planned in January of 1996. The capital was increased by 650 million yen in March, 1994, to the present capital of 1,650 million yen. (The original capital was 1,000 million yen.)

The number of employees was 563 and there has been no increase in the last 5 years. Total sales have increased from 18,490,000 yuan in 1989 to 155,000,000 yuan. (Total sales in 1994 were estimated at 220,000,000 yuan.) Meanwhile, the production increase was achieved mainly by the improvement of productivity. The average monthly salary of employees is 750 yuan, but that does not include the extra salary which is approximately 250 yuan each month. The extra salary is the equivalent of 4 months' salary for ordinary workers, 6 months for section chiefs and 8 months for department managers. In addition, there is a system of sending employees to Japan for training at Koito. Twenty men come each time for a period of three to four months for training in a production shop. This has been done seven times.

70% of Shanghai Koito's products are made for the VW Santana which is manufactured by Shanghai VW. The rest are supplied to other automobile makers in Changchun, Tianjin, Jinan, and Nanjing, among others.

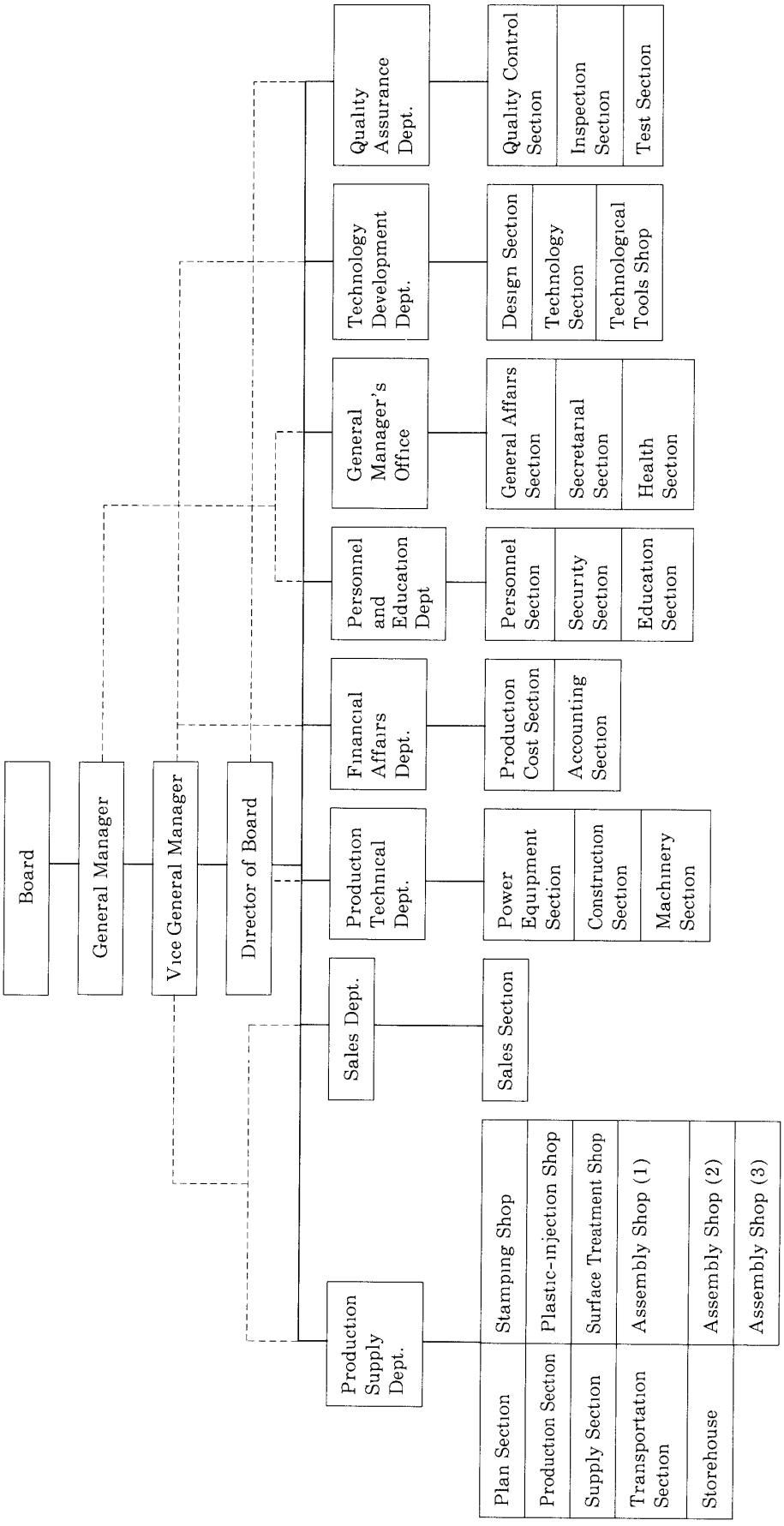
In the factory these is a shop for the manufacture and improvement of equipment. The workers in this shop are ranked high for their technological ability. The home manufacturing ratio is quite high.

To date, 70% of parts have been manufactured at home. Shanghai Koito has 30 parts-supply makers, most of which are town and township enterprises in Ningpo, Yongzhou, Nantong, among others.

Figure 1 shows the organizational structure of Shanghai Koito.

(b) Features of the stages of production

Six distinct stages are involved in producing auto lamps: press forming, plastic injection, surface treatment, assembly, testing, and technology development. Press forming is the first stage of lamp production. The factory has 30 presses of different tonnage in the pressing workshop. This includes a total of 160 tons of precision machines, over-sized machines, a 400 T multiple-station press, and a 360 T computer-controlled hydraulic press. The pressing process has been gradually converted from labor-intensive to technology-intensive with imported technological innovations and thereby become increasingly mechanized and automated. The reflectors used in the VW Santana lamps are one example. The complex shape and high precision of the reflectors meet the most advanced world standards. The fully automatic 400 T eight-



Source: Shanghai Koito Automotive Lamp Co., Ltd

Figure 1 Organization of Shanghai Koito

station press continuously and efficiently produces the reflectors. The tolerance of the parabolic face of the reflectors is controlled to within 0.1 mm to ensure the high quality of the light strength and beam shape. Another essential feature of the pressing workshop is the press forming lines which use various advanced combining technologies to produce about twenty differenct kinds of lamp housing. These combining technologies guarantee the precision of the geometrical shape of the complex hemming of the lamp and its relative position.

The second stage is plastic injection. Nineteen employees man the workshop operating the world's most technologically advanced plastic injection machines. The development of this workshop represents a big step towards modern production and a complete technological revolution. This new plastic injection workshop produced various kinds of plastic injection parts for auto lamps which have met the needs of VW-Santana sedans, Beijing Cherokee Jeeps, Tianjin Charade sedans, Nanjing Iveco light trucks, 125 motorcycles, among others. The yield has been a gross product of 3.9865 million yuan and a labor productivity of 209.8 thousand yuan per person per year.

Surface treatment, the third stage, is necessary for meeting the requirements of appearance and internal quality. Having imported the advanced coating technology from Japan Koito and made technological innovations of their own, Shanghai Koito now possesses various advanced surface treatment equipment which includes: small, large, and extra-large coating machines, an adhesive machine for round and irregularly shaped lamps, an automatic paint spraying table, a double-tier water curtain paint spraying table, and an automatic continuous drying furnace. They are used for the surface treatment of the 32 lamps which are mainly used on Shanghai Santana sedans. The superior quality of the surface treatment of the Santana compound head lamps has won the approval of SVW.

Stage number four is assembly. Instead of the traditional manual assembly lines, the various kinds of high quality auto lamps used in first class domestic cars, motorcycles, tractors and engineering vehicles are now assembled on modern "island" and other mechanized assembly lines. These use a variety of advanced technologies such as: hot-plate and super sonic welding; adhesive technology for head lights; astigmatic lens multiple-station assembly; chain conveying technology; air-sealed testing; light measurement technology. These assembly lines have attained a high level of quality, a high starting point, high specialization and mass production.

Shanghai Koito places special emphasis on the fifth stage which is the measurement and testing of products. To equip a variety of motor vehicles with effective, attractive "eyes", three generations of auto lamps, i.e. design, trial-production and production, must be tested repeatedly with advanced testing equipment to assure compliance with technical specifications. The complete set of testing procedures for automotive lamps includes: laser analysis as well as temperature, dust-proof, climatic, photometric, vibration, bulb life, and bulb light flux testing. Shanghai Koito is also

equipped with an advanced photometric testing laboratory with a complete set of testing instruments imported from Japan and can test the various photo-metric characteristics of head lamps, signal lamps, and RR reflectors. Measurement of the light colors of lamps as well as laser-analysis of glass figures can also be performed.

Another stage is technology development. The technology development department consisting of a design section, a technology section, and a technological equipment workshop, is responsible for, among other things, technical negotiating with customers, technical standards, product design, technical design, the manufacture of molds for technological equipment and clamping fixtures, and technical service for field production. As the rapid development of the Chinese automotive industry raises the quality and sophistication of many kinds of vehicles to world class level, the complexity of automobile lamps also increases. To keep abreast of these changes, more than 60% of the technicians of the technology development department at Shanghai Koito have participated in technical study in Japan at the Japan Koito facilities and can more skillfully master CAD and other such high technology than the persons of the same occupation in China. Some of the results of this development and training can be seen in the new sets of automotive lamps that have either been successfully developed of are currently being developed for the new VW Santana, Beijing Cherokee Jeep, Nanjing Iveco van, Jiang Xi Isuzu light truck, Jian Steyer heavy-duty truck, and Audi, Jetta, and Tianjin Charade cars.

(c) Current problems

The Shanghai Koito Automotive Lamp Co., Ltd. faces several technological problems. Basic technology is behind that of the other industrially advanced nations. When raw materials and parts (especially resin materials, glass lenses, bulbs, etc.) are required to be of international level quality, import is inevitable if the required specifications cannot be satisfied. The lifetime of the production machines made in China is nearly over. This would indicate that the machines have not actually performed well. This is especially true of the press machines. The quality of the dies for plastic molding is particularly low, and there is no model manufacturing technique that can be used for three dimensional curve processing. Shanghai Koito has few facilities for molding resins. Thus, even when orders are received for which there are the proper facilities, the employees have little experience in the manufacture of three dimensional curve molds (dies). The factory, which was acquired from the government, has a total floor space of 15,600 m^2 on a site of 8,000 m^2. There are four and five story buildings haphazardly arranged which lead to frequent interruptions in the production flow. It is even necessary to transport some materials by hand.

The workers in Shanghai factories were also seen to have some bad tendencies. They seem to lose the motivation to work once the day's norm has been accomplished. A sense of quality consciousness seems to be lacking. As long as a part is completed, no matter what the level of quality, the workers seem to be satisfied. Manual work is

preferred to advanced automation. Larger inventory is preferred. Employees want to work at their own pace and sit if possible.

Most of the facilities are old, subject to frequent trouble, and many are still non-automated. The maintenance system is generally poor. Homemade equipment, even if new, soon breakdown and request for repair is not responded to soon enough. Equipment is handled roughly. Many facilities still have hazardous working conditions. The workers tend to prefer high-cost foreign equipment.

Salary base has been rising rapidly. This is due largely to the policy of the Shanghai city authorities who have a goal of raising Shanghai's image to that of the international status quo. They believe that raising worker income, productivity, or the "will to work" will improve, which will consequently lead to an overall better, more international city. The average salary is 536 yuan, 120% higher when compared to 1989; 620 yuan, 115.7% in 1990; 750 yuan, 121% in 1991; 1,017 yuan, 136% in 1992; and 1,370 yuan, 135% in 1993. It is believed that the target of the Shanghai city authorities is to match Hong Kong's salary level within a few years.

III. Future problems

The tight relationship between automobile makers and parts makers and the division of labor system used in Japan's factories have contributed to the success of the Japanese automobile industry. As is well known, China has solicited Japan for its assistance in establishing this system in China. The Japanese response from MITI has been generally positive.

Shanghai VW is a foreign capital-based passenger car maker and largely dependent on parts ordered overseas. Since it has been a local government-managed enterprise. Shanghai VW has imported more than 80% of its parts. This parts buying ratio is exceptionally high. There are a large number of other local government-managed companies like FAW and SAW (most of them commercial car makers) where a vertically integrated, division of labor system is used, which are also heavily dependent on bought parts. This indicates that the auto parts industry in China is still underdeveloped.[9]

As is apparent from analysis above, for the future development of the automobile industry in China, it is of prinary importance to continue to absorb the advanced technology for auto parts production through the further promotion of passenger car manufacture. This must be done while at the same time continuing to maintain the tight relationships with foreign capital-dependent firms. A further problem is how to establish an efficient division-of-labor structure for the auto parts industry-this being just as important as the rearrangement and integration of the local government-managed automobile makers. The Chinese government has clearly stated its intention of directly addressing these problems. In 1994, the new policy of the Automobile industry clearly

emphasizes the promotion of both the automobile parts industry and the home manufacture of passenger cars ("people's cars").

It may thus be concluded that the further development of the automobile industry in China requires the establishment of an efficient division-of-labor system and therein lies a great opportunity for the Japanese automobile parts industry.

Notes

(1) According to Current state of Chinese Automobile Industry and a view of local manufacturing project, Chinese Automobile Industry: Current State and View of The Market by Kawabata, M., *TED Seminar Text No. 2A17,* Jidosha Mondai Kenkyu Kai (The Japan Association for the Research on Automotive affairs), 1992, p.28, the import tariff in China as of 1992 is as follows: 220% for passenger cars of no less than 2,000 cc and micro-buses with no more than 9 seats. 180% for passenger cars of no more than 2,000 cc and micro-buses with no more than 30 seats. 50% for trucks no more than 14 tons. 80% for automobile parts.

(2) China Automotive Industry Corp. (later renamed China National Automotive Industry Corp.) is a supervisory organ having an authority corresponding to that of the machine information bureau of the automobile section of MITI, Japan.

(3) For reference to Third Line Construction for Military Defence, see pp.77–80 and 158–162 of Furusawa, K., *The Historical Development of China Economy: from the Case of Primitive Accumulations Line to Innovation and Liberation Line,* Minerva Shobo, 1993.

(4) For reference to the prediction in units of automobiles supply-demand in China from 1981 to 1990, see Tanaka, S., View of Chinese Automobile Industry, *Monthly Automobile Parts, February* 1986, Japan Auto Parts Industries Association and Fig. 1 of his thesis.

(5) For reference to the automobile resale affair in Hainan Island, see pp.138–140, Furusawa, K., *Historical Review of Chinese Economy.*

(6) For reference to the organization ot The Seven Big Joint Venture Companies, see Table 1 of aforementioned Tanaka, S., *View of Chinese Automobile Industry.*

(7) The inside manufacturing ratio (estimated) of the "Chinese 7" core automobile factories are 80% at 2 companies, 70% at 1 company, 50% at 1 company and 40% at 3 companies, these values being relatively high compared with the approximately 30% of automobile manufacturers in Japan at that time. As to the factory outline including the inside manufacturing ratio in 1985 (representative automobile, units manufactured, number of employees, year founded), see Table 2 of Tanaka, S., *View of Chinese automobile industry.*

(8) According to *Business in China: Dream and Recording of Residentials in Beijing, China* by Watanabe, M., former director of Beijing office of Isuzu Motors by Saimal Pub., 1992, pp.124–127, the following 5 problems are cited as advantageous points for Japanese manufacturers advancing into China, namely to have the foreign funds counterbalance disregarded in 5–10 years since it comes after the start of manufacture, to have the facilities proposed by Japanese partners introduced without fail, to have inland the market liberated even with conditions, to have the supervising organ political interference regarding enterprise management and to take an attitude toward the Japanese's experience and knowledge with modesty.

(9) The domestic home manufacture manufacturing ratio of the Big Three and Small Three's ratio is according to the author's hearing investigations (March 1993, in Beijing) through the staff of China National Automotive Industry Corp.

〔付　記〕 本稿は，(1)城西大学学長所管研究奨励金「日本の自動車産業におけるハイテク化と国際競争力に関する研究」（平成4〜5年度），及び(2)文部省科学研究費補助金「現代自動車部品工業における技術発展と国際化に関する研究」（平成4年度，一般研究C）の研究成果などを収めてまとめたものである。