

# **Analysis of the Dynamic Relationship between the Emergence of Independent Chinese Automobile Manufacturers and International Technology Transfer in China's Auto Industry**

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**Abstract:** This paper examines the relationship between the emergence of independent Chinese automobile manufacturers (ICAMs) and International Technology Transfer. Many scholars indicate that the use of outside supplies is the sole reason for the high-speed growth of ICAMs. However, it is necessary to outline the reasons and factors that might contribute to the process at the company-level. This paper is based on the organizational view. It examines and clarifies the internal dynamics of the ICAMs from a historical perspective.

The paper explores the role that international technology transfer has played in the emergence of ICAMs. In conclusion, it is clear that due to direct or indirect spillover from joint ventures, ICAMs were able to autonomously construct the necessary core competitive abilities.

**Keywords:** Marketing, International Business, Multinational Corporations (MNCs), Technology transfer, Chinese Automobile industry

## **1. Introduction**

The purpose of this study is to investigate the chaotic

but progressive emergence of independent Chinese automobile manufacturers (ICAMs). It will also provide an academic view of the relationship between

the emergence of ICAMs and international technology transfer, from the points of view of both of the firms involved in the joint ventures (JV), that is, from both the major foreign automobile manufacturers' (i.e., VW, etc.) and the Chinese domestic automobile manufacturers' (i.e., FAW, etc.) points of view.

Many economists have documented the relationship between international technology transfer and the development of the Chinese automotive industry. For example, Guo and Zhang (2008) discovered that technological transfer from multinational companies has not brought a substantial improvement to the Chinese passenger vehicle industry, but has caused even more dependency on foreign technological transformation. Focusing on the change over time in the investment behavior of multinational corporations, Lei and Xu (2006) have concluded that the investment atmosphere has changed from one of monopoly to one of competition, which has helped to improve the international competitiveness of China's automobile industry. Jia (2004) reached a similar conclusion.

However, most studies have focused on the transferring side (multinationals), not on the recipient side (Chinese companies). The findings of the aforementioned studies indicate that the expectation of international technology transfer exists in China, as does the belief that the competitiveness of China's automobile industry has improved through advanced technology transfer and investment behavior transformation. However, since industrialization is

neither spontaneous nor caused just by an outside ripple effect, this paper will focus on the internal aspects, that is, the nature of the "Chinese learning mechanism" and the role of international technology transfer in the growth of independent Chinese automobile manufacturers. These manufacturers are regarded as the new forces of Chinese manufacturing

To clarify these issues, this paper will attempt to answer the following questions: (1) How and why did ICAMs enter the passenger vehicle market? Why was their emergence chaotic but progressive for the Chinese automobile industry? (2) What role has international technology transfer played in the ICAMs' emergence process? What effects, if any, did international technology transfer have on the competition building of ICAMs? (3) What are the largest barriers faced during international technology transfer from automotive Sino-foreign joint ventures to ICAMs? These questions are followed by another, that is, whether the key factors indispensable to the growth of ICAMs into world-class automakers are present in the current situation.

To answer these questions, this paper was divided into three parts. First, we distinguish between independent and non-independent Chinese automakers. We elaborate on the background and origin of ICAMs and outline the key factors that affected their emergence, especially in the passenger vehicle market. Although new entrants were banned by the industrial policy a few years after the implementation of the Auto Industry Policy (1994), some Chinese indigenous enterprises entered the

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passenger vehicle market successfully. CHERY and Geely can be regarded as examples of these new players. We also deal with the question of what changed after the emergence of ICAMs. Second, we review the history of international technology transfer to the Chinese auto industry until the end of the 1990s. Finally, we analyze the dynamic changes of the relationship between international technology transfer and the growth of ICAMs.

**2. Definition of ICAMs: What does “Independent” mean?**

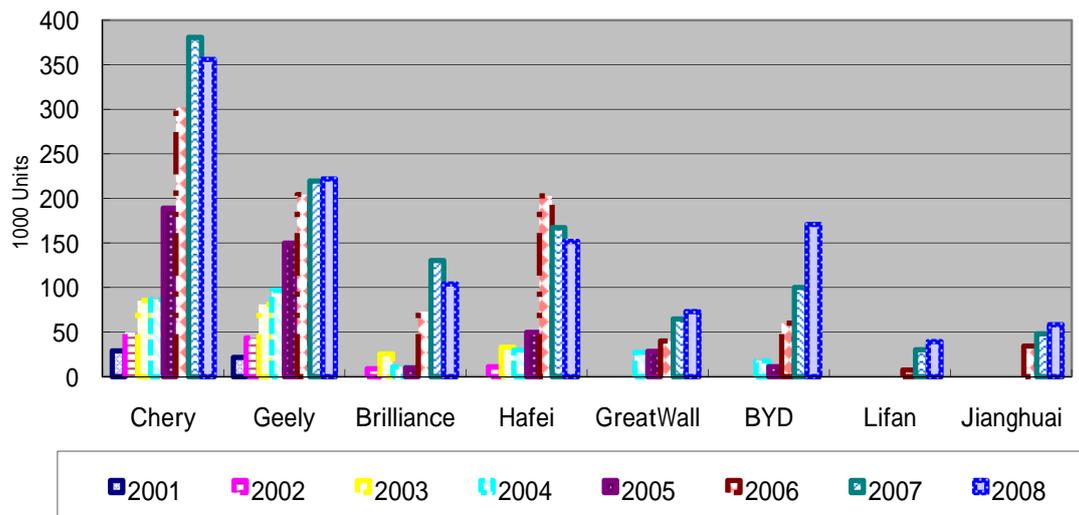
If (1) the automaker has developed its own indigenous brand, and (2) all the technologies necessary for R&D and the manufacturing process were *not* introduced through a form of joint venture with foreign companies, we use the term “ICAM.”

CHERY Automobile, Geely Automobile, Great Wall Motors, Zhongxing Auto, etc. can all be regarded as ICAMs.

*Non-independent* Chinese automakers simply introduce their foreign joint venture partners’ existing models as their own new ones. Companies such as Beijing Motors, Guangzhou Motors, etc. were provided with brands, passenger vehicle models, and all the necessary technologies, and thus were dependant on their foreign partners.

On the basis of this definition, over 20 enterprises (or brands) can be recognized as ICAMs. Because of the industry protection policy (that also served as a strict entry restriction for the passenger vehicle market), most ICAMs concentrated on trucks (including pickup trucks) and SUVs (Sport Utility Vehicles) as their main products. Another

**Figure 1. Passenger car sales by ICAMs**



Source: *Automotive information* 2002–2009. China Automotive Technology & Research Center (CATARC).

**Table 1.** Sales of top 10 passenger vehicle manufacturers in the Chinese market, 2001–2008 (1,000Units)

	2001		2002		2003		2004		2005		2006		2007		2008	
	Shanghai Volkswagen	FAW - Volkswagen	SAIC -GM Volkswagen	Shanghai Volkswagen	SAIC -GM Volkswagen	Shanghai Volkswagen	SAIC -GM Volkswagen	FAW - Volkswagen	Shanghai Volkswagen	FAW - Volkswagen						
1	241	125	301	208	396	298	354	325	325	325	406	495	495	499	499	499
2	—	125	208	111	298	201	300	252	250	240	349	461	461	478	478	478
3	80	80	111	111	201	201	252	252	240	240	345	456	456	445	445	445
4	58	58	95	95	117	117	202	202	234	234	302	381	381	366	366	366
5	53	53	85	85	114	114	144	144	230	230	290	295	295	356	356	356
6	51	51	65	65	103	103	130	130	190	190	260	282	282	351	351	351
7	28	28	59	59	100	100	110	110	189	189	219	272	272	306	306	306
8	22	22	50	50	85	85	97	97	158	158	204	231	231	295	295	295
9	—	—	41	41	76	76	89	89	150	150	203	220	220	222	222	222
10	—	—	40	40	65	65	87	87	140	140	201	218	218	205	205	205

Note: 1/ In June 2002, when China FAW Group Corp acquired Tianjin Automotive Xiali Co., the abbreviated name of Tianjin Automotive Xiali Co. was changed to Tianjin FAW.

2/ Since SAIC sold its stock back to CHERY in 2004, the abbreviated name of CHERY changed from SAIC-CHERY to CHERY.

3/ The sales of Geely Automobile is the sum of all its related subsidiaries, including SMA (Shanghai Maple Guorun Automobile).

4/ Sales of crossover vehicles are not counted.

5/ DPCA is the abbreviation of Dongfeng Peugeot Citroen Automobile Co., Ltd.

6/ Since the data-sources for 2001 and 2002–2008 are different, there may be some inconsistency in the figures for 2001 and after 2001.

Source: 'Annual vehicle sales and production of China 2001 (2001 Nian 1-12 Yuefen Qiche Shengchan Xiaoshou Qingkuangbiao)' (2002). *Internal Combustion Engine Parts*, China Internal Combustion Engine Industry Association, 1, 41–44; *Automotive information 2002–2009*. China Automotive Technology & Research Center (CATARC).

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problem faced by the newcomer ICAMs was weak design and innovation capabilities, especially in the case of advanced engines and system integration. Until now, only eight ICAMs have successfully begun passenger vehicle manufacturing<sup>1</sup>: CHERY, Geely, BYD, Brilliance, Lifan, Great Wall, Hafei, and Jianghuai (see Figure 1).

Figure 1 illustrates that only a few ICAMs have reached a suitable scale (assuming a minimum level of 50,000 units per year). Moreover, most ICAMs' annual sales are still comparable to those of Sino-foreign joint venture companies (see Table 1).

The word “independent” seems to mean “technically isolated” in the case of ICAMs. Compared to Sino-foreign joint venture enterprises, most ICAMs did not have either sufficient resources to design new models or skills in manufacturing. Sino-foreign joint venture enterprises surpass ICAMs in such aspects as technology, qualified human resources, facilities, and capital.

However, most Sino-foreign joint ventures lack one important characteristic—an “autonomous brand.” This makes the introduction of new models almost

impossible. Further, these *non-independent* automakers (most of which are state-owned enterprises) have no opportunities to develop inter-competitiveness because most of them are engaged only in the assembly process. The Chinese media claims that state-owned automakers are satisfied with the current state of affairs, that is, with the assembly of foreign models from imported parts, not the launch of their own brands. Most state-owned automakers are supported by the central government and are protected (from competition by new entrants) by industrial policy; these automakers enjoy being joint ventures and have lost the ability to become “independent.” In the other words, they are *non-independent*.

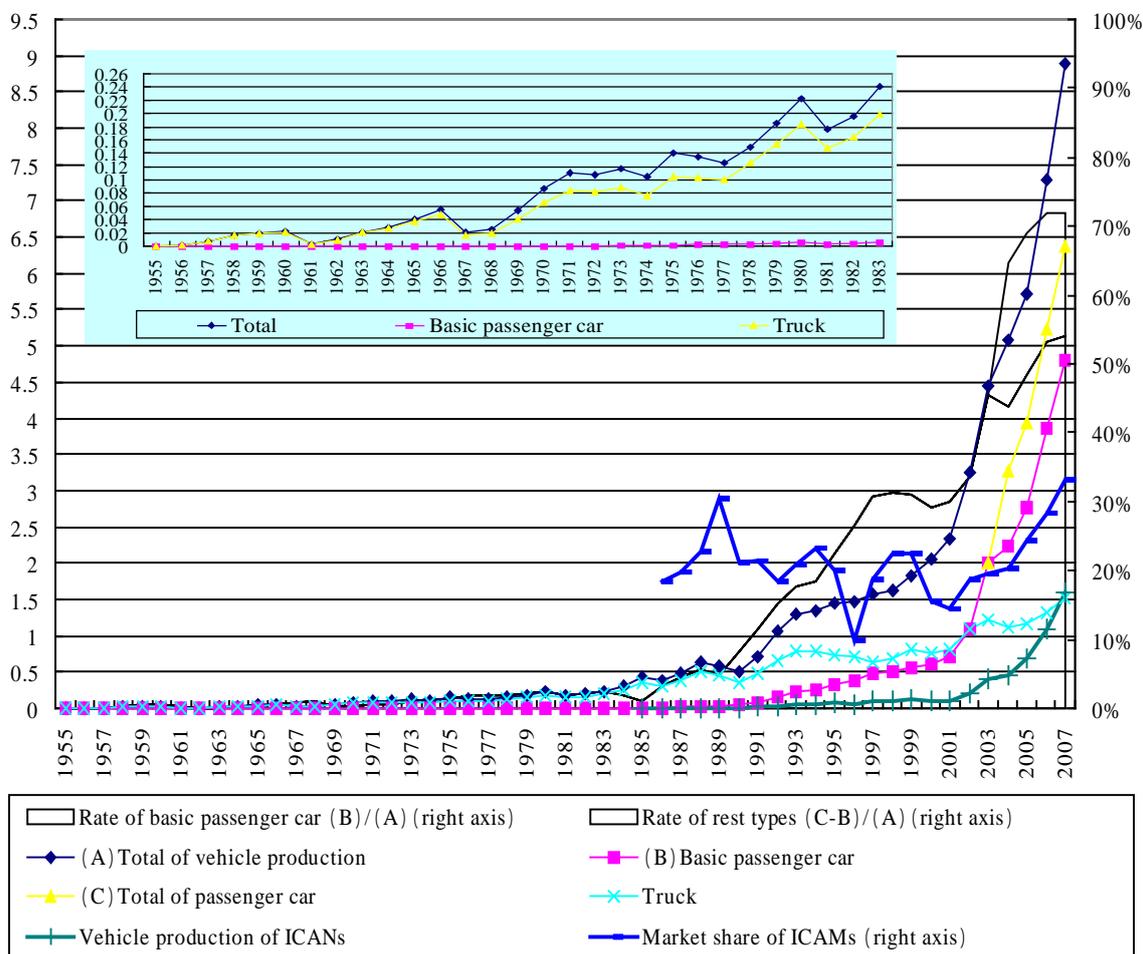
### **3. Background of the emergence of ICAMs: What stimulated new entry?**

This section provides an insight into the history of the Chinese automobile industry. As one of the key industries in the Chinese economy, the automobile industry was strictly controlled by the central government until the Reform and Open Policy was implemented in 1979. At that time, all production activities related to automobiles (such as R&D, manufacturing, and delivery) was based on the annual plan issued by the central government, and no independence or management rights were given to the automakers. In this context, the growth of the Chinese automobile industry was mostly based on a policy of self-reliance. The main product lines were trucks and buses. The use of passenger vehicles (regarded as

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<sup>1</sup> In 2001, the Chinese government amended *Motor Vehicles and Trailers—Types—Terms and Definitions* from GB 3730.1-1988 to GB 3730.1-2001. Under this amendment, the definition of “passenger car” is updated as including basic passenger cars (i.e., sedans or saloons), MPVs (Multi Purpose Vehicles), SUVs (Sport Utility Vehicles), and crossover vehicles. For this reason, some local Chinese SUV or MPV manufacturers, regarded as commercial vehicle manufacturers under the previous definition, have become passenger car manufacturers since the amendment was approved. In this paper, we do not cover these cases; we are concerned only with the companies that are permitted to manufacture basic passenger cars. That is why we just focus on these eight passenger vehicle manufacturers.

Figure 2. Vehicle production in China (1955–2007) (million units)



Source: *History of China automotive industry 1901–1990* (1996). China Communications Press; *Automotive information 2002–2009*, China Statistical Yearbook 2001–2008.

belonging to a “capitalist” lifestyle) was limited to official business purposes, and was not promoted until 1987. The first family-cars (or “private cars”) were released in 1989. From Figure 2, we can see that, in comparison with trucks, the production of basic passenger vehicles increased very slowly until 1989.

At a glance, the Chinese central government did not promote passenger vehicle manufacturing until 1987. Permission to launch joint venture projects was

granted to Beijing-AMC and to Shanghai-Volkswagen in 1983 and 1984, respectively. This was somewhat contradictory to the policy of product restriction. By granting this permission, the central government hoped to achieve the objective of import substitution.

As a result of the self-reliance policy, which had been in effect for approximately 30 years before the Reform and Open Policy, the Chinese automobile

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**Table 2.** Prices of some short-lived models in the Chinese market in the 1990s

<b>Model</b>	<b>Price (Year)</b>	<b>Rate of price via GDP per capita*(= RMB 6079)</b>
Audi 100	289,000 ('94)	45.54
Rex	62,800 ('94)	10.33
Hongqi CA7560	520,000 ('95)	85.54
Xiao Hongqi	220,000 ('97)	36.19
Cherokee 2021	188,000 ('97)	30.93
Santana 2000	165,000 ('97)	27.14
Santana	135,000 ('97)	22.21
Jetta	135,000 ('97)	22.21
Fukang (Citroën ZX)	135,000 ('97)	22.21
Peugeot 505	135,000 ('97)	22.21
Charade	66,500 ('97)	10.94
Alto	60,000 ('97)	9.87

Note: \* means data of 1997.

Source: Chen (2000), p. 64, National Bureau of Statistics of China.

industry was completely isolated from the rest of the world. For this reason, vehicles produced by Chinese automakers could not satisfy user needs by way of either quantity or quality. The import rush, especially for passenger vehicles, began after 1980. Although passenger vehicles had been imported since the 1950s,<sup>2</sup> the volume of import increased rapidly in the 1980s, and even exceeded the central government's expectations. For example, during the period 1981–1986, a total of 183,000 passenger vehicles (of total value, US\$ 850 million) were imported. In comparison, the average annual production of domestic automakers was only 4000 units. The import of passenger vehicles became the country's main expenditure in foreign currency.

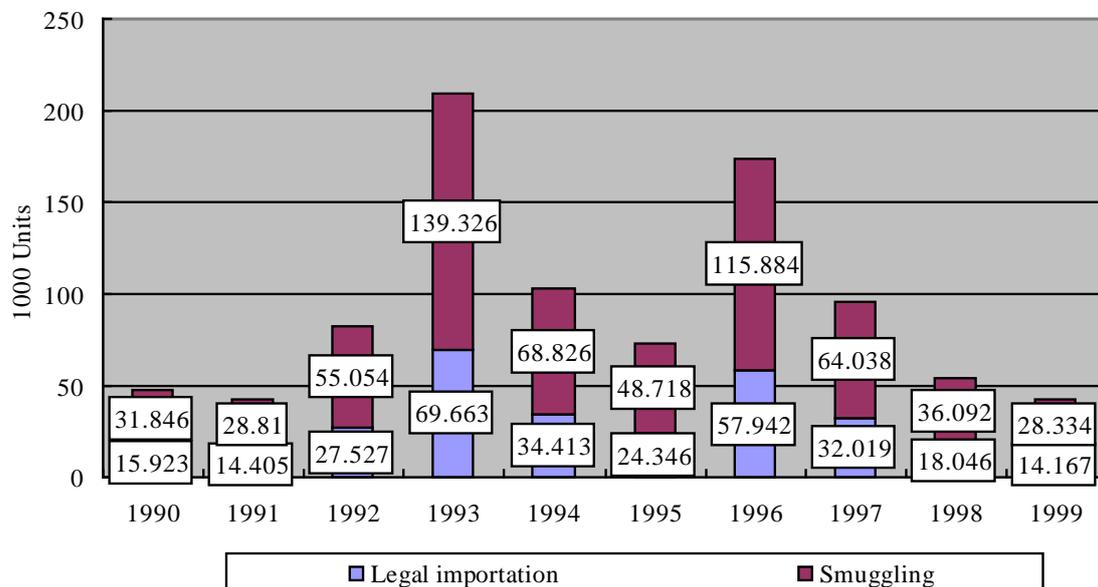
For this reason, the Chinese government decided to launch an import substitution mechanism. In 1987, the government issued the "Notice from State Council of PRC on the Reinforcement of Controlling the

*Importation of Passenger Vehicles*" to authorize China Faw Group Corporation (FAW), Shanghai Automotive Industry Corporation (SAIC), Dongfeng Automobile Company, Beijing Automotive Industry Corporation, Tianjin Automotive Industry Corporation, and Guangzhou Automotive Industry Corporation as the only domestic players in passenger vehicle manufacturing.<sup>3</sup> Through the 1980s and 1990s, the Chinese government reinforced the limitations of new entrants in the passenger vehicle market by the successive issuing of numerous acts related to the industry. Examples of these acts are "Notice on the Regulations of Controlling the Number of Passenger Vehicle Manufacture (1988)," "Decisions Concerning the Main Points of China's Current Industrial Policy (1989)," "Outline of State Industry Policies for the 1990s (1994)," and "Automotive Industry Policy (1994)."

<sup>2</sup> For example, the Chinese government imported 60 Benz cars in 1956. Chen and Ouyang (2005), pp. 81–82.

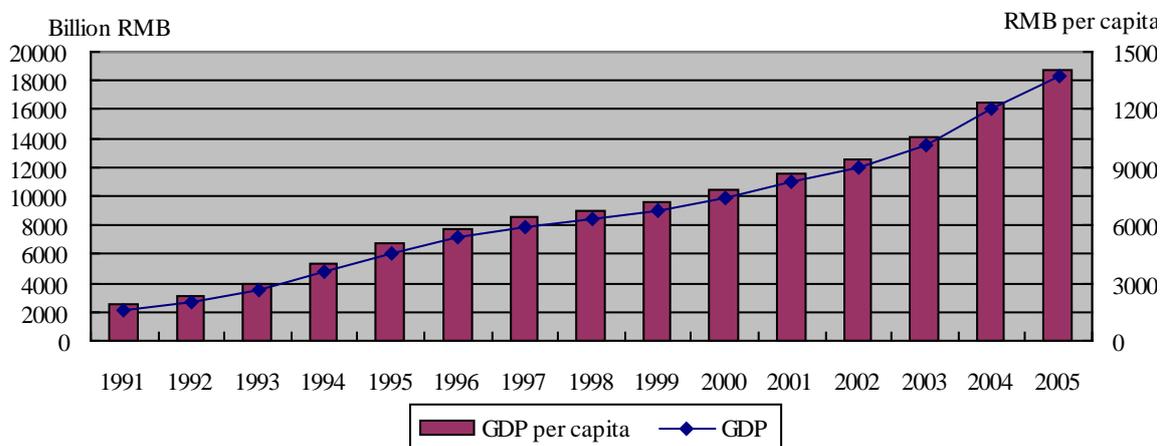
<sup>3</sup> State Council of PRC, "Notice on the Regulations of Controlling the Number of Passenger Car Manufacturers (Chinese Pinyin: Guanyu yange kongzhi jiaocheshengchandang de tongzhi)," 1988.

Figure 3. Importation in China through the 1990s



Source: Zheng (2007), p. 75.

Figure 4. GDP and GDP per capita in China, 1991–2005



Source: National Bureau of Statistics of China.

As a result, in the early 1990s, the Chinese automobile market was an oligopoly, led by a few authorized players and strictly protected by both industrial policy and high import duties. All the

authorized players intended to raise productivity through joint ventures with foreign corporations. This import substitution policy met with partial success. However, the price of products made by

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these joint ventures was higher than levels in the rest of the world, and much higher than the income levels of the normal Chinese household (see Table 2).

For this reason, in the early 1990s, automobile demand was mainly supported by state officials and state-owned companies, not by households. The high price of vehicles was the largest constraint on household demand. The average price of most vehicles was higher than RMB 130,000, which was more than 20 times the GDP per capita in 1997. In addition, the smuggling in of passenger vehicles in the 1990s greatly exceeded legal import (see Figure 3).

Generally speaking, the motorization of a country is quite smooth after its GDP per capita surpasses US\$ 1,000. After 1994, the Chinese GDP and GDP per capita experienced rapid growth (see Figure 4).

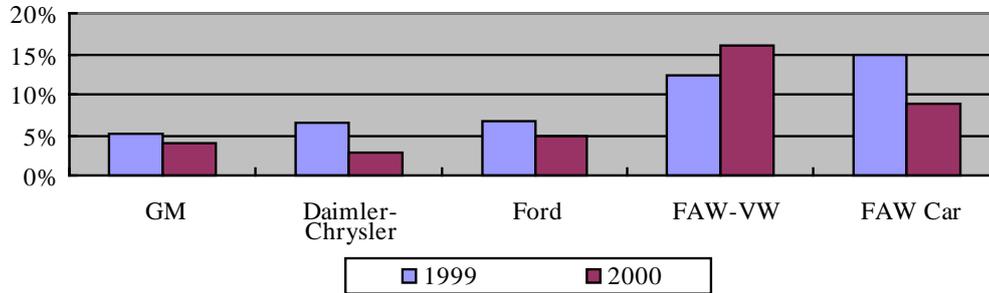
In the late 1990s, the Chinese market attracted the attention of global automakers, who revealed plans to enter the market because of its high growth potential. In 1998 and 1999, Honda and GM successfully used their last opportunities to enter the Chinese market, before the country's admission to the WTO. Honda founded a joint venture with Guangzhou Auto, and GM, in cooperation with its partner, Shanghai Auto, located one of its plants in Shanghai.

In the middle of the year 2000, when the Chinese GDP per capita was close to the US\$ 1,000 mark, the government and most joint venture automakers started to focus on the production of "family cars" (or "public cars"). Many automakers planned to promote products specified as "family cars," worth RMB 100,000, to influence motorization in China. However, in 2001, the income levels of

**Table 3.** Possibility analysis of China's motorization

The beginning of motorization in depended countries						
	U.S.A		Germany		Japan	
Period of speeding up	1910s–20s		1950s		1960s	
Price of public car	550 Dollars Ford Model T		4,500 DM VW1200Exp		410,000–430,000 Yen Corolla, Sunny	
Annual average per capita income	500 Dollars average of 1914–1923		3800 DM (1958)		380,000 Yen (1966)	
/	1.1		1.2		1.1	
Case study of China around 2000						
Price of promotion car by joint venture	About RMB 100,000 (Toyota Vios RMB 105,000, Honda Fit RMB 99,800)					
Price of ICAMs' vehicles	About RMB 40,000 (Geely HaoQing RMB 29,990–42,990)					
	China	Beijing	Tianjin	Shanghai	Guangdong	
GDP per Capita (RMB)	8622	25523	20154	37382	13730	
/	11.60	3.92	4.96	2.68	7.28	
/	4.64	1.56	1.98	1.07	2.91	

Source: *Weekly Economist*, (2004 September 28), p. 25, National Bureau of Statistics of China, author edited.

**Figure 5. Profit margins in the U.S. and China**

Note: Here, Profit margin is calculated as total profit as a percentage of total sales.  
Source: Gan, Dai, & Li, (2002).

Chinese households still were low, and motorization became possible only in some advanced areas like Shanghai, Beijing, and Tianjin (see Table 3).

Foreign companies were not the only ones to recognize the opportunities in the Chinese market in the late 1990s; Chinese domestic companies recognized them as well. In the 1990s, the high rate of profits in the passenger vehicle industry attracted domestic companies that had potential capabilities (see Figure 5). Additionally, the high price of the joint venture products and the high potential demand from households gave domestic producers the best opportunity to enter the segment of vehicles priced under RMB 100,000, which joint venture automakers did not intend to enter (see Table 3).

CHERY and Geely had been planning to enter the passenger vehicle market since 1997 with products priced at under RMB 100,000 (which was 1/2 to 2/3 of the price of the models produced by joint venture automakers). Although these domestic companies were not authorized as automakers due to the limitations of the automobile industrial policy

enacted in 1994, before China's entry to the WTO (1997–2003), they tried nevertheless to enter the market by gaining support from local governments (e.g., CHERY), or by taking over small state-owned automakers (e.g., Geely). Both strategies would give the domestic companies authorization to produce buses and trucks, but not to produce passenger vehicles. Under these conditions, some companies tried to produce and sell passenger vehicle models legally registered as microbuses.<sup>4</sup>

#### **4. Competitiveness strengthening strategy of ICAMs: How did they build their “Knowledge”? (Case study of CHERY and Geely)**

As mentioned earlier, in the late 1990s, the market for vehicles priced under RMB 100,000 was neglected by joint venture automakers; potential demand from households supported by the gradual growth of GDP per capita gave domestic companies an entry opportunity. On the other hand, the entry of domestic

<sup>4</sup> For further details, see Li (2007a),

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automakers into this low-end market, coupled with their intention to produce a cheap product, provoked price competition among manufacturers. Moreover, the low-price strategy further escalated competition in the entire market and caused the phenomena of price drop and rapid market expansion.

Since 2000, the Chinese passenger vehicle market has become one of the world's fastest-growing automobile markets—annual sales of new vehicles grew from 2.06 million units in 2000 to 7.27 million units in 2006, demonstrating a 23.4% average annual growth rate—and has attracted automakers from all the world over with its potential for growth and profits. Due to this growth, the number of domestic automakers, including CHERY and Geely, has expanded rapidly (see Figure 1).

Based on a survey of more than 100 Chinese firms that have been in operation since 2005, this section explores how ICAMs managed to build their “knowledge.” We focus on the role that international technology transfer has played in the competitiveness strengthening process of ICAMs. First, let us provide more details about CHERY and Geely.

CHERY, officially known as CHERY Automobile Co., Ltd., “was founded in 1997 by five of Anhui’s local state-owned investment companies, with an initial capitalization of RMB 1.752 billion. Plant construction commenced on March 18, 1997, in Wuhu (City), Anhui Province, China. The first car was produced on December 18, 1999. This represents a milestone in Chinese manufacturing history because it was the first car produced by a

totally Chinese owned and managed company.”<sup>5</sup> CHERY sold 3,810,000 units in 2007, in contrast with just 87,000 units in 2004. In 2007, CHERY Automobile sold 119,800 units in overseas markets, including Russia. Overseas expansion, especially in Russia, Southeast Asia, and the Middle East, has become a very important determinant of CHERY’s growth.

Geely, official known as Geely Group Co., Ltd., was founded on November 6, 1986. “Geely made its debut in manufacturing parts of refrigerator-evaporators. It was located in Huangyan, Luqiao, Taizhou city, Zhejiang Province. In 1989, Geely entered the production of advanced decoration materials and manufactured the first magnalium bent board in China. In April 1994, Geely entered the motorcycle industry, and in June of the same year, it manufactured China’s first scooter motor. Its total sales volume reached 60,000 units in 1995 and 200,000 units in 1996. Geely thus became the main motorcycle manufacturer in China.”<sup>6</sup>

“In May 1996, Geely Group Co., Ltd was re-organized. In March 1997, Geely entered the higher-education industry. The Group now has three colleges, including Beijing Geely University—one of China’s privately-owned universities that possesses the independent right to authorize the High Education Diploma in Beijing city.”<sup>7</sup>

“In 1997, Geely entered the automobile industry. On August 8, 1998, the production of the

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<sup>5</sup> [http://www.cheryglobal.com/about\\_chery.jsp](http://www.cheryglobal.com/about_chery.jsp)

<sup>6</sup> <http://www.geely.com/english/about/intro.htm>

<sup>7</sup> <http://www.geely.com/english/about/intro.htm>

**Table 4.** HQ6360 (Geely) vs TJ7101 (Tianjin Xiali)

Parameters	HQ6360	TJ7101
Photo		
Maker	Geely	Tianjin Xiali
Length-width-height (mm)	3650/1615/1410	3680/1615/1385
Wheelbase (mm)	2340	2340
Engine	376Q	TJ376QE
Engine displacement (cc)	993	993
Weight (kg)	1170	815

Source: Li (2007a).

**Table 5.** QQ (CHERY) vs Matiz (GM-Daewoo)

Parameters	QQ	Matiz
Drive System	FF	FF
Length-width-height (mm)	3550/1508/1491	3495/1495/1482
Wheelbase (mm)	2348	2340
Engine	SQR372MPI/DA-465QMPI	M-Tec/B10S1
Engine displacement (cc)	812/1051	796/995
Weight (kg)	850	840
Top speed (km/h)	135	140
Tire	175/60R13 77H	155/65R13
Suspension (Front)	MacPherson Strut	MacPherson Strut
Suspension (Rear)	Independent suspension	Non-independent suspension
Fuel consumption (L/100 km)	4.2 (60 km/h)	4.0 (90 km/h)

Source: Li (2006).

first Geely Car was launched in Linhai City, Zhejiang Province. On November 9, 2001 and December 26, 2001, China State Economic and Trade Commission (hereafter SETC) approved the Geely Automobile JL6360, HQ6360, MR6370, and MR7130 series to be listed in the SETC automobile products public catalog. Geely Automobile became the first private enterprise approved as an automobile manufacturer in

China.”<sup>8</sup>

Most of CHERY and Geely’s first generation products were thought of as either copies of existing vehicles or hodgepodes of different products (see Tables 4 and 5). This was especially true for exterior design. Both companies were placed under the scrutiny of intellectual property disputes with foreign automakers. However, as we will see below, this point

<sup>8</sup> <http://www.geely.com/english/about/intro.htm>

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**Table 6.** List of high-level proficient experts in CHERY

<b>Name</b>	<b>Post</b>	<b>Job experience</b>
<b>Oversea Chinese experts – about 30 people</b>		
Xu, M.	Director of Automotive Engineering Institute of CHERY, Chief Leader of R&D	Engine Expert, Ph.D. of Engineering (Hiroshima University), worked for GM, Ford, Visteon
Xin, J.	Vice Director of Automotive Engineering Institute of CHERY, Leader of Engine Durability & Hybrid Car	Worked for Honda (U.S.A)
Gu, L.	Vice Director of Automotive Engineering Institute of CHERY, Leader of Digital Crash Test	Crash Test Expert, Ph.D. of Modern Mechanics (University of Science and Technology Beijing, Northwest University), worked for Ford
Yuan, T.	Vice President (Parts Procurement)	Studied in Beijing University of Aeronautics and Astronautics, Ph.D. of Engine (Centre National de la Recherche Scientifique)
Qi, G. J.	Vice Director of Automotive Engineering Institute of CHERY, Leader of Automotive Body-In-White	Worked for DaimlerChrysler AG
Sun, G. C.	Vice President (CFO)	Worked for DuPont (China) as CFO
Yuan, Y. B.	Chassis Research	Worked for TRW Automotive
Li, M.	Electronic Driving Research	Worked for Motorola
Zhu, X. C.	Transmission Research	Back to CHERY from Australia
Gu, Y.	Vice President of CHERY Subsidiaries (Die & Molt)	Worked for Fuji Japan
<b>Chinese Experts from FAW – about 150 people</b>		
Kang, L. M.	Chief Engineer, Engine Project Manager	FAW
Hu, F.	Vice Chief Engineer, Project Leader of Engine Co-project with AVL	Gratitude from Automotive Engineering (Tsinghua University), FAW, retired from DongFeng Motors in 1995
Feng, J. Q.	Vice Chief Engineer, Designer of CAC372 Engine for QQ0.8L	The first engine designer of New China, he designed 6102 gasoline engine for JieFang 141 Truck
<b>Foreign Experts – about 40 people</b>		
Terada, S.	Plant Manager, Operation Management	Worked 30 years for Mitsubishi Motors as Plant Manager
Kawano, K.	Director of Plant KAIZEN	Worked 40 years for Mazda Motors
Kim, U. S.	Vice Chief Engineer	Ricardo Company
German experts	Manufacturing Technology Support	Unknown
<b>Others Domestic Engineers</b>		
Lu, J. H.	Vice President (R&D)	Gratitude from Automotive Manufacturing (Tsinghua University)
Li, F.	Vice President (Sales)	Worked for Foton Motors sales Co. as Vice President
<b>Total</b>		
In 2006, CHERY had 18,000 employees, including nearly 4,000 engineers. 1,500 engineers were directly involved in R&D.		

Note: Each rank/title corresponds to the year 2004 position.

Source: Li (2007b).

of view was based on empirical observation and was strongly affected by visual likeness.

What was the cause of the resemblance between

the ICAMs' products and other existing models? The

new entry limitations forced domestic companies to

take an unusual approach in entering the passenger

vehicle market. Without the necessary technology accumulation required for original R&D, qualified human resources, and capital, the ICAMs, including CHERY and Geely, designed new models by using reverse engineering tools, outsourcing design, and introducing technology and know-how through product line acquisition. However, as we have mentioned above, this imitative design caused numerous intellectual property rights problems before 2003.

Therefore, to avoid conflict with foreign automakers, it became extremely important to enhance original design and concepts for all ICAMs. We study the case of CHERY to illustrate how ICAMs managed to increase their capabilities of original product design and R&D. The same phenomenon was demonstrated in the case of Geely.

#### **(a) The headhunting of high quality proficient experts**

The first stage of knowledge acquisition (especially design and R&D know-how) included hiring Chinese engineers who were working for major global automakers and related companies, through headhunters and other types of intermediaries.

A number of foreign experts were also invited to work in China. For example, CHERY invited about 30 overseas experts with broad experience in such companies as GM, Ford, Visteon, Daimler Chrysler, Du Pont, TRW, and Motorola. These experts brought advanced technologies and know-how to CHERY and then diffused their knowledge throughout the

company by means of on-the-job training. This was especially effective in the case of young engineers (who are capable of absorbing useful knowledge directly and quickly).

In addition to the 30 foreign experts, CHERY invited more than 150 Chinese experts and engineers from FAW (FAW was supposed to have employed more engineers than any other state-owned automaker). These highly skilled professionals commenced work in the R&D and manufacturing departments of CHERY. By the end of 2006, CHERY had 18,000 employees, 20% (that is, approximately 4,000 people) of whom were engineers, and 1,500 of whom were directly related to R&D (see Table 6).

#### **(b) Joint-development projects and design outsourcing**

Besides the human resource policy, CHERY acquired technology and know-how via co-operation projects of joint-development and design outsourcing. Most ICAMs operated in a similar fashion. They preferred the tie-up cooperation of joint development and introduced the necessary knowledge from foreign professional engineering corporations.

For instance, in 2001, CHERY initiated a joint development project with AVL of 18 high-level engines (AVL is the world's largest privately-owned independent company in the development of power-train systems with internal combustion engines and instrumentation and test systems).<sup>9</sup> In

<sup>9</sup> <http://www.avl.com/wo/webobsession.servlet.go?app=bcms&page=view&nodeid=400013015>

### ***Emergence of independent Chinese automobile manufacturers***

this joint development project, for the purpose of improving its capabilities, CHERY wanted to acquire not just the 18 ready-made engines, but also the knowledge of how to design an original high-level engine.

A special training program for CHERY's specialists was organized by AVL, and a group of guest engineers was sent to AVL to acquire technical knowledge of the process. After a full day's work, they were required to recall all the details, record them, and report to CHERY's head office. Based on the working records of these guest engineers, CHERY established its own development standards and launched the development of its own original engine.

For design outsourcing, CHERY chose to cooperate with an outsourcing destination by sending a team of CHERY engineers to the outsourcing company. As soon as CHERY's engineers were able to understand and master certain aspects of a project, they were entrusted to fulfill these functions by themselves; only the operations that they could not comprehend were outsourced. Having repeated this process several times, CHERY acquired more of the knowledge, technology, and know-how necessary for enhancing original design capabilities.

#### **(c) Original affiliated supplier chain construction**

When CHERY and Geely made their first attempt to enter the passenger vehicle market with their first generation products, they depended on the existing parts suppliers who were subordinated to joint

venture automakers. For example, in 2002, Geely relied on parts from Tianjin Xiali's suppliers (at a maximum rate of 95%) to produce HaoQing.<sup>10</sup> CHERY procured parts from suppliers affiliated to ShanghaiVW for its first generation sedan product, which was called WindCloud.

However, the procurement of essential parts from competitors' affiliates caused a dilemma for CHERY and Geely because they had to compete with the very companies from which they procured essential parts like engines and chassis. As new entrants, they depended on a low-price strategy to gain competitiveness in the passenger vehicle market. Relatively high prices of parts from competitors, however, reduced their potential profit. This motivated CHERY and Geely to build their own network of affiliated suppliers as quickly as possible.

By the end of 2004, there were approximately 200 parts suppliers who had business relationships with Geely. Meanwhile, Geely gained 50% control of 100 companies and successfully founded its own stable system of parts suppliers. As a result, the dependence on Tianjin Xiali affiliates for supplies decreased from 95% to 1% by 2004.

Using these methods, ICAMs gained the opportunity to enhance original design capabilities and improve competitiveness. What is remarkable is that although ICAMs were not at the same growth level since they had entered the market at different times and had different management structures, the

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<sup>10</sup> Sun, Jili, & Shangde (2007).

need to gain and enhance original R&D capabilities was common to all of them. In light of the fierce competition between the joint venture automakers and their forerunners, there was no room in the passenger vehicle market for new local participants such as CHERY and Geely, especially because their strategy was to copy and market existing low-end models.

### 5. Discussion: The role of international technology transfer

ICAMs demonstrated rapid growth rates in both the domestic and the international markets. In 2007, ICAMs accounted for a 31% share of the domestic market, which was the highest record in history. CHERY is a good example, with sales of 3,810,000 units in 2007, compared to just 87,000 units in 2004. In 2007, CHERY also sold 119,800 units to overseas markets, including Russia (see Figure 6).

There is no doubt that the expansion demonstrated not only in domestic but also in overseas markets, especially in Russia, Southeast Asia, and the Middle East, was made possible by the growth of CHERY’S original capabilities in design and R&D. At the same time, global automakers

achieved further expansion through the establishment of Sino-foreign joint ventures (see Table 7).

If we take a look at the sales of 14 global automakers in the Chinese market, we see that in 2008, Volkswagen was the top seller with approximately 1 million units. Toyota, GM, Honda, and Hyundai sold 500 thousand units each, that is, half of Volkswagen’s sales. In the same year, Nissan sold 361 thousand units, approximately the same volume as that of CHERY. In 2008, CHERY, the top ICAM automaker, reported a slight decrease in sales (356 thousand units in 2008 vs 379 thousand units in 2007). Geely, the second largest ICAM automaker, sold 221 thousand units in 2007.

From the presented data, we can say that despite the rapid expansion that ICAMs have achieved in recent years, global automakers operating Sino-foreign joint ventures still dominate ICAMs in their markets. The economic activities of these Sino-foreign joint ventures remain the key factor in the Chinese market. Their operations, which mainly involve international technology transfer to China, have a strong and consistent effect on the development of the Chinese automotive industry.

Using the case of CHERY, we have outlined the methods by which ICAMs acquired original

Figure 6. Top 3 car exports

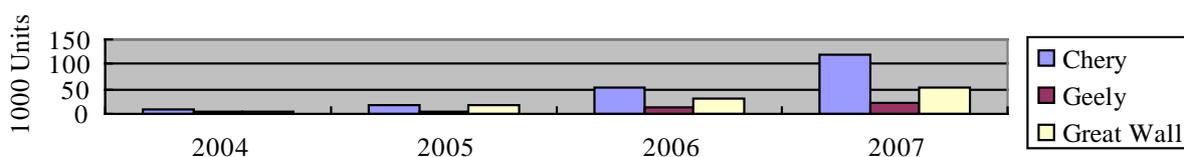




Table 7 (continued). Global automakers' operations in China

Global automaker (Sales, locally produced passenger vehicles in 2007 and 2008)	Sino-foreign joint venture				
	<p><b>JV: Jiangling Motors Corp.</b>  <b>Models produced:</b> Ford Transit, New Generation Transit, JMC Baodian, Baowei, Qingka  <b>Ownership:</b>            Jiangling Holding Co. 41%            Ford Motor Co. 30%            Other 29%</p>				
<table border="1"> <tr> <td>2008</td> <td>2007</td> </tr> <tr> <td>161,758</td> <td>180,476</td> </tr> </table>	2008	2007	161,758	180,476	<p><b>JV: Changan Ford Mazda Automobile Co.</b>  <b>Models produced:</b> Ford Fiesta, Focus, Mondeo, S-Max; Mazda2, Mazda3; Volvo S40, S80L  <b>Ownership:</b>            Ford Motor Co. 50%            Changan Automotive Co. 35%            Mazda Motor Co. 15%</p>
2008	2007				
161,758	180,476				
	<p><b>JV: Honda Automobile (China) Co.</b>  <b>Models produced:</b>            Honda Jazz (for export)  <b>Ownership:</b>            Honda Motor Co. 55%            Guangzhou Automobile Industry Group Co. 25%            Honda Motor Investment Co. 10%            Dongfeng Motor Group Co. 10%</p>				
<table border="1"> <tr> <td>2008</td> <td>2007</td> </tr> <tr> <td>470,033</td> <td>422,345</td> </tr> </table>	2008	2007	470,033	422,345	<p><b>JV: Dongfeng Honda Automobile (Wuhan) Co.</b>  <b>Models produced:</b> Honda Civic, CR-V  <b>Ownership:</b>            Dongfeng Motor Corp. 50%            Honda Motor Co. 40%            Honda Motor Investment Co. 10%</p>
2008	2007				
470,033	422,345				
	<p><b>JV: Guangzhou Honda Automobile Co.</b>  <b>Models produced:</b> Honda Accord, Fit, New City, Odyssey  <b>Ownership:</b>            Guangzhou Automobile Industry Group Co. 50%            Honda Motor Co. 40%            Honda Motor Investment Co. 10%</p>				
	<p><b>JV: Beijing Hyundai Motor Co.</b>  <b>Models produced:</b> Hyundai Accent, Elantra, Elantra HDC, Sonata, Sonata Lingxiang, Tucson  <b>Ownership:</b>            Hyundai Motor Co. 50%            Beijing Automotive Industry Holding Corp. 50%</p>				
<table border="1"> <tr> <td>2008</td> <td>2007</td> </tr> <tr> <td>450,163</td> <td>345,425</td> </tr> </table>	2008	2007	450,163	345,425	<p><b>JV: Dongfeng Yueda Kia Automobile Co.</b>  <b>Models produced:</b> Kia Carnival, Cerato, Cerato H/B, DYK Sportage, Optima, Rio  <b>Ownership:</b>            Kia Motors 50%            Dongfeng Motor Industry Investment Co. 25%            Jiangsu Yueda Co. 25%</p>
2008	2007				
450,163	345,425				

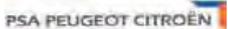
Source: Automotive news: 2009 guide to China's auto market (2009). [http://www.nxtbook.com/nxtbooks/crain/an2537706532BMMMPB\\_china/](http://www.nxtbook.com/nxtbooks/crain/an2537706532BMMMPB_china/)

capabilities of design and R&D. The role that international technology transfer played in this process cannot be ignored. In this section, we analyze the role of both direct and indirect international technology transfer (see Table 8).

First, we should mention that it is impossible to distinguish clearly the positive and negative effects of international technology transfer. As a result, Table 8 is based only on empirical analysis.

*Emergence of independent Chinese automobile manufacturers*

**Table 7 (continued).** Global automakers' operations in China

Global automaker (Sales, locally produced passenger vehicles in 2007 and 2008)	Sino-foreign joint venture				
 <table border="1"> <thead> <tr> <th>2008</th> <th>2007</th> </tr> </thead> <tbody> <tr> <td>21,170</td> <td>41,475</td> </tr> </tbody> </table>	2008	2007	21,170	41,475	<p><b>JV: Hunan Changfeng Motor Co.</b></p> <p><b>Models produced:</b> Liebao, Liebao Feiteng</p> <p><b>Ownership:</b> Changfeng Group 50%, Others 34%, Mitsubishi Motors Corp. 16%</p> <p><b>JV: Soueast (Fujian) Motor Co.</b></p> <p><b>Models produced:</b> Delica, Freeca, Galant, Lancer, Landio, Lioncel, New Space Wagon, Vercia</p> <p><b>Ownership:</b> Mitsubishi Motors Corp. 25%, Fujian Motor Industry Group 50%, Taiwan China Motor Corp. 25%</p>
	2008	2007			
21,170	41,475				
 <table border="1"> <thead> <tr> <th>2008</th> <th>2007</th> </tr> </thead> <tbody> <tr> <td>361,015</td> <td>281,520</td> </tr> </tbody> </table>	2008	2007	361,015	281,520	<p><b>JV: Zhengzhou Nissan Automobile Co.</b></p> <p><b>Models produced:</b> Nissan MPV, NT400 Cabstar, Paladin, Pickup, Rich, SUV</p> <p><b>Ownership:</b> Dongfeng Motor Group Co. 51%, Dongfeng Motor Co. 29%, Nissan Motor Co. 20%</p> <p><b>JV: Dongfeng Motor Co. /Dongfeng Nissan Passenger Vehicle Co.</b></p> <p><b>Models produced:</b> Nissan Bluebird Sylphy, Geniss, Livina, Qashqai, Teana, Tiida, X-Trail</p> <p><b>Ownership:</b> Nissan (China) Investment Co. 50%, Dongfeng Motor Group Co. 50%</p>
	2008	2007			
361,015	281,520				
 <table border="1"> <thead> <tr> <th>2008</th> <th>2007</th> </tr> </thead> <tbody> <tr> <td>178,308</td> <td>207,255</td> </tr> </tbody> </table>	2008	2007	178,308	207,255	<p><b>JV: Dongfeng Peugeot Citroen Automobile Co.</b></p> <p><b>Models produced:</b> Citroen C2, C-Elysee, C-Quatre, C-Triomphe, Picasso, New Xsara; Peugeot 206, 207, 307</p> <p><b>Ownership:</b> PSA Peugeot Citroen 50%, Dongfeng Motor Industry Investment Co. 50%</p>
	2008	2007			
178,308	207,255				
 <table border="1"> <thead> <tr> <th>2008</th> <th>2007</th> </tr> </thead> <tbody> <tr> <td>178,853</td> <td>160,849</td> </tr> </tbody> </table>	2008	2007	178,853	160,849	<p><b>JV: Jiangxi Changhe Suzuki Automobile Co.</b></p> <p><b>Models produced:</b> Liana, Landy, North Star (Suzuki Wagon R+)</p> <p><b>Ownership:</b> Changhe Group 51%, Suzuki Motor Corp. 25%, Suzuki Motor China Investment Co. 21%, Okaya 3%</p> <p><b>JV: Chongqing Changan Suzuki Automobile Co.</b></p> <p><b>Models produced:</b> Suzuki Alto, Gazelle, Swift 1.3, Swift 1.5, SX4</p> <p><b>Ownership:</b> Changan Automobile Co. 51%, Suzuki Motor Corp. 25%, Sojitz Corp. 14%, Suzuki Motor (China) Investment Co. 10%</p>
	2008	2007			
178,853	160,849				

Source: Automotive news: 2009 guide to China's auto market (2009). [http://www.nxtbook.com/nxtbooks/crain/an2537706532BMMMPB\\_china/](http://www.nxtbook.com/nxtbooks/crain/an2537706532BMMMPB_china/)

Before GM was permitted to create Shanghai General Motors Corp, that a JV between GM and SAIC Motors Corp. Other global automakers (e.g., Volkswagen and Peugeot) were motivated purely by profit to operate in the Chinese market. Only

non-significant knowledge related to R&D was transferred with their products to their Chinese operations. Local state-owned automakers, in the meanwhile, were looking for short-term profits and, as a result, were satisfied with this position. Even

Table 7 (continued). Global automakers' operations in China

Global automaker (Sales, locally produced passenger vehicles in 2007 and 2008)	Sino-foreign joint venture				
	<p><b>JV: Tianjin FAW Toyota Motor Co.</b></p> <p><b>Models produced:</b> Toyota Corolla EX, Vios <b>Plant 1</b> Toyota Crown, Reiz <b>Plant 2</b> Toyota Corolla <b>Plant 3</b></p> <p><b>Ownership:</b> Toyota Motor Corp. 40% FAW Xiali Automobile Co. 30% First Auto Works 20% Toyota Motor Investment Co. 10%</p>				
	<p><b>JV: Sichuan FAW Toyota Motor Co.</b></p> <p><b>Models produced:</b> Toyota Coaster, Prado</p> <p><b>Ownership:</b> FAW Group 50% Toyota Motor Corp. 45% Toyota Tsusho Corp. 5%</p> <p><b>Changchun Fengyue Company of SFTM</b></p> <p><b>Models produced:</b> Toyota Land Cruiser, Prius</p> <p><b>Ownership:</b> FAW Group 50% Toyota Motor Corp. 45% Toyota Tsusho Corp. 5%</p> <p><b>JV: Guangqi Toyota Motor Co.</b></p> <p><b>Models produced:</b> Toyota Camry, Yaris</p> <p><b>Ownership:</b> Guangzhou Automobile Industry Group Co. 50% Toyota Motor Corp. 31% Toyota Motor Investment Co. 19%</p>				
<table border="1"> <thead> <tr> <th>2008</th> <th>2007</th> </tr> </thead> <tbody> <tr> <td>543,106</td> <td>455,140</td> </tr> </tbody> </table>	2008	2007	543,106	455,140	
2008	2007				
543,106	455,140				
	<p><b>JV: FAW-Volkswagen Automotive Co.</b></p> <p><b>Models produced:</b> Audi A4L, A6L; VW Bora classic, New Bora, Golf, Magotan, Jetta, Sagitar</p> <p><b>Ownership:</b> China FAW Group Corp. 60% Volkswagen AG 20% Volkswagen Investment Co. 10% Audi AG 10%</p>				
	<p><b>JV: Shanghai Volkswagen Automotive Co.</b></p> <p><b>Models produced:</b> VW Lavida, Lingyu, Passat, Touran, Polo, Cross Polo, Santana, Santana Vista; Skoda Fabia, Octavia</p> <p><b>Ownership:</b> Shanghai Automotive Industry Corp. 50% Volkswagen AG 40% Volkswagen Investment Co. 10%</p>				
<table border="1"> <thead> <tr> <th>2008</th> <th>2007</th> </tr> </thead> <tbody> <tr> <td>983,436</td> <td>898,588</td> </tr> </tbody> </table>	2008	2007	983,436	898,588	
2008	2007				
983,436	898,588				

Source: Automotive news: 2009 guide to China's auto market (2009). [http://www.nxtbook.com/nxtbooks/crain/an2537706532BMMMPB\\_china/](http://www.nxtbook.com/nxtbooks/crain/an2537706532BMMMPB_china/)

though technologies were hardly transferred during this period, skills in manufacturing, parts supply, and sales were developed due to FDI (foreign direct investment). We consider this a Type 1 positive effect, as listed in Table 8.

On the other hand, this FDI caused a suspension of the R&D activities of existing local passenger vehicle automakers. For example, SAIC Motors

Corp. had to abandon its original product under its Shanghai brand in order to meet the localization standards required for the Santana. After the founding of Shanghai GM, the competition among Sino-foreign JVs quickly escalated. Some of the R&D projects undertaken by Sino-foreign JV projects were limited to product adaptation and localization. Due to the absence of original passenger

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**Table 8.** Role of international technology transfer in the Chinese automotive industry

		Receiving side	
		Positive effect	Negative effect
<b>Spreading side</b>	Indirect pathway (Spillover)	CHERY, Geely (R&D, Manufacturing, Sales)	
	Direct pathway	Type 1	state-owned automakers (R&D)
		Type 2	Sino-foreign JV (Manufacturing, Sales)
		CHERY, Geely (R&D, Manufacturing)	

Note: Type 1 refers to interior technology transfer in NMEs. Type 2 refers to technological consulting and outsourcing.

vehicles for R&D projects within Sino-foreign JVs and state-owned automakers, engineers directly involved in R&D shifted to ICAMs like CHERY and Geely. We consider this to be a Type 1 negative effect of international technology transfer.

The spillover of technological and R&D capabilities to ICAMs is considered a positive effect. For example, Kaking Technology Co., Ltd., a subsidiary of CHERY, undertook over 60% of CHERY's design work until 2005. The founders of this company were former team-members of Dongfeng Technology Center, which had undertaken R&D projects for XiaoWangzi and modification work for Citroen Elysee. (XiaoWangzi is an original passenger vehicle product of Dongfeng Motor Co., and Citroen Elysee is a product manufactured by Dongfeng Peugeot Citroen Automobile Co.)

Due to the spillover from Sino-foreign joint ventures, ICAMs acquired basic technological capabilities in R&D, manufacturing, and sales. As we have mentioned before, after CHERY successfully entered the passenger vehicle market, it preferred to

use Type 2 technological consulting and outsourcing (see Table 8) to improve its technological capabilities in R&D and manufacturing.

In conclusion, even though international technology transfer (as an important external factor) had a number of positive effects on the development of ICAMs development, the building of managerial capabilities and system integration (as an internal factor) became the main aim of all ICAMs.

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