ANALYZING CHINA'S AUTOMOBILE INDUSTRY COMPETITIVENESS THROUGH PORTER'S DIAMOND MODEL

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Abstract

This paper incorporates Porter's diamond model to analyze China's automobile industry. Besides looking at the four determinants of competitiveness in the original model, this study specifically examines the impact of government on industry competitiveness.

This study retrieves archival data on multi-measurements used in prior studies. The author incorporates one case study of a Chinese auto firm to illustrate the specific impact of government policy and the responses of auto assemblers and component suppliers. Interviews with experts in auto-related industries are conducted to triangulate the findings.

Results show that the Chinese auto industry is still in its early stages of development, whereas product quality and economies of scale of domestic automakers are approaching global standards; thus Chinese auto firms aim at becoming major players in the international market. The government plays an active role in assisting the industry development as the nation transitions from a planned economy to a free market.

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1. Introduction

Global competitiveness has become a topic for mainstream research in both academic and practical fields. Porter's (1990) diamond model is a well-known theory on competitiveness, which analyzes national (or industry) competitiveness through four major dimensions: factor conditions, demand conditions, firm strategy structure and rivalry, and related and supporting industries.

However, Porter's model was developed in the early 1990s using data from advanced nations; as emerging economies play a more important role in world trade, a number of scholars have questioned the applicability of the diamond model in a global context, especially in developing and/or emerging economies (Bellak & Weiss 1993; Cartwright, 1993; Dunning, 1980, 1993; Hodgetts, 1993; O'Malley & O'Gorman, 2001; Oz, 2002; Rugman & D'Cruz, 1993; Rugman & Verbeke, 1993a). Recent studies on emerging nations' competitiveness have modified the diamond model according to various national and/or industry characteristics (Barragan, 2005; Hughes & Hare, 1994; Moon & Lee, 2004; O'Malley & O'Gorman, 2001); however, no studies have examined the People's Republic of China, a growing economic power, through Porter's dimensions. Thus, this study applies Porter's diamond model to identify sources of competitiveness in China's auto industry.

China's auto industry, increasingly being headlined in major trade journals, attracts much attention in both strategic and academic fields. There are those that predicted China will compete well in exporting automobiles to the North American market in less than five years ("Mixed outlook for auto exports.", 2005), while others stated that China is not ready for export and the biggest sources of competitiveness, cost-benefits and consumer market, still lie in the domestic market (Mackey, 2005). Are Chinese automakers ready to face international competition? Are there sufficient

industry policies to support internationalization? What is the reaction of global auto firms, given a huge attractive market and growing domestic competitors? The motivation of the current study is thus to understand the real competitive position of China's automobile industry—one of its pillar industries—as the nation transitions from a centrally-planned and protected economy to a free market.

To date, analyses of China's auto industry are mostly based on secondary data from academic and professional sources. In this study, the author incorporates case study facts about Shanghai Automotive Industry Corporation-SAIC and its foreign partners, so as to analyze the performance of an indigenous auto firm. Supporting industries, firm strategy and the impact of government are the focal areas of this study. Finally, interview data from scholars, policy makers, and business practitioners are collected for confirmative purpose.

Contributions of the current study are threefold: first, the analysis of China's auto industry will fill a literature gap in applying the diamond model in one of China's pillar industries; secondly, this study can offer policy implications by analyzing significant government impacts on auto industry prosperity in a transition economy; and finally, understanding the industry could benefit strategic decision making for both international and domestic automakers.

2. Literature Review and Theory Development

Porter (1990) concluded that due to various national characteristics, nations cannot succeed in all industries, and thus it is important to identify and develop their internationally competitive industries. Therefore, he proposed the diamond model with four major (and two additional) determinants of competitive advantage in a particular industry.

Many scholars have questioned not only the applicability of the diamond model in less-developed nations, but also the measurements Porter used for international competitiveness and the power of government on industry competitiveness. This section briefly discusses the prior research related to Porter's diamond model and outlines a focused theoretical framework for the current study.

2.1. Porter's Diamond Model on Competitiveness

According to Porter (1990) nations are most likely to succeed in industries or industry segments where the diamond factors are mostly favorable. The six major competitiveness determinants are summarized below and their theoretical relationship is shown in Figure 1.

Factor conditions for production are the inputs and infrastructure necessary for competition, which include:

- Human resources: quality and quantity of skilled labor, cost of personnel, and labor skill variety;
- Physical resources: "the abundance, quality, accessibility, and cost of the nation's land, water, mineral, or timber deposits, hydroelectric power sources, fishing grounds, and other physical traits." (Porter, 1990, p. 74);

- Knowledge resources: market, scientific, technical knowledge residing in a nation's research institutions;
- Capital resources: capital availability and cost to finance industries. Capital resources can be affected by the rate of savings and national capital market structure;
- Infrastructure: availability and quality of infrastructure, including communication system, transportation system, payment or funds transfer, health care, and so forth (Porter, 1990, p. 74-75).

Demand conditions refer to home demand condition (Porter furthered his analysis to include international demand condition in his later work on industry development). Porter (1990) discussed home demand through three general attributes: the nature of buyer needs, the size and growth rate of home demand, and the transferability of domestic demand into foreign markets. As Porter described in his location competitiveness study, advantage arises from "having sophisticated and demanding local customers or customers with unusually intense need for specialized varieties also in demand elsewhere" (1998, p. 327).

Related and supporting industries include parts and service suppliers and distributors in the supply chain. As Porter stated, competitive supplier industries can provide "efficient, early, rapid, and preferential access to inputs" (1990, p. 101) which are basic production needs. Moreover, the geographic proximity with internationally competitive suppliers in the home nation helps build coordination and a communication network, which in turn improves production efficiency. Based on the availability and efficiency of supporting industries, the most significant benefit of home-based suppliers lies in the ability to accelerate innovation and upgrade in the overall auto industry.

Firm strategy, structure, and rivalry discuss the context in which firms are created, managed, and operated, given the domestic demand conditions, factor conditions, and supporting industry situations. In a developed industry, firms would build on the strengths provided by the source(s) of competitive advantage and invest in improving the less competitive factors. Moreover, as Porter concluded, fierce domestic competition pressures firms to innovate and improve productivity and consequently increase national competitiveness in the industry. Furthermore, "vigorous local and global competition not only sharpens advantages at home but pressures domestic firms to sell abroad in order to grow." (1998, p. 119).

Government sets up policies, rules, and regulations in industry activities. It is directly responsible for improving the wellbeing of citizens, as well as achieving economic and political stability (social benefits) (Porter, 1998). Government can influence all the four general determinants either positively or negatively. As Porter (1990) pointed out, government can affect factor conditions by imposing subsidiary policies, capital market regulations, and educational policies. It can also influence domestic demand conditions by establishing product standards or regulations that direct customer needs. Competition laws, tax policy, and other regulatory statutes can affect both supporting industries and firm structure and strategy.

One example of government policy is the economic form. Studies support that market-controlled economies are more efficient in improving productivity and innovation than those under government protection (Agarwal & Wu, 2004; Blumental, 1999; Koehn, 2002). Meanwhile, government encouragement of joint ventures (JV) with global competitive firms will facilitate technology transfer (Ali, Na, Law, & Buszard, 2004).

Chance refers to external events that may affect or benefit a nation or industry and that are totally outside the control of firms and government. Examples of chance events include pure invention, breakthroughs in basic technologies, wars, economic crisis, and major shifts in foreign market demand. They create discontinuities that can unfreeze or reshape industry structure and thus play an important role in shifting competitive advantage in many industries. Firms evaluate chance events differently due to various industry natures and stages in their lifecycle. Porter (1990) proposed that firms promote continuous innovation and improvement, and endeavor to seize opportunity resulting from chance events.

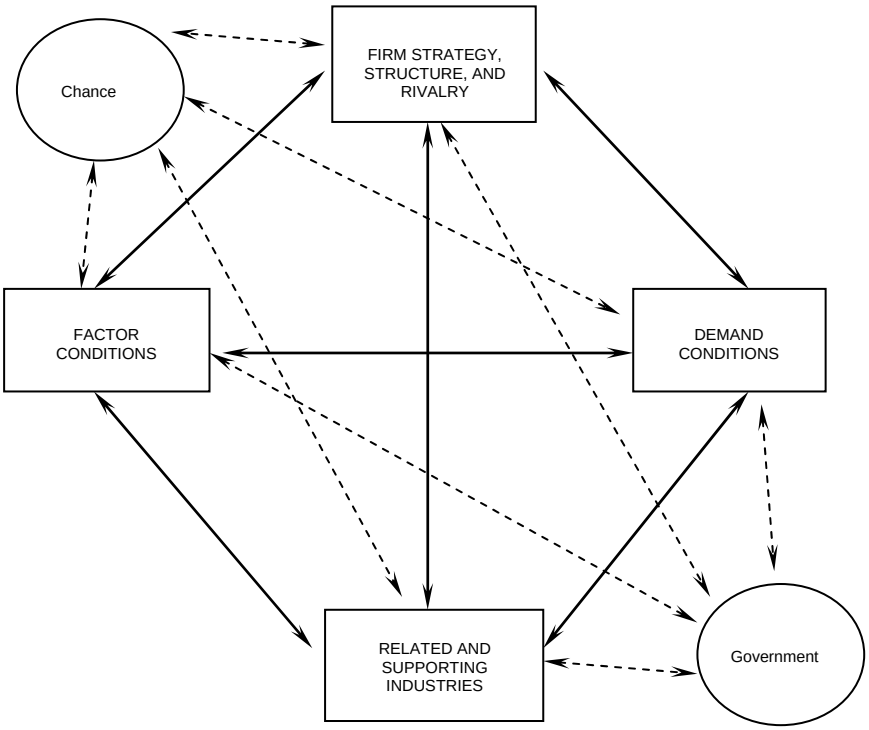

Figure 1 Porter's diamond model (Porter, 1990, p. 76)

The determinants, individually and as a system, create the context in which a nation's firms are born and compete: the availability of resources and skills necessary for competitive advantage in an industry; the information that shapes what opportunities are perceived and the

> directions in which resources and skills are deployed; the goal of the owners, managers, and employees that are involved in or carry out competition; and most importantly, the pressure on firms to invest and innovate. (Porter, 1990, p. 71)

Porter also defined and discussed the clusters of industries formed by networks among companies, suppliers, service providers, supporting industries, and associations (i.e. universities or trade associations). These clusters of industries could build strong capacities that contribute to the overall industry competitiveness (Porter, 1998). For example, Bell (2005) found that firms inside a cluster innovate at a greater level than the ones outside because better communication and more efficient supply chain management enhance the learning and knowledge creation processes.

And finally, Porter (1990) discussed the impact of multinational enterprises (MNEs) and inward foreign direct investment (FDI) on developing nations' competitiveness. Only in the early stages of economic development, as predicted by Porter, would MNEs contribute to the prosperity of the host nation because MNE activities bring in some technology needed for their production, as well as providing employment opportunities and stimulating basic infrastructure development. As nations develop their own infrastructures and most importantly their research and development (R&D) capabilities, it is the internationally competitive indigenous industries that ultimately create and improve the nation's competitive advantage around the globe.

2.2. Prior Applications or Modifications of Porter's Diamond Model

Porter's diamond model is recognized as a bridge between strategic management and international economics (Grant, 1991). He analyzed industry competitiveness through the major determinants and the contribution of particular industries to national competitiveness. Some scholars have applied and/or modified

this diamond model to analyze either industry or national competitiveness in the past decade. Meanwhile, others have critiqued Porter on his discussion about international competitiveness measures, the role of MNEs and the role of government. In this study, the author focuses on addressing the importance of government power as well as the contribution of MNEs in China's automobile industry.

2.2.1. Applications and/or Modifications of the Model at the National Level

Many studies have analyzed national competitiveness using the original or modified diamond model. Since Porter's model includes primarily national factors and since globalization results in a growing extent of regional (and even global) integration, Dunning (1993) proposed to consider international factors when analyzing industry or national competitiveness. Following this trend, Rugman and D'Cruz (1993) developed a double-diamond model where one angle of a national diamond is dependent on another nation's diamond (i.e. Mexico has relatively low domestic demand but the nation improves its competitiveness through linking to strong U.S. demand and thus strengthening its export market (Hodgetts, 1993)). Cartwright's (1993) study on New Zealand developed a multi-linked diamond for small, export-dependent nations where all determinants of national competitiveness are linked to global sourcing.

2.2.2. Applications and/or Modifications at the Industry or Firm level

Although the diamond model was originally developed for national competitive analysis, Porter also provided industry case analyses in his sample nations, in order to show that the model can be approached at the industry level. Other scholars thus have used this model to analyze specific industry competitiveness. For example, a recent study by Barragan (2005) tested the power of the double-diamond

model in Mexico's automobile industry. Barclay and Gray (2001) provided a case study of the information service industry in Barbados. Moon and Lee (2004) looked at the competitive performance of two MNEs using the diamond model and proposed an enlarged diamond through FDI integration in all determinants. The current study applies Porter's model to analyze China's auto industry competitiveness.

2.3. Comments on Porter's Diamond

- The impact of MNEs

Porter's model has been criticized regarding its purported claim on the impact of globalization and FDI on the host nation's diamond (Bellak & Weiss, 1993; Cartwright, 1993; Dunning, 1980; Grant, 1991; Hodgetts, 1993; O'Malley & O'Gorman, 2001; Oz, 2002; Rugman & D'Cruz, 1993; Rugman & Verbeke, 1993a; Sledge, 2005). Porter (1998) concluded that since MNEs invest in a host nation mostly for the purpose of resource or market access, they can help strengthen host nation's competitiveness only in the early stages of economic development, while the ultimate source of competitiveness or financial viability comes from the development of indigenous competitive firms.

However, Dunning's (1980) study showed that when large MNEs seek to improve their global competence and efficiency (when a home nation does not have all sources of competitive advantage), their activities in some or all of the determinants do contribute to a host nation's competitiveness in the long run. Young, Hood, and Peters (1994) offered an example of the contribution of MNEs in a host nation's diamond. They pointed out that global sourcing attracts MNEs to fully develop parts of their supply chain in host nations that could become global suppliers to the international market. O'Malley and O'Gorman's (2001) study of the Irish software industry also supported the idea that the presence of MNEs helps nurture

indigenous industries, especially in the related and supporting sectors. Thus, Rugman and Verbeke (1993a) proposed that FDI in small and/or developing nations should be included when analyzing national or industry competitiveness.

- Measurements for international competitiveness

Scholars have also commented on Porter's measurements for competitiveness (Cartwright, 1993; Grant, 1993; Hodgetts, 1993; Rugman & Verbeke, 1993b). Porter (1990) selected sixteen industry clusters and tested the model across eight advanced countries. He used productivity and export-related measurements to analyze nations' global competitive positions. Regarding small or emerging economies, Bellak and Weiss (1993) suggested applying multi-measurements (besides Porter's) for both national and international trade progressions, such as total export from auto-related industries and the contribution of the domestic auto industry to national GDP. Moreover, as mentioned above, inward-FDI related measures, such as the percentages of production and sales revenue from foreign-funded firms, should also be included when analyzing industry competitiveness in emerging nations.

- Significance of government power

As O'Shaughnessy (1996) stated, the diamond model simplified the impact of culture, history, and policies on economic development. Looking at China, previous studies have discussed the impact of centrally-planned economies (Oughton, 1997), the danger of government protectionism (Qin, 2004), and the ongoing economic and policy reform after its World Trade Organization (WTO) accession (Agarwal & Wu, 2004; Ali, et al., 2004; Blumental, 1999; Breslin, 2004; Sit & Liu, 2000; Zhang, 2003; Zhu & Nyland, 2005). Following the pace of globalization, the interaction between the Chinese government and MNEs would have a significant influence on China's global competitiveness.

In sum, this study applies Porter's diamond model to analyze China's auto industry competitiveness. To adjust the diamond model based on the major comments discussed above, the author retrieved archival data to analyze industry competitiveness using multiple measurements from both Porter and others' studies; the author also incorporated a published case study of one auto assembler to discover the strategic performance of auto joint ventures in China and the impact of government power; and finally the author conducted telephone interviews to triangulate my findings.

3. Research Questions

In the 1950s, major industries were under the direct control of the government, with centrally planned resource allocation and production. However, limited resources and little experience in economic development constrained the nation's ability to meet growing domestic demand. The Chinese government thus faced the dilemma of excessive domestic demand and low production capacity, especially in high-technology industries. Many high-tech products were highly dependent on imports, which created a huge trade deficit within international business (Harwit, 1995). To meet local demand as well as to improve trade balance, the Chinese government introduced several policy reforms in an effort to stimulate domestic production and attract inward FDI in export-oriented industries (Breslin, 2004; Han & Kim, 2003).

The open-door policy and economic reform introduced in the late '70s reduced government protection (Wang, 1999). Different forms of FDI (equity JVs, co-operative JVs, or wholly-owned ventures) were allowed in several industries, such as textiles and manufacturing. However, to maintain central control of the overall economy, government retained high protectionism in the pillar industries, which include semiconductor, automobile, and telecommunication sectors (Zhu & Nyland, 2005). This economic reform successfully stimulated domestic production and brought in FDI, while problems still existed. Firstly, the greater the government protection, the more dependent were those pillar industries on preferential policy and/or subsidies, and the less internationally competitive they were. Secondly, the nation's low infrastructure quality could not meet global standards and thus these industries were still limited in their ability to improve production efficiency (Ali et al., 2004; Oughton, 1997).

Since MNEs were eager to get access into China's potential market and the government recognized that FDI is necessary in all sectors in the early stages of economic development, China introduced the 1994 industrial policy in an effort to attract FDI in those pillar industries and more importantly to encourage knowledge transfer through the promotion of equity JVs and rigid localization requirements. This industrial policy was a milestone in the history of China's automobile sector development since it helped build up China's three giant automakers (First Auto Work (FAW), Dongfeng, and SAIC) and gave indigenous parts suppliers the opportunity to work closely with leading global auto assemblers and parts suppliers (Wang, 1999).

China has demonstrated a growing ambition in securing export market: in fact, to lubricate multilateral trade, China entered the WTO in 2001, which required the permission of FDI in most industries and the removal of trade barriers and protective policies. Now, nearly five years after its WTO accession, China has made significant progression in economic development and policy reform. However, foreign business practitioners still see hidden trade barriers (i.e. government's remaining protective power) that limit their ability to control and further explore efficiency in China (Wang, 1999; Zhang, 2003; Zhu & Nyland, 2005).

In sum, government plays an important role in China's auto industry development; as well, MNEs, together with their Chinese auto partners, contribute significantly to the prosperity of the industry. Therefore, this study incorporates Porter's diamond model and tries to identify and analyze:

- The overall competitiveness of the Chinese auto industry,
- The role of government in stimulating industry competitiveness, and
- Domestic automakers and their joint venture performance.

4. Research Settings—China Automobile and Porter's Diamond

Porter's diamond model provides an analytical framework with multi-measurements for national or industry competitiveness. Many scholars have assessed Porter's model in developed nations and some emerging economies; however, none of them look at China specifically through Porter's dimensions in regard to industry competitiveness. The current study will provide insights into the competitive position of China's auto industry through Porter's single diamond model. Further, China is in transition from a centrally planned economy to a free market economy. Fast economic growth is accompanied by serious problems in industry structure (Harwit, 1995). Thus, both political and economic reforms are necessary to meet global standard and stimulate international trade. By looking at the government's impact in the auto industry, this study will address one major facet on Porter's diamond model—the significance of government power on emerging nations' competitiveness. Finally, this study also hopes to provide a practical understanding of the model as a tool for policymakers, business practitioners, and research academics to increase industry competitiveness.

China's auto industry is representative of the overall national economic development, because as one of China's pillar industries it generates attentions from various stakeholders, including domestic and international auto firms, national and local governments, and component and parts suppliers. Thus studying this sector can help boost understanding of other major industries. Understanding the overall industry competitiveness can assist both business practitioners and policymakers in future strategic decisions.

Finally, at the firm level, domestic firms accustomed to government protection must learn to face international competition independently, while MNEs still find it

difficult to do business in China due to hidden barriers and government power. By looking at the performance of major automobile manufacturers in China, this study will further assess the reaction of domestic auto firms to government policies and the contributions of MNEs to an emerging nation's industry competitiveness.

5. Research Methodology

In the diamond model, factor and demand conditions are mostly general facts. In contrast, firm performance of both assemblers and suppliers and their reaction to government policy changes contribute the most to the industry prosperity in China, which are more specific and analyzable for the current study. Thus, this study focuses on analyzing related and supporting industries, firm structure and strategy, and the role of government.

This study analyzed the general competitiveness of the Chinese automotive industry, following measurements from Porter and other scholars (see Appendix A). To address the significance of foreign investment, the author included FDI distribution in major industries, auto joint ventures performances, and multinational and domestic auto firms strategy differences. The author also discussed changes in China's auto industry policies in an effort to understand the government's role in stimulating industry competitiveness. In Porter's original study, "chance" is used to include all uncontrollable events, such as natural disasters or wars. Since China's auto industry develops in a stable process with few chance events, the author replaced the "chance" with China's WTO membership and focused on analyzing policy changes and their impact on automotive industry competitiveness.

To address the third research question, one case study of SAIC and its JVs with Volkswagen (VW) and General Motors (GM) was incorporated from prior studies (see Appendix B for a complete list of qualitative research documents) in an effort to discover the strategic performance of and power balance between MNEs and domestic automakers. The case study method is useful when it is important to study a phenomenon in context where there are many variables to explore (Yin, 2003).

The time period selected is from the early 1990s until after China's WTO accession (as a consecutive timeline). Before WTO accession, China adopted an industrial policy in the auto sector in 1994. The transition and reform after its WTO accession has been ongoing since 2001. Thus, this study tries to compare and analyze China's auto industry policy changes and their impact on firm strategy and performance.

5.1. General Competitiveness Analysis

Porter's indicators for international competitiveness are mostly export-related measures, such as "increase in exports to the world" and "proportion of exports from the industry with respect to the total export of the nation" (Porter, 1990, p. 742). Due to the unique characteristics of China (with large potential demand and supply markets but little international trade in the auto industry at its current economic stage), this study adopts measurements from both Porter and other scholars to analyze China's auto market competitiveness (detailed measurements and methods of analysis are summarized in Appendix A).

The author retrieved mostly archival data from the National Bureau of Statistics (NBS China), industrial association reports, WTO documents, trade journals, company reports, and academic journals, in order to discover any improvement or retrogression in the auto sector. The author analyzed the competitiveness of major determinants from consecutive trends in definite data (i.e. production capacity) and changes in descriptive measures (i.e. policy adaptation), according to prior studies' methods and Porter's comments. To ensure consistency in the findings, the author incorporated production- or trade-related hard data from national or international statistics reports, and built analysis on case facts provided in previous studies.

5.2. Case Study of SAIC

To further address the government impact and auto firm performance, the author retrieved multi-source case facts to analyze the history and future prospect of one domestic auto firm, and its interaction with MNEs. Reviewed studies are grouped into five categories: academic research, company report, government report, industrial association, and trade journal. All important findings and data were archived in a database for future access and reference.

SAIC-VW is the first auto JV in China and has been the leader in this area for the past two decades. Since SAIC has experienced both development and difficulties along with China's economic reform (Depner & Bathelt, 2005), studying its experience may offer valuable insights on the overall market progression in China. Moreover, following Chinese policy promotion, SAIC's another joint venture partner General Motors, shows increasing growth potential in the Chinese market. Comparing Shanghai VW and Shanghai GM's strategies and performances in China could provide significant implications to both indigenous and global auto firms.

Similar to the archival data analysis for general competitiveness, this case study focuses on discussing several sources of competitiveness that are related specifically to SAIC operation, which include related and supporting industries, firm structure strategy and rivalries, and the impact of government power.

5.3. Interview Data

The author conducted interviews with personnel in auto-related industries in order to check the accuracy of archival data analysis and gain current insights from experts in different fields. Prior studies have showed that approximately five to seven interviews are sufficient for supplementary and confirmative purposes (Barragan,

2005; McCracken, 1988). Target interviewees included policymakers, research academics, and personnel from auto joint ventures, parts suppliers, and distributors.

The author identified potential interviewees from research institution contact lists, company websites, and industrial organization yellow pages. The interview guide (provided in Appendix D) covered both general and specific questions according to the expertise of the specific interviewee. The author contacted the target interviewees by telephone and read the invitation letter and the consent form to them directly. Appendix C shows the written invitation letter and consent form.

The invitation letter and interview guide were written in English, and then translated into Chinese. An external translator conducted backward translation to ensure information accuracy. The author conducted the telephone interviews in Chinese and took notes of the answers. All interview notes were then translated into English, transcribed into Word document and analyzed according to the following topics: 1) strengths, weaknesses, opportunities, and threats, (with respect to Porter's competitiveness determinants) in China's auto industry; 2) government impact on auto industry development; 3) performance of auto joint venture partners; 4) performance of indigenous and foreign parts suppliers; and 5) the impact of China's WTO membership on the auto industry development.

6. Results

6.1. General Competitiveness of China and its Automobile Industry

The auto industry in China has experienced 53 years of development since the foundation of the First Auto Manufacture Group Corporation (now First Auto Work), and scholars have divided those years into four major developmental stages (Francois & Spinanger, 2004; Harwit, 1995; Jing, 2005):

1. 1953-65: the nation learned technological skills mainly from the Soviet Union and followed strictly planned production. There was no international contact at all and annual production was on average 60,000 units.
2. 1966-80: production capacity increased significantly (to 160,000 units per year) due to fast growing domestic demand. By 1980, China had 56 plant sites, 192 factories for various sorts of vehicles, and 2,000 spare parts producers (China Automotive Yearbook, 1986). Such proliferation of auto plants was in response to Maoist' "self-reliance policy" and based on a positive estimated profit in auto market. "The government advocated strict limits on imports of trucks and cars, hoping that modernization of existing factories and attention to manufacturing small passenger cars and light trucks could satisfy projected national needs for such vehicles." (Harwit, 1995, p. 143).
3. 1981-98: by the mid-80s, the Chinese government found out that growing auto demand could not be satisfied by extant domestic manufacturers, even with high government subsidies and preferential policies. Thus, joint venture became China's choice of preference in order to use foreign investors' advanced technologies, capitals, and managerial skills to develop domestic manufacturing and meet local needs. Deng Xiaoping's "Open Door Policy"

introduced in 1978 attracted large amount of FDI into China, and Volkswagen became the first foreign entrant into China's auto assembly industry. In those years the number of auto production companies had increased to 2,500, of which 60% were joint ventures. Based on a positive estimation of profit from auto industry, many provincial governments promoted regionalized production, which fragmented the auto assembly and part supplying markets.

4. 1999-present: market rationalization and WTO accession attracted more FDI from leading global auto firms. Production capacity had reached around 3 million in 2002, a large amount of which concentrated in east coastal areas.

China's first wave of investment began in 1984 and included the establishment of Beijing Jeep and Shanghai Volkswagen. The second wave came in the early 1990s, when FAW-Volkswagen, Guangzhou Peugeot, and Dongfeng-Citroën came into being. Total investment in the industry, including foreign capital inflow, climbed from $64 million US in the sixth Five-Year Plan period (1981-1985) to $0.87 billion US in the eighth (1991-1995) period. The third wave dated to the late 1990s, when GM, Toyota Motor, and Ford secured their respective car assembly deals at Shanghai GM, Tianjin Toyota Motor, and Chang'an-Ford. In the ninth and tenth Five-Year Plans (1996-2005), cumulative investment in the auto sector amounts to $23.5 billion US from 1996 to 2004, which is 0.71% of total national investment (China Automotive Yearbook, 2004; NBS, 2004). Besides a growing number of multinational auto firms entering the market, the fourth wave of investment (since 2001) has also been characterized by the emergence of new Chinese car assemblers such as the Geely Group, Brilliance China, and Shanghai Chery (Xing, 2002).

Since the last round of investment, it appears that the Chinese auto market is becoming the front line of global competition for international auto giants. Meanwhile, multinationals will also have to contend with local players that are launching new models and competing for supply network, and who are competitive in terms of both cost and versatility. Tables 1 and 2 show major car producers in China and their geographical locations. By the end of 2003, China's auto production capacity approached 3 million units and is expected to reach 7 million in 2006 (Jing, 2005).

Table 1 Production capacity in provinces, 2003

Province	Capacity(units/year)
Shanghai	810,000
Jilin	340,000
Liaoning	230,000
Sichuan	205,000
Hubei	180,000
Guangxi Zhuang	150,000
Zhejiang	150,000
Beijing	145,000
Jiangsu	130,000
Guangdong	120,000
Tianjin	120,000
Shandong	100,000
Fujian	80,000
Anhui	60,000
Hainan	50,000
Shanxi	50,000
Heilongjiang	30,000
Henan	30,000
Guizhou	10,000
Total	2,990,000

Note. China Automotive Yearbook, 2004.

Table 2 Major car producers and capacities in China, 2003

Producer	Foreign Partner	Capacity (units/year)
Beijing Hyundai	Hyundai	30,000
Beijing Jeep	Daimler-Chrysler	85,000
Chang'an Ford	Ford	50,000
Chang'an Suzuki	Suzuki	150,000
Dongfeng Honda	Honda	60,000
Dongfeng PSA	PSA/Citroen	150,000
Dongfeng Yueda Kia	Kia	50,000
Dongfeng Yulong	Nissan	60,000
FAW Chengdu	Toyota	5,000
FAW-Hainan	Mazda	50,000
FAW-Toyota	Toyota/Mazda	100,000
FAW-VW	Volkswagen	270,000
Geely	-	150,000
Guizhou Aviation Ind.	Subaru (Fuji Heavy Ind.)	50,000
Harbin Hafei	Mitsubishi	30,000
Hunan Changfeng	Mitsubishi	30,000
Jiangsu Nanya	Fiat	100,000
Jiangxi Fuqi	-	20,000
Jiangxi Suzuki	Suzuki	30,000
Jinbei Brilliant	BMW	200,000
Jinbei General Motors	General Motors	30,000
Rongcheng Huatai	Hyundai	20,000
SAIC Chery	Daewoo	60,000
SAIC-GM	General Motors	150,000
SAIC-GM Wuling	General Motors	150,000
SAIC-VW	Volkswagen	450,000
Sanjiang Renault	Renault	30,000
Shangdong Yantai	General Motors	50,000
Shanghai JMStar	-	30,000
Southeast	-	60,000
Tianjin-Daihatsu	Daihatsu	150,000
Tianjing-Xiali	-	20,000
Xi'an Qinchuan	-	30,000
Yuejin Auto	-	30,000
Yuejin Auto	Fiat	30,000
Zhengzhou Nissan	Nissan	30,000
Total		2,990,000

Note. Adapted from Francois & Spinanger, 2004, p. 18.

It was only in 1993 that China began to emerge as a global trading power. After 1993, exports increased by 60% in two years and doubled in five years. In the process, a $12.2 billion US trade deficit in 1993 was transformed into a $5.4 billion

US surplus in the following year, with the trade surplus rising to $40.3 billion US in 1997. 1993 also marked the emergence of China as a major recipient of FDI—indeed more FDI flowed into China in 1993 than in the entire preceding fourteen years of reform combined (Breslin, 2004; NBS, 1994).

In 2004, China ranked the third leading international trader, with 6.5% share of world export and 5.9% of world imports (WTO, 2005). However, China's export market is still dominated by miscellaneous manufacturing and information technology and electronic component products. As shown in Table 3, China's top 30 export industries accounted for more than 60% of total export value, among which motor vehicle and parts exports only contributed an insignificant amount (less than 2%). Measured against Porter's export-related indicators for international competitiveness, China's auto industry, with low whole-vehicle and parts exports, is still at its early stage of development and does not contribute much to the nation's competitive power.

Table 3 China's top 30 export industries, 2004

Product Label	Export (US billions)	Import (US billions)	Balance Trade	Share of Total National Exports (%)
COMPUTER EQUIPMENT	59.91	14.46	45.45	10.10
TELECOMMS EQUIPMENT NES	44.12	23.18	20.94	7.44
OFFICE EQUIP. PARTS/ACCS.	24.88	14.92	9.96	4.19
ARTICLES OF APPAREL NES	18.20	0.52	17.68	3.07
BABY CARR/TOY/GAME/SPORT	16.36	0.50	15.86	2.76
VALVES/TRANSISTORS/ETC	16.18	74.45	-58.27	2.73
SOUND/TV RECORDERS ETC	15.86	1.21	14.65	2.67
FOOTWEAR	15.20	0.48	14.73	2.56
ELECTRICAL EQUIPMENT NES	13.58	12.27	1.31	2.29
WOMEN/GIRL CLOTHING WVEN	12.83	0.32	12.52	2.16
FURNITURE/STUFF FURNISHG	12.62	0.67	11.95	2.13
DOMESTIC EQUIPMENT	10.18	0.45	9.73	1.72
MENS/BOYS WEAR, WOVEN	10.06	0.27	9.79	1.70
ARTICLES NES OF PLASTICS	9.18	2.12	7.06	1.55
ELECTRIC CIRCUIT EQUIPMT	8.18	14.93	-6.75	1.38
MADE-UP TEXTILE ARTICLES	7.74	0.08	7.66	1.30
BASE METAL MANUFAC NES	7.57	2.38	5.19	1.28
OPTICAL INSTRUMENTS NES	7.12	23.44	-16.32	1.20
HEADGEAR/NON-TEXT CLOTHG	7.07	0.12	6.96	1.19
MAN-MADE WOVEN FABRICS	7.03	3.28	3.75	1.19
ELECT POWER TRANSM EQUIP	6.99	4.48	2.51	1.18
WOMEN/GIRL WEAR KNIT/CRO	6.66	0.07	6.59	1.12
TRUNKS AND CASES	6.30	0.11	6.19	1.06
COTTON FABRICS, WOVEN	6.04	2.25	3.79	1.02
TRAILERS/CARAVANS/ETC	5.97	0.07	5.90	1.01
MISC MANUF ARTICLES NES	5.77	0.96	4.82	0.97
INDUST HEAT/COOL EQUIPMT	5.67	4.82	0.85	0.96
TELEVISION RECEIVERS	5.49	0.15	5.34	0.92
MOTORCYCLES/CYCLES/ETC	5.17	0.22	4.95	0.87
MOTOR VEH PARTS/ACCESS	4.43	7.34	-2.91	0.75
Subtotal Exports	382.395			64.45
Total Export	593.325			100.00

Note. Summarized from United Nation Statistics Division, 2005, Table 156.

As seen in Table 4 and 5, China had made significant progressions in exporting and importing automotive products and it maintained a relatively high annual growth rate (average 48% and 45% increase in export and import respectively, from 2000 to 2004); however, China’s share of world auto exports and imports are still lower than other leading nations, and auto product exports account for a low percentage in national total exports.

Table 4 Export and import of automotive products of selected economies

	Value (US billions)					Share in Economy's Exports (%)	
	1990	2000	2002	2003	2004	2000	2004
Export							
China	0.26	1.58	2.68	3.57	6.27	0.6	1.1
United States	32.55	67.19	67.09	69.24	76.42	8.6	9.3
Canada	28.44	60.66	56.33	56.95	63.66	21.9	20.1
Japan	66.19	88.08	92.51	102.73	115.73	18.4	20.5
Mexico	4.71	30.65	30.91	30.13	31.56	18.4	16.7
European Union	-	287.19	330.40	403.64	470.79	11.8	12.7
Intra-EU	-	215.55	242.90	297.38	344.90	13.1	13.7
Extra-EU	-	71.64	87.50	106.26	125.89	9.0	10.5
Republic of Korea	2.30	15.19	17.33	23.12	32.32	8.8	12.7
Import							
China	1.80	3.80	6.96	12.78	14.43	1.7	2.6
United States	79.32	170.19	176.63	181.28	197.00	13.5	12.9
Canada	24.64	46.28	46.63	49.10	52.85	19.3	19.3
Japan	7.33	9.96	9.89	11.13	12.80	2.6	2.8
Mexico	5.27	20.00	21.26	20.19	21.60	11.5	10.9
European Union	-	246.75	277.51	344.23	397.44	9.6	10.5
Extra-EU	-	32.14	34.35	43.66	52.54	3.5	4.1
Republic of Korea	0.93	1.77	2.54	3.04	3.46	1.1	1.5

Note. Adapted from WTO, 2005, Section 4, Table 67.

Table 5 Share of world automotive products exports and imports

	Value (US billions)	Share in World Exports or Imports (%)			Annual Percentage Change			
	2004	1990	2000	2004	2001	2002	2003	2004
Export								
European Union	470.79	-	49.9	55.6	13	12	22	17
Extra-EU	125.89	-	12.4	14.9	15	16	21	18
Japan	115.73	20.8	15.3	13.7	7	15	11	13
United States	76.42	10.2	11.7	9.0	3	6	3	10
Canada	63.66	8.9	10.5	7.5	1	2	1	12
Republic of Korea	32.32	0.7	2.6	3.8	21	12	33	40
Mexico	31.56	1.5	5.3	3.7	1	1	-3	5
Brazil	8.68	0.6	0.8	1.0	17	2	33	33
Turkey	8.10	0.0	0.3	1.0	51	39	57	59
China	6.27	0.1	0.3	0.7	41	42	33	76
Thailand	5.71	0.0	0.4	0.7	27	12	33	44
Taipei, Chinese	3.74	0.3	0.4	0.4	14	15	22	23
South Africa	3.70	0.1	0.3	0.4	21	62	29	19
Australia	3.09	0.2	0.4	0.4	10	3	18	12
Russian Federation	2.21	-	0.2	0.3	26	18	26	44
Argentina	2.19	0.1	0.4	0.3	1	-19	-9	44
Above 15	834.18	-	98.7	98.5	-	-	-	-
Import								
European Union	397.44	-	41.9	46.2	13	11	24	15
Extra-EU	52.54	-	5.5	6.1	13	10	27	20
United States	197.00	24.7	28.9	22.9	4	7	3	9
Canada	52.85	7.7	7.9	6.1	3	11	5	8
Mexico	21.60	1.6	3.4	2.5	2	9	-5	7
China	14.43	0.6	0.6	1.7	40	42	84	13
Australia	13.35	1.2	1.5	1.6	12	18	30	20
Japan	12.80	2.3	1.7	1.5	6	7	13	15
Turkey	11.51	0.4	1.0	1.3	19	31	122	85
Russian Federation	10.50	-	0.4	1.2	43	19	45	54
Switzerland	8.10	1.9	1.1	0.9	7	-1	12	12
Saudi Arabia	6.72	0.9	0.6	0.8	15	5	11	11
South Africa	5.65	...	0.4	0.7	24	-10	47	54
United Arab Emirates	5.64	0.3	0.5	0.8	...	20	45	...
Norway	4.58	0.4	0.4	0.5	15	13	18	32
Thailand	3.87	0.8	0.4	0.4	19	15	33	16
Above 15	766.03	-	90.7	89.2	-	-	-	-

Note. Summarized from WTO, 2005, Section 4, Table 66.

Despite its low export share in the global auto industry, China's competitive position has improved significantly in the past a few years. The total annual production ranking has risen from the ninth in 1999 to the fourth in 2003. China's

auto production as a percentage of world total production has risen from 3.28% in 1999 to 7.85% in 2004 (as shown in Table 6, China Automotive Yearbook, 2004). Nonetheless, although China is showing an increasing production capacity and a large potential for auto exports, growing auto production in recent years are mainly serving domestic demand, which indicates low international competitiveness.

Table 6 China and world annual auto productions (million units)

	1999	**2000**	**2001**	**2002**	**2003**	**2004**
A: China	1.83	2.07	2.34	3.25	4.44	5.07
B: World	55.88	58.30	56.16	58.78	60.66	64.62
A/B (%)	3.28	3.55	4.17	5.54	7.33	7.85
China rank in the world	9	8	8	5	4	4

Note. China Automotive Yearbook, 2004

In 2002, China manufactured 3,254,200 vehicles and sold 3,248,000 units, an annual increase of 38.49% and 36.65% respectively. The three leading auto firms together produced 1,571,900 vehicles and sold 1,591,300 units, accounting for approximately half national productions and sales. Vehicle exports and imports data was also significant after the year of China's WTO accession. In 2002, Vehicle import reached 127,000 units, a 76.9% increase from 2001. Passenger cars import increased by 50.8%, sport utility vehicles (SUVs) by 211.3% and light trucks by 160.8%. Vehicle export increased to 43,000 units, a 75.9% increase from the previous year. Although parts and component export increased to $2.38 billion US, import also amounted to $3.39 billion US (China Automotive Yearbook, 2003). By 2008, the market is forecast to reach a value of $63.81 billion US, which equates to a compound annual growth rate (CAGR) of 21.7% in the 2003-2008 period, much stronger than that of the Asia-Pacific market (Lienert, 2003).

China's auto industry value has been growing at an average rate of 3.3 folds as Gross Domestic Products (GDP) growth from 1999 to 2004 (see Table 7), which

becomes a leading force in the national economy. By 2010, as predicted by economic experts, added value from automobile and related industries will have reached $150-250 billion US which will promote GDP increase by 1~1.8% (Jing, 2005; Lienert, 2003). Tax revenue from the automobile industry will contribute to more than 30% of that from total mechanical industries (NBS, 2005).

Table 7 Auto industry growth rate and its contribution to GDP

Year	A: GDP Growth Rate (%)	B: Auto Market Value Growth Rate (%)	B/A	C: GDP (US billions)	D: Auto market value (US billions)	D/C
1998	5.21	5.37	1.03	114.55	2.58	2.25
1999	4.75	12.73	2.68	120.00	2.91	2.42
2000	9.02	23.11	2.56	130.81	3.58	2.74
2001	8.77	23.09	2.63	142.29	4.41	3.10
2002	5.22	44.69	8.56	153.10	6.37	4.16
2003	9.30	36.10	3.88	171.44	13.78	8.04
2004	9.50	17.49	1.84	199.60	16.10	8.07
Average	7.40	23.23	3.31	147.40	7.10	4.40

Note. China Automotive Yearbook, 2005; NBS, 2005, Table 14-19.

The rapid expansion can be traced to heavy state investment and the energetic introduction of foreign capital (Ali et al., 2004). Figure 2 shows the auto industry market value in 2004, where FDI, in terms of foreign controlled enterprises and partnership with domestic firms, accounted for almost half of total market share. Attention should be focused on parts supply market. Research showed that by the end of 2005, part supply firms invested with foreign capital dominated China's auto parts market with more than 60% market shares. Furthermore, foreign firms controlled over 90% market shares in advanced-technology fields, such as auto electronics and engine production (Invest in China, 2006). Though government's local content regulation succeeded in promoting the use of local materials and increasing employment opportunities, indigenous first-tier suppliers still found it hard to compete with global firms due to low R&D capability and production capacity, which are major limitations on China's auto industry development.

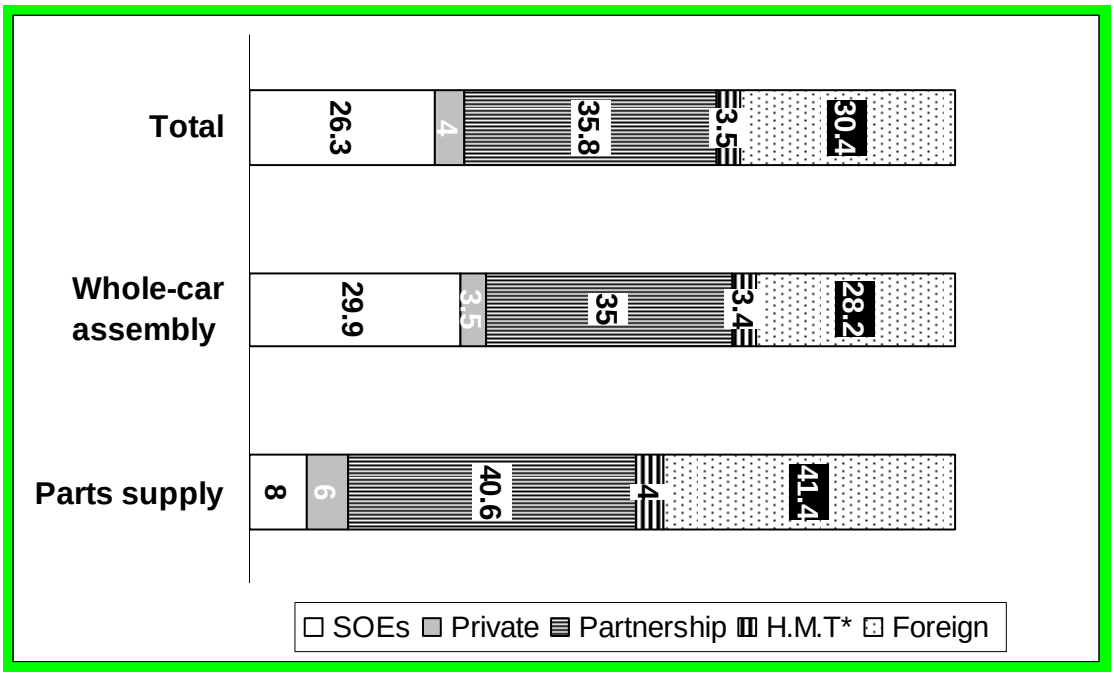

Figure 2 2004 Auto market value

Note. *H.M.T: Hong Kong, Macao, and Taiwan. Adapted from Invest in China, 2006.

As shown in Table 6 and 8, although China's annual auto productions rank in top ten nations, its percentage of total world production is lower than 10%. Furthermore, China still has low private car possession rate, as compared with other top ranking nations. In 2001, China's passenger car possession rate was 1/26 of Korea, 1/47 of U.S. and 1/55 of Japan, which indicates a large potential demand market. In regard to international trade, China has an insignificant trade volume and a negative trade balance. Auto export from China in 2001 was merely 1/47 of U.S., 1/58 of Korea, and 1/159 of neighbor nation Japan, which again, according to Porter's competitiveness measures, shows low competitive power in the global auto market (China Automotive Yearbook, 2002).

Table 8 2001 Auto possessions in the world's leading auto production nations

	World Production Ranking	Population per Passenger Car	Population per Vehicle	Auto Trade Balance (US millions)
China	8	172.5	93.4	-46
U.S.	1	2.0	2.0	-5,346
Japan	2	2.3	1.7	3,836
Germany	3	1.8	1.7	1,685
France	4	2.0	1.7	1,817
Korea	5	5.3	3.6	1,490
Spain	6	2.2	1.8	1,097
Canada	7	1.8	1.8	906

Note. China Automotive Yearbook, 2002.

In sum, China's automobile industry has made remarkable progression from its early developmental stages till after the WTO accession. Both auto production and added value contribute to national economy at an increasing rate. However, in terms of international trade, China's automobile industry still contributes a limited amount to national, as well as global, import and export trades comparing with other leading auto production nations. FDI shows significant power in China's whole-car assembly and parts supply industries, which is becoming a potential threat to indigenous suppliers as the government reduces its protective power. A low domestic vehicle possession rate indicates a large potential demand market for both foreign and indigenous automakers, which makes it more important and practical to understand the competitive position of Chinese auto industry. In the following section, the author discussed in detail China's auto industry competitiveness through Porter's diamond model and multiple measurements.

6.2. Porter's Diamond in China's Auto Industry

Faced with the prospect of stagnant global sales, the world's biggest carmakers are jockeying for a share of one of the few buoyant markets (Gao, 2002). China's domestic car sales, growing at more than 10% annually, accounted for 15%

of global growth from 2001 to 2005 (Gao, 2002). Again, these growing sales were in the domestic market and did not improve China's competitiveness in the global auto industry. Local demand—promoted by better roads, new distribution channels, the deregulation of the auto market, and China's WTO entry—is expected to increase dramatically as China's economy continues to grow (Breslin, 2004).

6.2.1. Factor Conditions

According to Dunning (1980) and Porter (1990), MNEs invest in other nations mainly for three reasons: 1) resource seeking (for lower production costs), 2) market seeking (to get potential market share), and 3) efficiency seeking (to optimize global operation and production). In the early stages of China's economic development, many foreign firms invested in China for cheap material and labor costs, as well as low worker unionization rate and environmental standards. Thus, most of China's exports come out of miscellaneous manufacturing and labor-intensive industries. However, MNEs entered into China's automobile industry mostly to gain access to a large potential demand market and avoiding trade barriers for imports.

The central government has increased investment in basic infrastructure development in order to remove the bottleneck effect caused by low infrastructure conditions and to increase energy productivity, transportation quality and communication ability. For example, the government promotes railway, highway, and waterway transportation projects so as to explore domestic demand for motor vehicles and to improve the supply chain efficiency. By the end of 2004, there were 61,015 km of railways in operation (11.72% increase from 1995), 1,870661 km of highways (61.68% increase from 1995), and 123,337 km of navigable inland waterways (11.55% increase from 1995) in China (NBS, 2005). A positive estimate of profit in

the automobile industry indirectly promotes the development of national infrastructure development.

To speed up the progression, the government has also attracted FDI in the basic infrastructure sectors. As we can see in Table 9, total FDI from 1997 to 2004 reached $459.52 billion US, a large amount of which helped develop basic infrastructure in the nation.

Table 9 FDI (US billions) distribution in basic industries

Sector	1997	1998	1999	2000	2001	2002	2003	2004
National Total	45.26	45.46	40.32	62.38	69.19	82.77	53.50	60.63
Manufacturing	28.12	25.58	22.60	44.25	48.85	59.27	36.94	43.02
Real Estate Mgt.	5.17	6.41	5.59	5.23	5.03	7.22	5.24	5.95
Power, Gas & Water Supply	2.07	3.10	3.70	1.23	2.13	1.47	1.30	1.14
Social Services	1.99	2.96	2.55	4.25	4.29	4.99	3.16	3.82
Transportation, Storage, Postal and Telecommunications	1.66	1.65	1.55	1.42	0.88	1.53	0.87	1.27
Construction	1.44	2.06	0.92	0.83	1.82	1.06	0.61	0.77
Farming, Forestry, Animal Husbandry and Fishery	0.63	0.62	0.71	1.48	1.76	1.69	1.00	1.11
Health Care, Sports and Social Welfare	0.20	0.10	0.15	0.15	0.13	0.26	0.13	0.57*
Education, Culture and Arts	0.07	0.07	0.06	0.08	0.07	0.11	0.06	0.57*
Geological Prospecting and Water Conservancy	0.01				0.01	0.03	0.02	0.23
Other Sectors	1.54	1.15	0.97	1.50	1.43	2.11	2.25	

Note. *Author calculated due to different classification of 2004, the $0.57 billions US covers health care, sports, education, culture, social security and social welfare. Summarized from NBS, 1997-2004.

Skilled labor is an important basic factor for industry development (Porter, 1990). Although China's population on average has a low education level, the auto industry attracts many skilled laborers in urban areas due to its geographical concentration in major cities and fast technological advancement introduced by foreign partners. Both labor productivity and wage in the auto section increased

significantly between 1994 and 2004, at the rate of 11.4% and 13.5% respectively (China Automotive Yearbook, 2005). China's labor cost owns comparative advantage as compared with developed nations, but may not be as competitive as other developing nations. Wages (including welfare bonus) is on average $1 to $2 US per hour, which is 1/10 to 1/20 of hourly wages paid in advanced nations. As technological and managerial skills keep transferring into China, the quality and cost of its labor market will show continuous competitiveness in the world.

Another important factor indicator is technological advancement and R&D investment. As shown in Table 10, China's auto industry had cumulatively invested $50.2 million US in R&D, taking on average 1.5% of annual sales revenue from 1998 to 2003. Auto assemblers invested the most, with $29.1 million US accounting for 58% of total industry R&D investment. In the Global Competitiveness Report (from 2000 to 2003) China generally ranked high in promoting research in industries and collaboration with research institutions (Schwab & Porter, 2004); however, R&D investments of Chinese auto firms are still lower than those of leading global companies. According to Jing (2005), FAW invested $1.06 billion US (1.65% of its sales revenue) and SAIC invested $ 0.59 billion US (2.09% of its sales revenue) in 2003, but those were only 1/65 and 1/116, respectively, of R&D investment of Ford in the same year. The nation owns relatively high technological skills in developing trucks and light trucks, while a majority of passenger cars designs are dependent on foreign technology. Foreign dependency is even more significant in the auto parts supply market. Thus, Chinese automakers and parts suppliers need to increase their research investment and improve their self-design capabilities in order to compete in the global market.

Table 10 Auto industry R&D investment and sales revenues (US 100 millions)

	A: Total R&D investment	B: Sales Revenue	A/B (%)	Auto assemblers	Auto refitter	Engine	Parts
1998	4.6	331.7	1.39	2.1	0.46	0.11	1.39
1999	6.9	376.7	1.84	3.6	0.54	0.30	1.60
2000	8.2	430.5	1.90	4.6	0.52	0.19	1.87
2001	7.1	514.4	1.38	4.1	0.53	0.15	1.87
2002	10.4	719.2	1.45	6.8	0.97	0.28	1.68
2003	13.0	984.8	1.32	8.0	1.02	0.58	2.77
Total	50.2	3,357.2	1.50*	29.1	4.04	1.61	11.19

Note. * indicates the average value. China Automotive Yearbook, 2004.

A final advanced factor condition is the stability of the nation's capital market and the availability of funds. In early years (late 1980s), capital investments in the automobile industry were monitored by the central government. National banks usually held equity in auto joint ventures to oversee the operation (Depner & Bathelt, 2005). The 1994 industrial policy required that investments of over $60 million US must be approved by the central government. To comply with WTO protocol, China reduced its controlling power in capital market and granted more freedom to local governments and multinational financial institutions. Overall, government has been working to promote capital freedom in the auto sector and to cooperate with rationalizing the market.

In conclusion, China is transitioning from its basic factor competitiveness to an early stage of advanced factor conditions. Improved infrastructure and labor skills help build a platform for industrialization while technology advancement and capital market freedom need further development to achieve advanced competitive factors.

6.2.2. Demand Conditions

Although China's auto firms have few competitive advantages comparing to leading global companies in terms of technological and managerial skills, China is

still the largest potential demand market in the world. Kister (1998) stated that, the world three largest auto markets are North America (two people per vehicle), Europe (two people per vehicle), and Asia (34 people per vehicle). Currently North American and European markets have almost saturated, while China has a low vehicle prevalence rate. Using the ratio of U.S. automobile demand vs. income (every 1% increase in average income will result in 2.6% increase in vehicle demand) (Humphrey, 2003), Jing (2005) predicted that China's average income will increase at an annual rate of 6% which, by 2010 will be translated into 10 million vehicle demand, and by 2020 it will be 60 million. If the consumer environment for cars improves significantly through the reduction of excessive taxes and fees, operational restrictions, and red tapes in vehicle purchasing and registration, such purchasing power may convert into huge auto sales.

Figure 3 shows the production composition of China's total vehicle output. China's early auto production primarily focused on heavy trucks (mostly for construction and military uses). Accompanied by the process of urbanization, the need for public transportation has increased dramatically (China Association of Automobile Manufacturers (CAAM), 2002; China Automotive Yearbook, 2004). In addition, passenger and private cars represent more and more market share because of increased product variety and private vehicle demand. Increasing road and highway constructions, as well as the rapid development of tourism, further enlarges auto demand market.

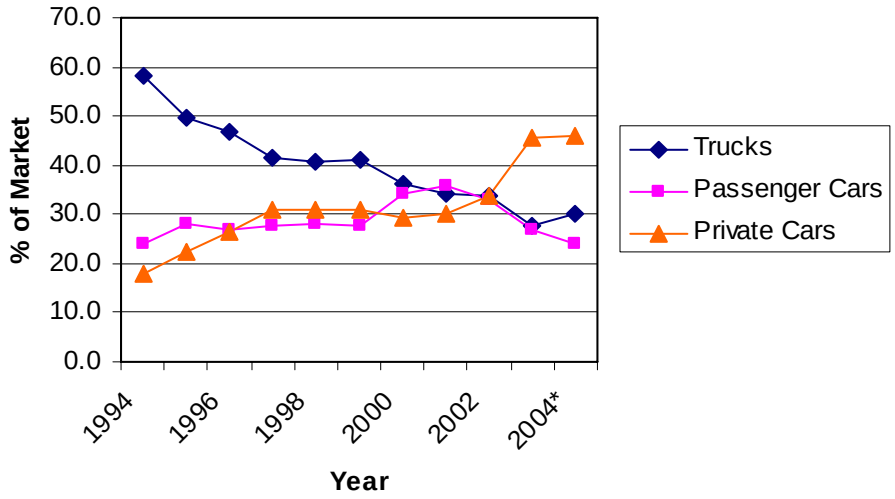

Figure 3 China auto market compositions

Note. *2004 market shares are based on estimation. Adapted from China Automotive Yearbook, 2004.

By 2004, China's per capita disposable income had reached $1,177 US (some developed regions had exceeded $5,000 US). National savings had reached $1.3 trillion US. Increasing purchasing power significantly stimulated the automobile market. Moreover, reduced interest rate (from 10.25% in 1990 to 5.22% in 1998 and 2.25% in 2004) was introduced to promote domestic expenditures. In Beijing, for example, new car sales in 2004 were 260,000 units, an increase of 13.7% from 2003, among which passenger cars accounted for 120,000 units (Li, 2005). Currently, for every 100 families in Beijing, 12 own private vehicles. While this number is insignificant compared with developed nations, it indicates a huge buyer market for passenger cars (CAAM, 2002).

China has 1.6 billion people—and more than 300 million families. Currently the country's per capita GDP is low by international standards, and the majority of Chinese families are preoccupied with issues such as housing, medical care, and education (Ma, 2005). Nevertheless, the absolute number of families that can afford to

buy a car—from three to five million—though small in percentage, is large enough to sustain rapid growth in the auto market. It is clear that with increased Chinese purchasing power, businesses need to understand China's middle classes, which today are better educated, better traveled, more informed and more demanding. There were around 100 million people belonging to this group in 2002, with an annual income of $7,000 US or above, constituting the upper 15% of the Chinese population in terms of household income ("Building a brand.", 2003). By 2010, it is estimated that 400 to 500 million Chinese will be a member of the middle class, making China a bigger market than the United States (Brennan, 2002). Philip Murtaugh, Chairman and Chief Executive Officer of General Motors China Group, talked at the 2001 China Business Summit about the opportunities in the auto market posed by the emergence of China's middle class. He explained that through global experience the take off point for automotive sales occurred when per capita income reached $4,000 US, which is the case in Beijing, Shanghai, and other major cities. GM's marketing is now shifting from institutional buyers to increasingly sophisticated private buyers ("The middle class.", 2001). Predicting a growing number of buyers in the middle to upper classes, many luxury and sport car brands are also heading to China either through joint ventures or increased imports, such as Mercedes-Benz (JV), BMW (JV), Porsche (import), and Land Rover (import) (Invest in China, 2006).

A potential problem faced by many auto firms is the asymmetric distribution of China's population and income. Competition in major cities (i.e. Beijing, Shanghai, and Shenzhen) has been accelerated in almost all market segments (including economic, middle priced, and luxury cars) because of population concentration and relatively advanced industrialization, which indirectly causes the overcapacity problem in coastal auto firms. Conversely, in western inland provinces with low

infrastructure conditions and few foreign investments, the market is left with limited exploration. The nation and its auto firms need to work together in exploring inland demand market and in improving the general living quality.

Overall, growing domestic demand becomes a source of competitive advantage in China's auto industry. The national government is working cooperatively to promote domestic auto expenditures. The growing middle class group creates more sophisticated private customers than institutional buyers. Auto firms are adapting their strategy to compete in all market segments and to explore potential demand market in inland China.

6.2.3. Related and Supporting Industries

Car production in China increased more than three fold between 1993 and 2001 (CAAM, 2002). Over the same period, the supply chain underwent a major transformation. Multinational part suppliers began to work closely with local suppliers, in response to growing pressure from global auto assemblers. Meanwhile, Chinese domestic carmakers tried to improve their research capacity and economy of scale by standardizing local supply network.

The government acknowledged in its tenth Five-Year Plan (2001-05) for the development of the automotive industry that China's auto market is still highly fragmented (Ma, 2005). In 2000, there were 1,628 parts manufacture enterprises, employing 760,000 workers. The gross industrial output of the industry was $6.9 billion US, with a profit of $335 million US. The export value of auto parts and components reached $490 million US, accounting for 40% of total export value of automotive products (China Automotive Yearbook, 2001). Though the passenger-car market has changed from a sellers' to a buyers' market over the last decade, many of China's more than 100 original-equipment manufacturers (OEMs) lack the economy

of scale and technical capability (Zeng & Wang, 2001). These parts suppliers, which are barely able to meet their own economy of scale and do not refer to global supply chain as benchmarking, charge higher prices than imports and are unable to design new products that meet assemblers' demand. Overall, it is still a market characterized by dispersion, disorder, and high costs.

Over the past two decades, relationships between suppliers and assemblers in the West have been transformed. First, there has been a shift towards the supply of complete functions (corners, systems, or modules) rather than individual components (Sadler, 1999). Operations previously carried out by auto assemblers, such as the production of seats and exhaust systems, are transferred to the first-tier suppliers. Second, component manufacturers have taken an increasing role in the design of components and systems (Sadler, 1998). While the assembler provides overall performance specifications and information about the interface with the car, the supplier designs a solution using its own technology, often adapting a basic design to meet customers' specific requirements. These shifts have enabled vehicle assemblers to transfer R&D costs to component manufacturers and to benefit from the specialized technological skills of these manufacturers (Humphrey, 2003).

Following this trend, the new direct suppliers are becoming large global firms, which are either specialized in complex systems, or integrators of several simpler subsystems, as summarized in Table 11. They are expected to have a substantial responsibility in the design and engineering of these systems and to coordinate the supply chain necessary for their manufacturing and assembly.

Table 11 Global auto supply chain of automotive products

	Raw Material Supplier	**Standardizer**	**Component Specialist**	**Integrator**
Focus	A company that supplies raw materials to the OEM or their suppliers	A company that sets the standard on a global basis for a specific component or system	A company that designs and manufactures a component tailored to a platform or vehicle	A company that designs and assembles a whole module or system for a car
Market Presence	Local Regional Global	Global	Global for 1st tier Regional or local for 2nd, 3rd tiers	Global
Critical Capability	Material science Process engineering	Research, design and engineering Assembly and supply chain management capabilities	Research, design and process engineering Manufacturing capabilities in varied technologies Brand image	Product design and engineering Assembly and supply chain management capabilities
Types of Components or Systems	Steel blanks Aluminum ingots Polymer pellets	Tires ABS Electronic control unit	Stampings Injection molding Engine components	Interiors Doors chassis
Note. Adapted from Humphrey, 2003, p. 128-130.				

For confirmative purpose, the author contacted twenty people and finally conducted seven telephone interviews. Interviewees included two sales managers from different auto joint ventures, one representative from a parts supply firm, one parts import manager from the Hainan Mazda Co. Ltd, one university professor, one auto magazine editor, and one consultant from an auto research institution.

The interview with the auto magazine editor in China revealed the current competitive position of China's parts supply market. According to the editor, indigenous parts suppliers have four strengths and four weaknesses. The first and most obvious strength is low production costs. Secondly, available production facilities build a solid infrastructure for parts manufacture and technological upgrading. For the above two reasons, GM and VW have planned to increase parts purchasing from China, with the investments of $5 billion US and €1 billion Euro respectively, in the next two years. This explains the large export value from auto parts and components market. Understanding of domestic auto supply chain and communication becomes the third strength of indigenous parts suppliers. Many domestic component manufacturers have experienced China's industrialization process and thus set up a solid communication network. And the final strength lies in the growing demands for parts supply and after-sale maintenance.

In regard to weaknesses, the editor expressed concerns on the future of indigenous parts manufacturers. Firstly, although domestic factories manufacture and export spare parts and components, they do not learn the central technology and thus merely provide cheap material and labor forces, as highlighted in the example given by the editor. A large portion of parts exports comes out of foreign subsidiaries and their joint ventures, and toward their global supply chain.

> For example, GM purchases large amount of parts from China, but most of them come out of GM's China operation (GM has its own

> parts manufacture facilities in China). GM brings in parts design and benefits from cheap labor and material costs but its Chinese partners cannot get the expected technology spillover.

Closely related to the technology weakness, domestic parts suppliers do not have the ability to manufacture a whole module or a system independently. Lack of technological skills prevents indigenous parts suppliers from becoming global first-tier suppliers. The third weakness is the lack of economy of scale in the parts supply market. Although market rationalization and firm consolidation show significant results in the whole car assembly sector, the component supply market, with over 1,000 enterprises, is still limited by low production capacity. And finally, the editor considered a lack of global supply chain knowledge (i.e. production cost allocation or accounting system) a barrier to enter into the international market.

> Another obstacle for parts export is that China's accounting system is different from the global standard. For example, there was a balance sheet for air filtrator export. China reported low on raw material cost but high on administrative cost (which is true following low Chinese material price and the firm's large labor cost). But the buyer firm finally rejected the deal because they considered low material cost as low production quality while high administrative cost as low efficiency.

The response from the editor regarding the above mentioned challenge confirms my findings from archival data analysis—that domestic parts suppliers, to a large extent, are still limited at the material supply and basic production level. To help ease this challenge, the government had been promoting local content regulations on auto assemblers, which indirectly protected the domestic parts suppliers. China's ultimate purpose of economic reform is to exchange market for technology and knowledge. This is especially true in both car assembling and parts supply sectors. On one hand, China puts strict local content restriction on whole car assembly plants, which forces joint venture auto firms to purchase parts from indigenous suppliers. On

the other hand, China recognizes the low capacity in production and quality control of domestic suppliers (which by themselves cannot meet global standards) and thus the government also promotes equity sharing joint ventures in the parts supply market. By doing so, indigenous suppliers at least have the opportunity to work closely with first-tier global suppliers locally so as to learn global supply chain operation and aim at becoming local component specialists.

While Chinese parts suppliers are eager to learn technology from global firms, world leading parts manufacturers desire to get into Chinese market for low production costs and proximity to their whole-car-assembling partners. For the above reason, a lot of world-class auto parts suppliers have been following the multinational auto firms to the Chinese market, such as Delphi Automotive Systems, Bosch, Valeo, Siemens, Dana, Allied Signal, Lucas Varity, United Technologies, ITT, TRW, Rockwell, Tenneco, Cooper etc. The proportion of joint ventures in the component industry increased significantly in the late 1990s. Till 1996, 35% of the local suppliers were joint ventures. As shown later in the case of SAIC, several large indigenous suppliers have created strategic alliances or joint ventures with foreign-owned companies in order to work in collaborative projects with the automobile and parts manufacturers or to acquire technological know-how or expertise. These firms have achieved high levels of technology, productivity, and quality. All of them have acquired international quality and reliability certifications, such as QS-9000, ISO, and all are able to supply multiple carmakers in China (Depner & Bathelt, 2005).

Auto experts are concerned about China's parts supply market as China's WTO entry resulted in tariffs on imported parts being reduced and local content requirement being removed. Once MNEs can easily get into the market with their global supply chain, many predicted that indigenous parts producers will be forced

out of the game (Ali et al., 2004; Chen, 2002; Fan & Scott, 2003). However, studies also showed that the local content requirement enforced in the 1990s successfully helped build partner relationship between domestic and global suppliers, as well as improving local suppliers efficiency and capacity. Thus, even with the presence of free market access, global auto assemblers may prefer the intra-China network they developed in the last decades to global outsourcing (Thun, 2004; Wang, 1999; Yang & Liu, 2006). Instead of threatening domestic parts suppliers, China's WTO accession is expected to introduce more global benchmarks, which help indigenous parts suppliers learn and adapt to international production standards (Veloso, 2000).

In sum, although China's auto parts industry contributes much to the automotive product exports, indigenous parts suppliers have few competitive advantages over global component manufacturers, in term of economy of scale and R&D capability. Further consolidation and research investment are needed to gain a competitive edge in the global supply chain.

6.2.4. Firm Strategy, Structure, and Rivalry

Major auto assemblers invested heavily in the emerging markets, increasing production capacity and modernizing existing plants. They are attracted not only by the sales growth prospects offered by low motorization rates in developing nations, but also by the potential cost reduction that may be obtained through integrating low-cost manufacturing locations and spreading the vehicle development costs across a greater number of markets (Humphrey, 2003). In China, the government promotes the development of large business groups in the auto sector so as to concentrate foreign investment and help build up competitive Chinese automakers.

To respond to new market trends and demands, automakers are pursuing a set of strategies that are common among major firms (Veloso, 2000). Firstly, automakers

are now planning operations on a global scale, with models being launched simultaneously in different locations with similar standards. Firms are also trying to replicate global supply chain structure, demanding that suppliers set up facilities in the new regions where they are present. This strategy has been implemented ever since the late 1980s when global auto giants set up production plants and introduced global quality standards in developing nations.

The second strategy is to recognize products around common platforms, interchangeable modules, and shared supplier network. The most significant characteristic of China's auto market in 2002 is that competition was switching from mainly price war to model creation and replacement. China's auto market now has more than 40 auto brands and over 200 models, among which new models account for more than 60% of market shares (CAAM, 2002). Both global and domestic automakers invest a lot in R&D to speed up the pace of new model introduction. Meanwhile, declining sales per model and short product life-cycles are preventing automakers and suppliers from reaching economy of scale in design and manufacturing, with a significant adverse impact on cost. By focusing on common platforms and interchangeable modules, OEMs are able to make faster and lower cost deployment of new solutions across the whole product range while tailoring vehicles to a multitude of tastes and preferences of consumers around the world (Xing, 2002); this utilizes a combination of cost leadership (in complete modules) and differentiation (in whole car model design) strategies (Porter, 1986). Furthermore, a shared supplier network can help improve the suppliers' economy of scale while promoting global quality standards and reducing the cost of vehicle manufacturing. For example, one major reason for GM to set up joint facilities in Shanghai area is to tap into the established auto supply network between SAIC and VW.

To focus investment on model creation and car related services, OEMs are becoming less involved in manufacturing and assembly, passing the responsibility of designing and manufacturing important modules onto their suppliers. Thus, the third strategy is to work with a smaller number of larger specialized suppliers. Major criteria for choice of supplier to be a strategic partner include: price and quality competitiveness, R&D capacity, economies of scale, and location (for parts with substantial logistics costs) (Fan & Scott, 2003). The Chinese component supply market is under major consolidation and rationalization process in order to meet the above criteria and get more involved in the global auto supply chain.

Finally, given the increasing importance of design, brand management, and customer relationship, assemblers are joining cross-industry constellations that link them to the technical and market researchers, financial institutions, parts and service suppliers, and final customers.

Following these global trends, Chinese auto firms are developing large business groups, the members of which represent major participants in the auto supply chain. Meanwhile, inter-firm linkage with global auto firms encourages technological and managerial knowledge transfers which ultimately strengthen the competitive power of the Chinese auto industry.

Although some indigenous automakers are independently designing and producing new models, a majority of market shares and car models in the current Chinese market are from joint venture plants. On one hand, as shown in Table 12, major car models technologically originate from foreign partners. This indicates a weakness in domestic R&D capability. On the other hand, Geely and Chery, two indigenous auto firms, show growing production capacity and increasing domestic market shares. They also plan to export to the international market. Their increasing

significance in the auto sector reveals government's ultimate ambition—to create a Chinese designed and globally competitive vehicle brand.

Table 12 Sales of major passenger car models and tech origins

Producer	Brand	Sales Unit	Market Share (%)	Tech Origin
FAW-VW	Jetta	153,916	6.88	VW
SAIC-VW	Santana	132,719	5.93	VW
FAW-Tianjin	Xiali	112,919	5.05	Daihatsu
Guangzhou Honda	Accord	105,387	4.71	Honda
Beijing Hyundai	Elantra	102,749	4.59	Hyundai
SAIC-GM	Excelle	92,225	4.12	GM
SAIC-VW	Santana 2000	90,339	4.04	VW
SAIC-VW	Passat	74,877	3.35	VW
SAIC-GM	Regal	72,903	3.26	GM
FAW-VW	Bora	63,283	2.83	VW
Guangzhou Honda	Jazz	59,303	2.65	Honda
SAIC-GM	Sail	57,839	2.59	GM
Chang'an-Suzuki	Flyer	55,854	2.50	Suzuki
Dongfeng Yueda Kia	Qianlima	55,781	2.49	Kia
Geely	Haoqing	55,189	2.47	Self
Chang'an Suzuki	Swift	54,198	2.42	Suzuki
FAW-Mazda	Family	53,205	2.38	Mazda
Chery	QQ	49,366	2.21	Self
FAW-VW	Audi A6	46,177	2.06	VW
FAW-Toyota	Crown	45,654	2.04	Toyota
Total of Above		1,533,883	68.57	

Note. China Automotive Yearbook, 2003.

The total number of auto firms in China remains high (around 130 in 2003), but the number belies a growing concentration within the industry. The three dominant business groups—the FAW, Dongfeng, and SAIC—account for 67% of sedan and over 50% of total vehicle production in 2003 (see Figure 4 and Table 13) (Thun, 2004). Their combined production in 2003 was 1.38 million sedans, and each aspired to reach production level of 1 million vehicles by 2005 (Thun, 2004). These groups are still not at international levels with respect to costs, but they are mass producing passenger vehicles at high volumes that are close to world-class quality and

technology. They are competing with other developing nations for mass auto production while investing in designing China-branded vehicles.

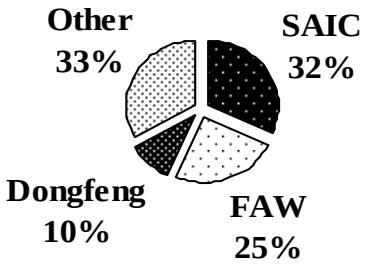

Figure 4 Shares of sedan market by manufacturers, 2003

Note. Adapted from Thun, 2004, p. 456.

Table 13 Top three business group in China auto sector, 2003

Producer	Foreign Partner	Capacity	Market Share %
SAIC Chery	Daewoo	60,000	2.01
SAIC-GM	General Motors	150,000	5.02
SAIC-GM Wuling	General Motors	150,000	4.86
SAIC-VW	Volkswagen	450,000	15.05
Dongfeng Honda	Honda	60,000	2.01
Dongfeng PSA	PSA/Citroen	150,000	5.02
Dongfeng Yueda Kia	Kia	50,000	1.67
Dongfeng Yulong	Nissan	60,000	2.01
FAW Chengdu	Toyota	5,000	0.17
FAW-Hainan	Mazda	50,000	1.67
FAW-Toyota	Toyota/Mazda	100,000	3.34
FAW-VW	Volkswagen	270,000	9.03
Total		1,555,000	51.85

Note. China Automotive Yearbook, 2003.

As shown in Table 14, all of the top three auto groups have multiple joint venture partners (SAIC has the most with 35 international joint ventures in auto-related industries). From global firms' perspective, they form multiple joint ventures due to low individual capacity of Chinese producers. Whereas from a Chinese perspective, multiple partners would translate into partner competition in the Chinese

market, which would ultimately speed up technology transfer and market rationalization. Major portions of revenue and production volume in Dongfeng and SAIC are still from joint venture plants, while FAW seems to be promoting more indigenous operation and has joint ventures contribute to a minor amount of revenue and total volume.

Table 14 Top three automotive business groups performance, 2003

	FAW	**Dongfeng**	**SAIC**
Number of car producers	2	3	2
Number of truck producers	13	15	5
Number of engine producers	2	3	1
Number of component producers	3	23	44
2002 revenue (US billions)	10.7	8.4	12.8
2002 asset (US billions)	8.9	7.0	9.4
2002 profit (US billions)	2.4	2.2	3.4
2002 ROA	27%	31%	36%
Total R&D personnel	2,594	4,946	2,390
R&D/sales intensity	1.5%	1.5%	1.3%
Number of technical centers	2	1	1
Number of training centers	1	1	1
Number of JVs	2	4	35
Types of JV	Car	Car, truck, engine	car, truck, component
Foreign partners	VW, Toyota	PSA, Nissan, Cummins	GM, VW, Delphi, Visteon
JV volume/group volume	85%	100%	100%
JV revenue/group revenue	34%	72%	66%
JV profit/group profit	41%	56%	60%
JV R&D personnel/group R&D personnel	12%	18%	22%

Note. Summarized from China Automotive Yearbook, 2004; Zhao, Anand, & Mitchell, 2005, p. 158.

Hutchings and Michailova (2004) suggested that distinctive knowledge transfer to host nation operations is vital to build competitive advantage in an alien environment. To promote domestic auto firms' competitive power—rather than make China a world auto factory—the government restricted FDI through foreign equity

limits and local content requirement. As a result, there was a trend in the early 1990s to link an MNE source network with a recipient business group network. Most Chinese auto JVs become the intermediaries between those two networks (see Figure 5). Thus, the knowledge flow through the JV is not limited to a one-to-one arrangement (foreign firm-to-local firm) but includes a network-to-network setting. Such network-to-network transfers can have far-reaching implications for the diffusion of knowledge in an emerging economy (Zhao et al., 2005). Not only could such network-to-network structure hasten technology transfer in all areas, MNE source network will also bring in global operational benchmarks on which firm performance can be evaluated. At the level of business groups, this would translate into the increasing use of objective standards when assessing the performance of and interaction between member firms. At the level of individual firms, this often means more effective accounting and financial management.

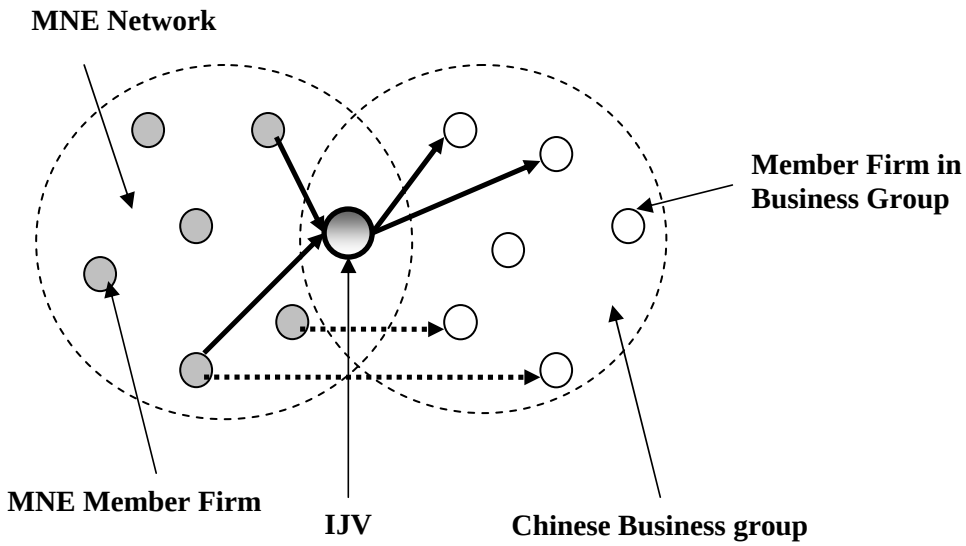

Figure 5 Auto IJV and knowledge transfers

Note. Adopted from Zhao et al., 2005, p. 130.

If we look further into Chinese business groups, the local partners of most JVs are affiliated with local firms from various industries. These firms cover component suppliers, distributors, financial organizations, research institutions, legal or administrative companies, and other related enterprises. By 2003, there are 21 large auto business groups in China, the sum of which represent over 90% of total Chinese automotive firms and revenues (China Automotive Yearbook, 2003). Besides being a hub between the foreign source network and the recipient business groups, the local partners of JVs also act as intermediaries between government and individual firms. Although the government has reduced its direct control over the auto industry, the core firms of these groups take charge in monitoring the performance of the whole industry on behalf of the central government.

To conclude, auto joint ventures and the network-to-network industry structure have successfully promoted the development of Chinese auto industry. Some predicted that joint ventures will be unwound once the Chinese are capable of competing on their own, given China's ambition for whole-car design and export ("Mixed outlook for auto exports.", 2005), while others believed that China would never completely sever its links with other partners as long as cooperation contributes to its advantageous competitiveness, such as opening up foreign markets and shrinking costs, which is more reasonable for China following the trend of globalization (Chen, 2004; Luo, 2002; Ravenhill, 2005). It is clear that China is determined to control domestic auto market through regulatory policies and promote export to improve its international competitiveness.

6.2.5. The Power of Government in Auto Industry Competitiveness

6.2.5.1. Government protective power

As Wang (1999) described, to explore economy of scale in developing nations, domestic firms need an entry barrier placed on foreign counterparts. A certain protection period is necessary for the local carmakers to develop so as to compete with well-financed and technologically advanced MNEs in the future. In the early stages of China's economic development, the key carmakers were all state-owned enterprises to which the government could provide the massive financing necessary to create domestic giants. Due to the importance of the component industry, car part tariffs were kept high, which indirectly encourage businesses to set up domestic part supply networks and to increase inter-industry linkages and technology spillover. As the government considers the giant automakers and their supplier networks strong enough for international competition, the government gradually releases its protection and welcomes global competition. This pattern of industrialization is China's plan in strengthening its domestic automobile industry, where government plays an important role in each phase of the plan.

The protectionism in China's auto industry in the last two decades was inspired by the development pattern in Japan and Korea. Both countries demonstrated that active government interventions contribute to the quick expansion of the export-oriented automobile industry (Wang, 1999). Therefore, the automotive industry is the first among Chinese industries to be backed by a formal state industrial policy. To maintain control over the auto industry, China regulated inward investments through different tools, including trade barriers, screening, equity limits, and local content requirement, to protect domestic automakers and narrow the technology gap.

Trade barriers

A tariff rate on automobiles was set at 180-220% before 1986. Regarding the non-tariff barriers, China applied restrictive import licensing to a number of product categories including motor vehicles, key parts of vehicles, crane lorries, motorcycles, and key parts of motorcycles. Some other trade barriers included foreign exchange controls, state monopoly of trading companies and domestic marketing, and quality and technical standards regulations (Chen, 2002; Depner & Bathelt, 2005).

However, serious consequences resulted which indicated the failure of the trade barrier measures. First of all, instead of the expected reduction due to high tariff rates and low import quotas, imported automobiles sales increased because of growing demand, and this increase, accompanied by widespread car smuggling, limited domestic auto productions. Secondly, MNEs quick to invest in Chinese ventures benefited from protectionism through short-term profits (i.e. auto parts imports from their home nations) without promoting domestic auto industry development. Finally, the high profit rate led to the proliferation of shoddy car producers in China. The industry became further fragmented in the late 1980s, which countered the government's intent to control import, promote local production and rationalize the auto market.

Screening

Multi-level authorities regulate and monitor foreign investments in the auto sector. The State Planning Commission is responsible for formulating the national economic plan. It has virtual control over the units and types of vehicles the joint ventures can produce. Moreover, it also has to approve the new joint ventures that are greatly dependent on the Commission for ensuring approval of a constant, reliable supply of raw materials and energy sources (Harwit, 1995).

The next level of bureaucracy in the automotive industry involves

- The Ministry of Foreign Economic Relations and Trade (MOFERT): responsible for approving JV contracts with foreign capital. They will make sure the capital investment and foreign exchange will be balanced by the approved JVs.
- The Ministry of Machine-Building and Electronics Industry (MMEI): working together with its subordinate company, the China National Automotive Industrial Corporation (CNAIC), plays the formulating role in China's automotive planning section. MMEI is responsible for directing the allocation of raw materials among industries, investment in these industries, and appointment of personnel in the areas it directed (Invest in China, 2005).
- The Ministry of Aeronautics and Astronautics (MAAS): a marketer for the domestic industrial-parts factories. Its responsibility lies in promoting sales of indigenous auto parts to various manufacturers.

The final bureaucracy, the State Council Automobile Leading Small Group, was first established in 1987. It consisted of representatives from various administrative groups that worked to coordinate national policies (act as secondary examiners). It ceased to function by 1989 but has reformulated on call. For example, the group was formed again to discuss the impact of China's WTO accession on the auto industry between 1998 and 2000 (see Figure 6 for the state organizational structure in auto-related screening).

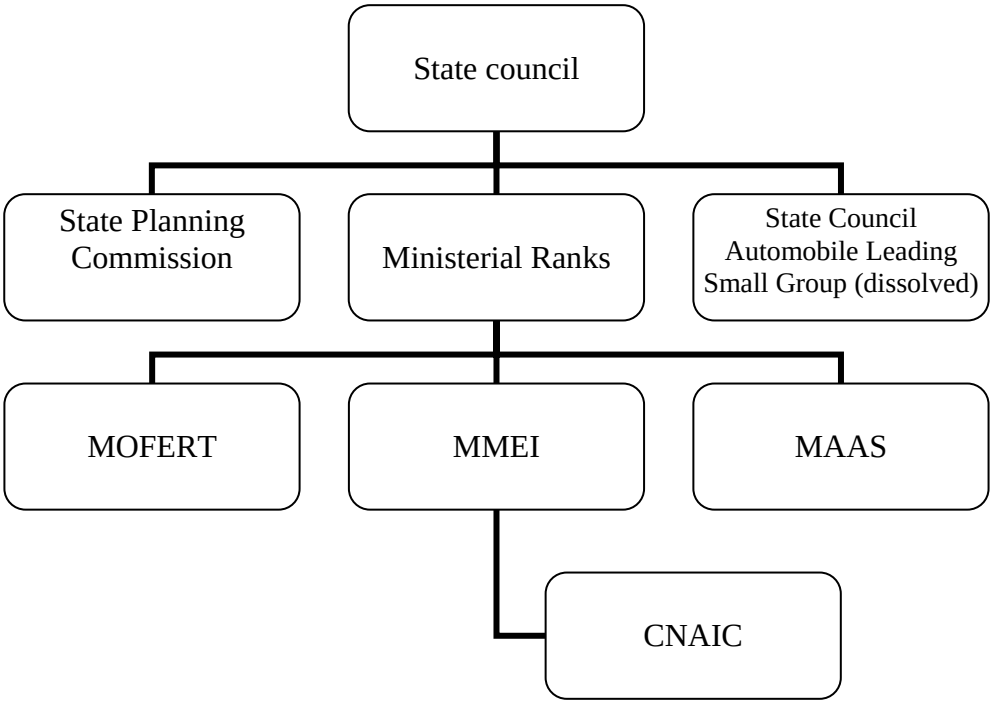

Figure 6 The state organizational structure

Besides the central government, local municipal authorities also play significant roles in China's auto sector. At the top level, mayoral participation in capital intensive industries (such as auto manufacturing) is very common. Moreover, the composition of municipal committees (economic commission, planning commission, and foreign economic relations commission) indicates great control of government power. The study conducted by Harwit (1995) found that in the early 1990s in some major automotive production cities, the heads of automotive corporations were also powerful members of the economic committee(s). An example he gave is that a board chairman of one auto joint venture was also the vice-chairman of the machinery and electronics department under the municipal economic commission (Harwit, 1995).

At the firm level, automotive industrial groups take charge in monitoring the overall performance of the auto cluster in each city. Studies showed that in Shanghai and Guangzhou, automotive industrial corporations are actively involved in auto

financing, supplier network, sales distribution, and after-sale service functions (Francois & Spinanger, 2004; Harwit, 1995; Sit & Liu, 2000).

Government involvement in business administration could present significant obstacles to the auto firms. Harwit's (1995) study of Beijing Jeep and its crisis resolution illustrated the inefficiency of the state and local government structures. When problem was encountered, none of the government agencies (multi-layered state and municipal commissions) could react quickly or effectively. More seriously, various bureaucracies showed disunity in their approaches to the problem. Thus, to improve the efficiency and effectiveness of government monitoring, a majority of screening tasks have been given to local government. Decentralization from national authorities to the local government is a successful organizational restructure, since it improves government efficiency and allows the market to promote resource relocation and process optimization. Jurisdictional competition among local governments can also improve market efficiency through sorting and matching, which is a necessary process to create thriving markets in the transition economy.

Foreign equity limits

MNEs participating in China's whole-car-assembly projects or the three key component projects (motors, air bags, and ABS) are subject to the maximum *equal* share holding limit. In reality however, later operations proved that this requirement did not achieve the objective of management control and technology enhancement as desired by the policymakers. Nearly all the foreign investors have tremendous discretion on the operation of joint ventures, even though they only have minority equity shares. For example, Citroën, with 25% of share holding in the joint venture, controls important management activities such as sales, purchasing, and finance, as well as production control and quality monitoring (Harwit, 1995). Similar situation

can be found in most of the joint ventures in the auto sector. As shown in Jing's (2005) study, sectors with advanced technology and skills (such as engine development and electronic gas control system) are still dominated by foreign partners.

Slow technology transfer becomes the tradeoff of equity control over auto joint ventures. Teece's (1981) study showed that global firms that possess superior assets will opt for a strategy that enables them to retain tight control over foreign operations in order to protect the value of those assets. Therefore, joint ventures would usually purchase major components or technologies from parent companies. The foreign investors intend to prolong the purchasing period to maximize the profit generated from transfer pricing. That being said, China's equity limit can at least guarantee that domestic firms have half the stake of the market; otherwise wholly-owned foreign firms will most probably exclude the domestic counterparts. Hence technology transfer becomes a secondary consideration in the transition period.

Local content and R&D requirements

The local content and technology transfer requirements are imposed to pursue two of China's most important policy goals: complex industrial development and self-reliance. These requirements were combined with varied tariff rates to encourage increased local content of assembled vehicles. For passenger cars whose local content exceeded 80%, the tariff rate on imported parts and components was 40%, and for local content of 60-80% and below 60%, the tariff was 60% and 75% respectively (China Automotive Yearbook, 1995). This policy was designed to create technological linkages to the component industry and to strengthen the indigenous capabilities in whole car design and manufacturing. By imposing local content requirements, the Chinese government compels MNEs to use locally produced

components and to provide employment opportunity, which allows indigenous auto firms to benefit from the technology spillover effect.

Auto joint ventures are also required to set up an internal technical center that is capable for model adaptation and development of future generations of products following global standards. The 1994 industrial policy provided three strategic guidelines for developing indigenous R&D capabilities. First, vehicle assemblers should include 5-10% of total reinvestment for developing or expanding their technical centers. Second, R&D spending should reach at least 2-3% of sales within five to ten years. Third, key component suppliers should apply 10-20% of their reinvestment to set up R&D facilities and technical centers. The government will provide financial and taxation support for joint R&D projects in the automotive industry (China Automotive Yearbook, 1995).

The beneficial spillover effects of local content application were manifested gradually by the mid-90s. For example, Shanghai Volkswagen formed the Shanghai Santana Local Content Co-operative (SSLCC) by bringing together the parts makers, banks, universities, and research institutes. Being a member of SSLCC means a long-term contract and a steady supply of components, which are the key incentives for the component suppliers to execute continuous quality improvement. Many local parts suppliers either import technologies or form alliances with global component manufacturers so as to integrate into the complete manufacturing system.

6.2.5.2. Automotive industrial policy

A national automobile industry policy was issued in 1994 (the 1994 Policy), which aimed at developing large automotive groups while limiting foreign participation. The state expressed the intent to develop three or four large automotive groups, six or seven key auto plants, and eight to ten major motorcycle plants. In the

long term, by 2010, the state would promote conglomeration among individual enterprises across different industries, so that there would be three or four auto groups that are internationally competitive. Moreover, this policy prohibited foreign companies from establishing more than one auto joint venture making the same type of vehicle in China (Ministry of Commerce of the People's Republic of China (MOFCOM), 2005).

In the intervening ten years, the 1994 policy could no longer accommodate the rapid development of the auto industry. A new automotive industry development policy (the New Policy) was formulated in 2004 to explain China's WTO commitments, the development of China's economy and China's aims to turn the auto industry into one of its pillar industries. Several significant changes are summarized below (Lall, 2004; MOFCOM, 2005).

- Development orientation: the New Policy aims at keeping the auto industry at pace with economic and social change, and aims at a policy based on sustainable development. For example, the New Policy encourages the development of cars with advanced energy-saving technology, small displacement and recycling materials.
- Trademarks on products: there was no trademark protection provision in the 1994 Policy. The New Policy, in an effort to promote first class domestic enterprises and heighten public awareness of domestic brands, entails brand protection, which requires all domestically produced cars and assembly parts to carry registered trademarks or service marks.
- Market access administration: the New Policy creates a standardized procedure to allow the state and local administrations to collectively issue notices on eligible auto manufacturers and products (bypass the hierarchical

authentication procedure). In addition, the threshold of local government's discretion to approve automotive investments since China's WTO entry has been raised from $30 to $150 million US.

- New investment management: 1). The New Policy provides a more favorable approval mode for auto investors. The approval process is simplified for market-adjusted expansion and investment, which allows existing automakers to expand into auto part or related businesses with quicker access. The approval process remains the same for newly established companies or existing automakers that manufacture vehicles in a different category. 2). The New Policy keeps the limitation provided in the 1994 Policy regarding the equity interests that is allowed for the foreign party in a vehicle assembly joint venture (50% maximum), while foreign components manufacturers are not subject to such limitation (to promote development and attract more FDI in the component sector). The New Policy also allows foreign investors to invest in multiple joint ventures with different domestic automakers (to encourage a broaden range of model introduction and knowledge transfer). 3). A minimum of $250 million US must be invested for new automotive manufacturing projects, of which $100 million US must be self-owned capital. Such a project must include a product R&D organization with an investment of no less than $60 million US.
- Automotive loans: following the New Policy, various supporting facilities will be built to foster the implementation of auto financing. For example, a maximum of 80% of the auto price could be granted for automobile loan according to the China Banking Regulatory Commission (CBRC). Furthermore, with the provision of a simplified investment review procedure,

many auto assembly firms are expected to share the auto financing and the after-sale service markets, as complementary services provided with their auto sales. This provision will significantly benefit the consumers by providing a simplified financing path and reducing the risk.

- WTO commitments: the most significant impact on the auto industry is the removal of protective policies. By 2006, import quota will be abolished and the average tariff on whole cars will be reduced to 25%, on parts and components to 10%. The New Policy provides the eleventh chapter on "import management" to promote a non-biased marketplace for local and imported cars. China agreed to comply with the WTO protocol on Trade-Related Investment Measures (TRIMs) upon entry to the WTO. Under TRIMs, China cannot subsidize export performance or require that companies use locally produced parts and components, restrict the types of vehicles produced, or maintain separate regulations for domestic and imported products.

As China transitions to a free market economy, the government continues to modify the auto industry policy to meet changing market conditions. However, the author's interview with the auto consultant revealed that it is difficult to align the industry policy with the underdeveloped free market due to the problems remaining from the planned economy.

> Indigenous auto firms find it difficult to operate under the free market rules. Problems like disorderly competition, repetitive investment, and lack of production of models demanded by the market still exist in China's auto industry, which demonstrate a mismatch between industry policies and the current market situation. Therefore, China needs to further adapt its industry policy in order to effectively address and solve the market problems.

The central government has used its restrictive power to regulate and control FDI, which serves as a substitute for its inability to support domestic auto industry

development. Government policy helps concentrate FDI in key firms in exchange for granting foreign firms access to the domestic market. While local partners have the opportunity to learn technological and managerial skills, foreign partners benefit from getting access into the market and bringing in global benchmarks for quality and price optimization. Although China has made significant progression in developing its auto industry, the central government still needs to further adapt the industry policy to address new market problems.

6.2.6. WTO Entry and its Impact on China's Automobile Industry

The transition from a command economy to a market-based economy has been remarkably successful in China. After 15 years of negotiations, China finally jointed the WTO in December 2001. Agarwal and Wu (2004) predicted that China's auto assembly and distribution sectors will face increasing foreign competition, which will lead to industry-wide resource reallocation and consolidation such as mergers and acquisitions.

China will cut tariffs on cars, buses, and trucks to an average of 25% by 2006 (see Table 15). Although this figure is still high given the low profit margin in the auto sector and the definition of free trade, the Chinese government insists on keeping a reduced tariff for some time in order to provide some leverage to domestic producers. Furthermore, tariffs on more than 160 auto parts and components will be reduced from an average of 25% in 2001 to 10% by July 1, 2006. China has also committed to increase its import quotas on motor vehicle products by 15% annually, based on quota values in 2000, and to eliminate import quotas entirely on January 1, 2005 (see Table 16). China will eliminate import licenses for engines in 2003; motorcycles, trucks, and buses in 2004; and passenger vehicles in 2005 (Invest in China, 2006; Koehn, 2002; Xing, 2002).

Table 15 Scheduled WTO-mandated tariffs of cars, buses, and trucks (%)

Cars	2001	2002	2003	2004	2005	2006	2006
	Jan. 1	Jan.1	Jan. 1	Jan. 1	Jan. 1	Jan. 1	July 1
Engine size							
Less than 3 liters	70.0	43.8	38.2	34.2	30.0	28.0	25.0
3 liters and up	80.0	50.7	37.6	37.6	30.3	28.0	25.0
Buses (number of seats)							
30 and up	45.0	37.5	33.3	29.2	25.0		
20-29	60.0	47.5	40.0	32.5	25.0		
10-19	65.0	47.5	40.0	32.5	25.0		
10-19 (diesel)	65.0	38.4	32.9	27.5	25.0		
Gasoline Trucks (Gross vehicle weight)							
8 tons and up	30.0	21.0	18.0	15.0	15.0		
14-20 tons	30.0	24.0	22.0	20.0	20.0		
5-14 tons	40.0	30.0	25.0	23.3	20.0		
Less than 5 tons	50.0	37.5	30.0	29.2	25.0		

Note. WTO, 2001, Annex 1A, section IV.

Table 16 Import quotas on motor vehicle products (million units)

Description	2000	2002	2003	2004	2005
Motor vehicles and parts	6,000	7,935	9,125	10,494	No quota
Motorcycles and parts	286	376	432	497	No quota
Cranes and chassis	88	116	133	153	No quota

Note. WTO, 2001, Annex 1A, section IV.

China is required to open certain services sectors as well. These include distribution, financing, insurance, road transportation, storage and warehousing, maintenance and repair, and leasing and rental. WTO terms will generally permit wholly foreign-owned subsidiaries in these areas by 2005. China is required to totally remove the local content and the technology transfer requirements after its five year transition period in 2006. Table 17 provides a summary of China's general WTO commitment. The interview with the professor specifically addressed the advantage of allowing foreign investment in Chinese capital market. According to the professor, the entry of global financial institutions will provide a better and a more convenient auto-financing platform for customers. More importantly, the introduction of a

developed credit evaluation system and a customer-oriented culture will stimulate reform and advancement in the domestic financing market.

Table 17 Summary of China's general WTO commitments

	Before WTO entry	**After WTO entry**
Tariffs	200% in 1980s; 100% in 1990s	25% by 2006
Import Quota	30,000 vehicles a year allowed from foreign carmakers	Quota increased 20% a year, phased out by 2005
Local Content and Technology Transfer	40% in first year of production, increasing to 60%, 80% in second and third years, respectively. Require to invest in R&D locally	No local-content requirement. No regulation on the establishment of R&D or training center
Foreign Participation in Sales, Distribution and other Services	Limited to wholesaling through joint ventures; prohibited from consolidating sales organizations of imports	Will be allowed to own vehicle wholesale, retail organizations; integrated sales organizations permitted by 2006
Auto Financing for Chinese Domestic Customers	Foreign, nonblank financial institutions prohibited from providing financing	Foreign, nonblank financing permitted in selected cities prior to gradual national rollout

Note. Adapted from Gao, 2002, p. 148.

China's auto industry is heavily impacted by its WTO entry. Consolidation has been taking place in the industry in order to generate economy of scales and competitive product quality. Major Chinese auto companies have also formed multiple joint ventures with MNEs for the same purpose. The question is whether Chinese auto firms will have enough time to phase out their infancy before July 2006 when tariffs on autos decrease from the rate of 100% and 80% to 25%.

Some analysts thought that China's indigenous automobile industry would be a major victim of WTO accession (Han & Kim, 2003; Kister, 1998; Lin & Lin, 2001; Qin, 2004; Wang, 1999). According to research conducted by Yang and Liu (2006), the expected changes to the automobile industry are significant: 15.1% reduction in output, 14.5% reduction in employment, 105.1% increase in import and 7.8% reduction in export. At the end of 2001 it was forecast that car prices would decline by around one third within a few years and that imports of passenger cars would increase by 30% (Luo, 2002). Growing demand caused by price reduction would favor imported vehicles, and domestic auto producers were predicted to finally lose their competitive edge in Chinese market and the global auto industry.

However, others have an optimistic view of the future of the Chinese auto industry. When analyzing China's national strategy for internationalization, scholars concluded that China agreed to remove trade barriers based on a positive estimation of the power of domestic automakers (Ravenhill, 2005; Sutton, 2004; Xing, 2002; Zhu & Nyland, 2005). Although WTO agreement gives MNEs the opportunity to freely import parts and components, existing auto assemblers may prefer the established supplier network in China because of improved production and design capacity of domestic suppliers. Thus, China's WTO entry should be considered an opportunity for domestic automakers to get into the global market.

Since researchers promote conflicting views regarding the future of China's automotive industry, the author obtained information about the 2006 government policy by talking with a parts import manager from Hainan Mazda Co., Ltd. According to the manager, the new policy is approved by the State Economic and Planning Commission, the State Asset Supervision and Administration Commission, China Automotive Technology and Research Center, and the State Environment Protection Administration, and is considered a replacement of protective policy after China's WTO accession. China is required to remove all trade barriers by 2006. Instead of protecting the automotive industry, the government is encouraging R&D in indigenous auto firms by setting up flagship enterprises. Chery, Geely, and Yutong who have produced China-branded cars are the candidate firms. They will establish centers for technical research, human resource training, and quality control and standardization; and the government will provide funds and human resource support in research projects. By doing so, the central government want to help its indigenous automakers become self-reliant firms with total capacity for design, manufacture, and management.

In sum, China's WTO entry brings both opportunity and threat into the automotive industry. The result is yet to be seen, but intensified competition, growing auto demand, and improved price-quality schema are predicted to radically affect China's auto industry following global standards.

6.3. Overall of the Diamond Framework

Table 18 provides a summary of the determinants in the diamond model based on the analyses in previous sections. The structure and measurement levels (High (H), Medium (M), and Low (L), and a transition assessment, i.e. M-H (Medium to High)) are adapted from Barragan's (2005) study on Mexico's competitive position. The

Chinese auto industry could be classified as less competitive when measured against Porter's export-related indicators, because a majority of the current production serves domestic market with few export amounts. However, a large demand market attracts both Chinese and foreign investments in factor and supply chain development. Industry policy introduced in the late 1980s helped set up the partnership format in auto assembly and parts manufacture sectors, which dominated Chinese auto market for a long time. Increasing domestic competition helped speed up the rationalization process, including supply chain efficiency improvement, auto assemblers' consolidation and restructures, technology advancement in parts supply and whole car designs, and so forth.

In China, government's interaction with all four determinants contributes significantly to the fast development of its automobile industry, which confirms Porter's discussion on the role of government. In general, government is able to concentrate funds in developing factor conditions, promote domestic demand for motor vehicles, direct foreign investment in major auto groups, and encourage technology transfer in indigenous supply network. Specifically, the government modified the industry policy in order to effectively regulate FDI and assist the industry progression. For example, it imposed trade barriers and local content requirements on auto joint ventures to simulate localization rate; it required the establishment of technical center to promote technology transfer; and it utilized China's WTO accession as another tool to introduce its domestic auto giants into the global market.

Table 18 Assessment of the diamond of Chinese automobile industry

	Factor Conditions	Demand Conditions	Related and Supporting Industries	Firm strategy, Structure, and Rivalry	The role of government
Assessment	L-M	M	L	M	M-H
Source of Competitiveness	Basic industrial infrastructure Cheap production cost Skilled labor Increased R&D investment Reduced regulation in capital market	Growing domestic demand Growing middle class with sophisticate demand. Unexplored inland provinces	Fragmented industry Lack of economy of scale Low R&D capabilities Dependent on foreign technology Lack of experience of global supply chain operation and quality standards	Growing competition between JVs, indigenous firms, and global automakers Ongoing firm consolidation and market efficiency improvement	Frees capital market to promote expenditures Trade barriers Central monitoring Equity limitation Local content and tech-transfer requirements Promote indigenous design capacity WTO commitment Active in all competitive determinants

6.4. Shanghai Automotive Industry Corporation (SAIC)

Following Porter's discussion on the competitiveness of industry clusters, SAIC (and its major auto assembly partners—VW and GM) and the development of Shanghai automotive industry cluster provides a success story for industry development where governments, national and municipal, not only provide advanced infrastructure but play an active role in formulating industry structure.

Neither GM nor VW has achieved their prodigious success manufacturing cars in China alone. Although they compete, both giants are linked to the same Chinese partner—Shanghai Automotive Industry Corporation, or SAIC—which owns half of the operations and shares half of the profits. These joint ventures are a big success for SAIC which has more than doubled in size since 2000. In the year of 2003, it produced 612,216 cars with VW and GM, a startling increase of 57% from 2002 (SAIC, 2004). That has catapulted SAIC onto Fortune's list of the world's largest companies at No. 461, with revenues of $1.43 billion US and profit of $83.3 million US in 2003 (SAIC, 2004). SAIC has an enormous appetite for growth and is already casting its eyes beyond China's borders. Officials have openly declared their intention to become one of the world's six largest automakers by 2020, joining GM, Toyota, Ford, Daimler-Chrysler, and VW (Taylor III, 2004).

SAIC has devised a multi-pronged strategy for expansion. Inside China, it will continue to support the growth of its joint ventures with VW and GM, both of which have announced plans to more than double productions over the next three years. SAIC is also targeting foreign markets. It is taking a 48.9% stake in South Korea's Ssangyong Motor, primarily a maker of sport-utility vehicles. SAIC will introduce Ssangyong sales in China in exchange for a foothold in the Korean market. The new investment should help SAIC fend off challenges from its chief domestic rivals, FAW and Dongfeng Motor. As the third leg of its growth plan, SAIC expects to develop and sell a passenger car in China in 2007 under its own logo[1].

In regard to the supply market, by 1991, many of the parts producers that were originally controlled by different authorities had become integrated into the SAIC group. SAIC now consists of different companies and establishments that

[1] Statistical facts and information discussed in the following case studies are incorporated from previous studies, as specified by authors, or otherwise from SAIC, SGM, SVW, or related company websites. A complete researched document list is provided in Appendix B.

manufacture cars, trucks, buses, and motorcycles, as well as parts and equipments. By the end of 2001, SAIC had established 55 joint ventures with other automobile and component manufacturers and employed almost 62,000 people (see Figure 7) (Depner & Bathelt, 2005; SAIC, 2004). The resulting supplier network developed into one of the most advanced in China. Shanghai and its neighboring provinces also have the largest conglomeration of parts makers in China. SAIC's strategy in this process is to integrate as many suppliers as possible into its own network so as to develop broad competencies in the auto production.

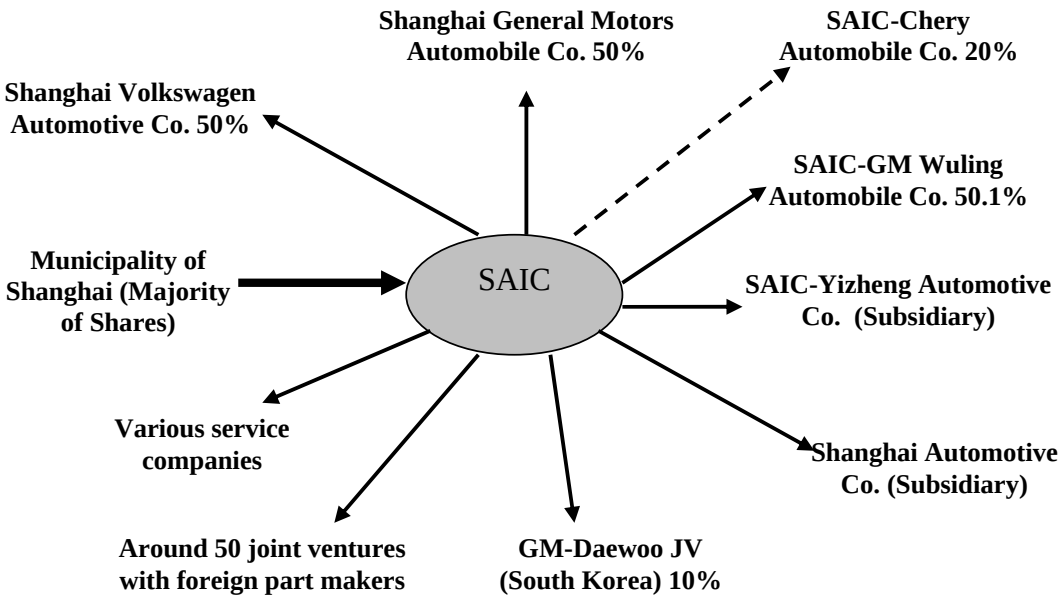

Figure 7 Composition of Shanghai automotive industry corporation

Note. Percentages indicate share holdings of SAIC in each partner organization. SAIC used to hold 20% equity in Chery but released by the end of 2003 due to a legal problem discussed in later section. Adapted from Depner & Bathelt, 2005, p. 62.

It is worth mentioning that SAIC has a policy to sign contracts with more than one supplier for each component. This not only secures its supplies (for reasons of insufficient transportation or other unexpected problems such as shortage of power

supply in some areas), but also promotes competition among the suppliers. The competition undoubtedly pressures the suppliers in upgrading technology and raising efficiency (Lee, 2000). Specifically for the latter reason, SAIC (and other major indigenous auto firms) have established multiple joint ventures in the auto assembly sector as well (SVW, SGM, SGM Wuling, etc.).

Understanding the SAIC—one of the earliest established and now the leading domestic auto groups in China—could offer significant insight on the performance of most auto joint ventures in China. Currently, SAIC's joint ventures with VW and GM contribute to a major portion of its operation, and thus in the next sections the author incorporated case facts about its partnership with VW and GM and analyzed the firm strategy, supplier network, involvement of governments, and potential problems with technology transfer and business governance.

6.4.1. General History of SVW and SGM

Not only did Shanghai present an advantage as a potential market, but Shanghai's heavy industrial infrastructure also made major contributions to Shanghai VW (SVW) and Shanghai GM (SGM). A larger number of parts factories, together with the extant Shanghai car plants and the city's steel and other heavy industries, cried out for the final ingredients necessary for rapid development: modern technology and management skills.

An automobile cluster began to develop in Shanghai in the 1980s, thanks to strong government support at different levels. To upgrade the national automobile industry following international standards and to avoid an influx of automobile imports, the central government started negotiation with VW in 1978 for the establishment of a joint auto production firm. During that entire year, the country's state-owned auto factories produced only 15,500 vehicles, and the industry was

characterized by old-fashioned, low-quality cars that were produced with outdated equipment in a labor-intensive process (Kiefer, 1998). Chinese official pressed the idea of building autos for export and insisted on auto-parts localization. The German counterpart, however, explained the necessity of auto-part import at the first stage and proposed the idea of localization as China became more experienced in producing quality part supplies. Within this cooperative atmosphere, the contract was signed in 1984. This joint venture was owned 50% by Volkswagen, 25% by SAIC, 15% by the Bank of China's Shanghai Trust and Consultancy Corporation, and 10% by the China National Automotive Industrial Corporation. The involvement of Chinese partners revealed careful forethought: "The Bank of China could provide or guarantee needed loans, SAIC would have an interest in solving local problems, and CNAIC could be a link to the central planner." (Harwit, 1995, p. 153).

To reduce its dependence on VW and to stimulate technology transfer after one decade of cooperation, SAIC decided to engage in the joint venture with GM in the early 1990s. SAIC and GM signed a contract to jointly set up Shanghai GM production facilities in Pudong in 1997. GM was anxious to win this joint venture because it believed that SAIC was the best automobile company in China. Indeed, SAIC was highly profitable due to many advantages. Notably, the Chinese government had chosen SAIC to be the primary passenger car producer enabling it to acquire the most relevant technological experiences, more so than any other domestic company. However, the obvious disadvantage of working with SAIC was its existing joint venture with VW which was one of GM's global competitors and which had dominated the Chinese passenger car market since the mid-80s (see Table 19). Since its establishment, SGM has grown into one of the largest car producers in China.

Between 2001 and 2003, GM increased its market share in China substantially, from 2.7 to 9.9% (“Shanghai GM supply chain system.”, 2005).

Table 19 Total car production in China and SVW's share, 1990-2003 (1,000 units)

	1990	1992	1994	1996	1998	2000	2002	2003
A: Total	40.0	162.7	268.7	393.0	507.1	607.1	1,092.0	2,020.2
B: SVW	18.5	65.0	115.3	200.2	235.0	253.12	301.1	396.0
B/A (%)	46.3	39.9	42.9	50.9	46.3	41.7	27.6	19.6

Note. China Automotive Yearbook, various issues; SVW, 2005.

6.4.2. Auto Supplier Cluster in Shanghai Area

The development of the automobile industry in the city was strongly supported by municipal policies, including infrastructure development, labor market, and industrial policies. In addition, to stimulate broad manufacturing competencies and to integrate Chinese suppliers within the region, the central government enforced local-content regulations on those auto joint ventures to spur the development of a regional production network with substantial local linkages.

Meanwhile, there has been a strong tendency in the international automobile industry to develop hierarchical supplier networks and shift the developing, manufacturing, and assembly responsibilities of important modules to the first-tier suppliers. Along with the globalization strategy of the automobile producers, large first-tier suppliers were also required to follow their auto assembly partners and set up production facilities in other nations (Sadler, 1998). As a consequence, VW demanded that important first-tier suppliers establish production facilities in China, preferably within the region. However, production volume (less than 20,000 units in 1990) at that time was too small for global suppliers to set up mass production facilities in Shanghai.

In the initial years after production was launched, SVW still imported most parts and components for the production of the VW Santana from overseas, a large

part of which was from Germany. At that time, there were basically no firms in the region that could have supplied the parts that were needed. However, the Chinese government threatened to impose a production limit on SVW if the firm would not increase its local content in production. To achieve the 70% local content regulation but at the same time to ensure global quality standards, VW and the Chinese government worked interactively in promoting joint venture partnerships in the auto parts sector.

Currently, among the suppliers of SVW, sixty have set up equity joint ventures with foreign companies and 120 have transferred technologies from developed countries. Working together with leading global component manufacturers, Chinese indigenous parts suppliers have been able to elevate themselves from the role of raw material suppliers to local system integrators by introducing, absorbing and assimilating overseas technology. As shown in SAIC's supplier network, one supplier firm for SAIC, the Shanghai STEC Transportation Electric Co., Ltd, has become a small business group itself. It has created five subsidiary JVs, as well as a technical center in Shanghai. The firm has the capability to design and manufacture complete modules for its customers (SAIC, 2004). The JV is still reliant on the foreign partner for technology, but the relationship is a partnership rather than complete dependence. By supplying to SVW and SGM, the company is becoming a supplier to many other auto assemblers in China and aiming at exporting to the world.

Global component and parts producers also benefit from partnering with indigenous suppliers through access to cheap material and labor and reduced risk of wholly-owned subsidiaries in an unfamiliar environment. For instance, Ford established a joint venture with a Chinese partner to produce various kinds of automotive-used glass in 1992. Allied Signal invested $27.4 million US in its wholly

owned subsidiary producing turbochargers in Pudong New Area of Shanghai in 1994. ITT built its joint ventures for manufacturing breaking equipment. GKN started manufacturing transmission shafts in 1989. Bosch, one of the world's largest auto part and component producers, signed a giant JV contract (a total investment of $2.7 billion US) with a group of Chinese companies in 1996 ("Shanghai GM.", 2005).

To conclude, joint ventures between global components suppliers and SAIC seem to offer advantages to both sides. SAIC benefits from the technology transfer while MNEs are able to use existing production facilities, acquire materials or parts through established channels, and get access to SAIC's partners in the supply chain. The result is positive: in 2002, SVW had 371 suppliers that were located in China. The local content in the production of cars ranged from 40% for the newly introduced VW Polo to 93% of the VW Santana. At SAIC's another partner plant, SGM, the localization rate for its Buick sedan had reached 70%. The firm imported only $140 million from the United States in 2002 as compared to the annual parts import of $700 million US in 2000 (Shanghai General Motors, 2006).

6.4.3. Joint Ventures Firm Strategy and Competition

SAIC's strategy is clear—to form multiple auto JVs with different global firms and to benefit from competitions between those partners, in regard to technology transfer, new model introduction, and supply market rationalization. SAIC's experience with GM and VW proved this strategy, and GM seems to do a better job in quality control, technology adaptation, and accurate appraisals of domestic demand market than its competitor VW. While VW and GM are increasingly going head to head in the marketplace as they expand their product lines, SAIC may find itself competing with both when its own car goes on sale. At the same

time, VW and GM run the risk of being shunted aside as China's domestic auto industry develops.

In July 2004, national auto sales rose only 3.7% over the same period in 2003 (CAAM, 2005). The growth slowdown has had a significant impact on VW who was losing market shares because of an aging product line and increased competition. In 2002, cars made by SVW had 27.6% of the China market; in 2003 they slipped to 19.6%, and for the first seven months of 2004, they fell further to 15.5% (Xu, 2005).

VW's difficulties have created an opportunity for GM, which passed SVW briefly in June 2004 to become the market leader. "Over the past few years, Chinese consumers have become more savvy shoppers through greater access to information" ("The middle class.", 2001), said Phil Murtaugh (CEO of GM China) at the 2001 China Business Summit, and "they have higher expectations for the products and their quality." ("The middle class.", 2001). He pointed to the dramatic increase of internet usage and the greater number of Chinese auto publications. "China's growing middle class itself represents a sophisticated customer base for a broaden product mix and thus fierce competition," Murtaugh said ("The middle class.", 2001). A careful evaluation of changing domestic consumers and a close relationship with Chinese engineers in its technical center keeps GM consistently in the leading position in Chinese passenger car market.

Specifically for business operation, the two joint ventures have adapted divergent manufacturing and technology development strategies. SVW has invested heavily in automation, while SGM relies more on manual labor. In the SGM workshop where steel stampings are fused together, about 75% of the welding is done by hand; in GM's U.S. plants, only 5% is performed manually. Since hand welding produces more variability in results, GM performs more quality checks in China. The

labor-intensive system seems to work. Both VW and GM have created technical centers to train Chinese engineers and modify Western design for the Chinese market, while GM seems do a better job (detail is discussed in the next section).

GM's entry into the Chinese market and its cooperation with SAIC also initiated a number of changes in the product strategy of SVW, as desired by the Chinese. The firm now produces different models in Shanghai—the "Santana", "Santana 2000", "Passat", and "Polo". SVW started to produce the "Gol" in Shanghai in 2002, a model that was originally designed for Brazil. VW now pushes the establishments of broad engineering competencies to be able to adapt cars to the specificities of the Chinese market.

SAIC's partnerships with GM and VW successfully promote technology transfer in auto-related industries in Shanghai. SAIC still needs its partners, because despite of being a longtime maker of commercial vehicles and components, it lacks the capital to develop a full line of cars, the up-to-date technology to ensure quality control, and the brand names needed to lure consumers. Although its ultimate target is to produce a China-designed and China-branded vehicle, SAIC, following the trend of globalization, will not sever its links with global partners for the purpose of technology advancement and foreign market access in the future.

6.4.4. Technology Transfer: Good and Bad

Scholars advocated that the existing supplier network and industrial infrastructure were important reasons why GM also decided to set up production facilities in Shanghai in 1997(Gallagher, 2005; Taylor III, 2004), while the later success of GM, to a large extent, is attributed to its sincere investment in local technology development and close cooperation with Chinese engineers. Nonetheless, problems could rise from inter-JV technology transfer.

GM was the first company that actually established a technical center with additional investment in Shanghai, following the government's promotion of technology transfer in the 1994 industrial policy. A separate $50 million US joint venture was established between GM and SAIC named the Pan Asian Technical Center (PATAC). PATAC's main purpose is to provide engineering support to SGM and other Chinese auto companies. PATAC has also established an in-house emissions testing center and has employed around 400 Chinese engineers, which, though not directly training Chinese engineers, gives China the opportunity to work closely with advanced techniques and learn in the process.

PATAC's contributions were apparent only two years after its establishment. SGM launched a compact sedan called the Buick Sai Ou (Sail) for private consumers in the growing Chinese middle class. While GM was the original technology provider, Chinese PATAC engineers completed most of the product adaptation process and SGM manufactured the Sai Ou with 70% local content. PATAC also works closely with SGM's research labs in universities that conduct auto-related studies and request relevant adaptations. For example, engineers from PATAC and the Body Manufacturing Satellite Laboratory in Shanghai Jiaotong University conducted research on body manufacturing and technical design, such as adaptive strategy in auto-body assembly process, and process robustness of auto-body stamping. Their achievements are significant. The engineers reduced the body-in-white variations in Shanghai GM and Jinbei GM, developed the flow chart of body quality control, dimensions data analysis and variation root, and developed a database for local body materials (Shanghai General Motors, 2006).

According to Porter (1990), only when a foreign company transfers R&D decisions can it add to the host nation's competitiveness. The establishment of

PATAC is a good example of R&D decision transfer. The process of model adaptation and improvement can help Chinese engineers learn advanced technology and thus gain experience in whole car design and remodeling, which will ultimately contribute to the overall industry competitiveness.

The bright side of working with joint venture partners is obvious, while the down side is that inter-firm technology transfer can hurt the feelings of both foreign partners. Although top management of SAIC, VW, and GM expressed confidence in their confidentiality agreements, people worry about the future of SAIC's "two-hand partnership" because problems could arise if SAIC decides to take the technology it learned from one joint venture and apply it to another, or simply grab it for itself.

As shown in the SAIC organizational chart in Figure 7, SAIC used to hold 20% in Chery Automobile Co. but released its share in 2003 because of a suspicious pirating issue (Gong, 2004). The Chery QQ, a minicar manufactured by a Wuhu City company, was promoted as being an independently designed Chinese car, but GM said the car, especially its highlights and air-intake system, looked suspiciously like its own Chevy Spark, a small car built by SAIC and GM in Western China. Although no evidence showed that SAIC was involved in Chery's model design, SAIC's stake in Chery cast suspicion on its credibility with GM.

As a developing country with limited industrialization experience, Chinese automakers have a long way to go in technology advancement so as to catch up with leading global auto firms. Government's intent to exchange market access for technology aims at helping indigenous players speed up in the process. When global auto firms take an active attitude in transferring knowledge and technology into China, domestic automakers should value the foreign intellectual property while still working independently in developing technological competitiveness.

6.4.5. Government Involvement and Business Governance

As one of the top auto business groups in China, SAIC's administration is to a large extent directed by the government. The primary linkage between SAIC group and the government is at the level of top management. In the 1990s, SAIC's president and top managers were appointed by the municipal government, who would also report to the state or local economic commissions. To achieve the objective of balanced growth within the group, top management oversaw the contribution of the auto industry to regional development, which in turn limited the ability of joint venture business governance. At the same time, the 50% equity regulation posted on MNEs restricted their power to improve administration efficiency—a problem to be solved by China's WTO commitment.

The foreign equity limit and the government's protective power created no pressure for competition between suppliers and thus discouraged their motivation for optimization. The municipal government could force the assembly plants to purchase components from local suppliers, and the suppliers knew that they would supply the assembly plant no matter how high their costs. The government did not care whether the profit was realized in the supply firms or at the assembly plants as long as it was in the SAIC family. It was like shifting money from its right pocket to its left. But such irregular purchasing decisions, without referring to global cost and quality benchmarking, constrained the production cost at a sub-optimal level.

The government's desire for balanced growth within the business group blurred the distinction between firms, which went against the competition for optimization rule. One interview with a representative from a supplier firm best illustrates the problem:

> If you are a stronger performer and are able to make a profit, you would quite likely be given a lower price for the component supplied

> to the (auto assembly) plants. (Decreasing the strength of your balance sheet) and quite possibly would have workers transferred over from struggling firms (adding to the labor burden). Instead of competing for best price and best quality, suppliers would try to hide their profit and avoid being 'mistreated' within the group. Such unhealthy and unfair competition will do no good to the business group in the long run.

It becomes apparent that government intervention could discourage the competing motion between firms, which creates no motivation for cost reduction. More seriously, firms would turn passive in improving production efficiency and highly dependent on government assistance, which goes against government's original purpose in developing large auto groups.

Thus, the government has agreed to reduce its power in business governance after the five-year transition period following China's WTO accession. MNEs, given a more controlling stake, are expected to help improve the market efficiency by introducing their global benchmarking system. The result has yet to be seen, but we can reasonably expect large consolidation and rationalization activities in China's auto sector.

In conclusion, success of SAIC is the result of capitalizing on foreign technology and the ability to serve as system integrator within China, which is the strategy most Chinese auto groups employ to compete in the domestic market. In other words, MNEs following rigid government regulations contribute a lot to the development of China's auto industry. SAIC's current challenge is to build a sufficiently solid foundation to support its ambitious growth in both domestic and international markets, along with intensified domestic competition. That will mean strengthening its ties with VW and GM, optimizing its supply chain, and developing its own car business.

7. Discussion and Conclusion

The rapid expansion of the auto industry in the emerging markets satisfies both governments and the MNEs. On the one hand, national governments expect exports, increased employment and a technological boost to the industry of the host countries. This explains the restrictions and investment incentives they introduce. On the other hand, the global auto assemblers are anxious to position themselves in growing auto markets in developing countries. These would provide overall scale to spread development costs, cheap production costs for selected vehicle and component developments, and new markets for higher-end vehicles produced in the advanced economies (Humphrey, 2003).

The analysis of SAIC and its global partners demonstrate some important aspects of the current Chinese auto industry. By looking at the policy impact on supplier network and firm strategies, this study stresses the importance of government power in promoting the development of Porter's competitiveness indicators.

There have been three mainstream viewpoints on China's auto industry development (Jing, 2005). At one end of the discussion, some suggest the idea of completely opening up the Chinese auto market. They state that the global auto market is dominated by several leading companies and China has no competitive advantage in either technology or resource advancement. Thus, the best way for China is to open up its auto market to global players, i.e. allowing wholly-owned foreign subsidiaries or foreign-controlled partnership, which is the method adopted by Brazil, Mexico, and Canada to develop their automobile sectors. However, this strategy was rejected not long after China's initial development plan because the central government ultimately wants a China-designed and -branded auto vehicle for exports.

At the other extreme, people recognize the huge demand market and production capacity in China, and thus support the idea of self-reliance and self-development, which is the technique Japan and Korea applied in their early developmental stages. This way of development seems attractive corresponding to China's ambition for self-designed automobile, but is arguably premature after decades of development since the large knowledge gap limits the ability of domestic auto firms to independently design and manufacture quality auto vehicles.

And finally, the majority of industry analysts and practitioners support the idea of equity-controlled partnerships with global auto firms, which proved a successful strategy in the late 1990s. China's strategy is to exchange advanced technology and managerial skills for demand and factor markets. Though problems still exist (i.e. slow technology transfer and administrative conflict in equity joint ventures), this method has given rise to the prosperity in China's auto industry since the 1990s.

Analysis from the current study supports the above strategy—to build industry competitiveness on foreign partners' knowledge; however, after China's WTO accession, Chinese auto firms need to realize the threat brought in by a free market thus reduce its dependency on foreign technologies. Jing's (2005) discussion outlined a strategy for China auto industry in the 21st century. He dubbed the ultimate strategy for Chinese auto firms as "self-competitive", which requires companies to extend production for exports, invest in R&D, and improve the supply chain efficiency. The government considers WTO membership an opportunity to revitalize the domestic auto industry while launching leading indigenous auto firms into the global market. As the government gradually reduces its power in the auto sector and as Chinese auto business groups approach global scale, China's auto firms are expected to compete independently in both domestic and international markets.

7.1. Significance of Government Power in China's Auto Market

By controlling the entry of foreign firms into China, leveraging the foreign firm's desire for market access into technology transfer, and then partnering these foreign firms with centrally sanctioned domestic firms, the central government gives dramatic advantage to a chosen few business groups. It is no coincidence that the three groups that are currently at the core of the central government's focus each have at least two major foreign assembly partners: Dongfeng has Citröen and Nissan, FAW has VW and Toyota, and SAIC has VW and GM. One partner is good, but when there are two, the foreign partners will compete with each other via faster model introduction and cost reduction, which ultimately strengthens China's auto industry competitiveness.

The biggest issue currently facing the Chinese auto sector is the future of equity control in auto assembly operations. China's WTO commitments do not include a timetable to eliminate equity controls in auto assembly facilities, and the Chinese government is expected to limit foreign equity ownership to no more than 50% for some time. Multinational automakers with joint venture facilities in China have expressed their readiness to buy out their Chinese partners and will increasingly pressure the government to lift the cap on foreign ownership. Meanwhile, Chinese auto firms realize that cheap production cost and demand conditions cannot be the sustainable long-term competitiveness. Thus, they are designing new models and improving their supply chain management, aiming at entering the global market as a new separate entity.

In sum, as China transitions to a free market, the government is expected to reduce its involvement in industry operation, and let the market promote competition and progression in the automobile industry.

7.2. Local Automakers Future Prospects

Although a strategy based on global partnerships and cooperation might not have the patriotic appeal of a national champion strategy, there is the potential for high profits and technical upgrading, particularly in a country with the market appeal of China. With the policy support of both the central and local governments, firms can leverage the resources they develop in the domestic market into ever more influential role in the global production networks of which they are part (Lall, 2004). Thus, China's WTO entry becomes an opportunity for Chinese auto groups to get access and independently compete in the global market.

Almost all interviewees (two sales managers from different auto joint ventures, one representative from a parts supply firm, one parts import manager from Hainan Mazda Co. Ltd, one university professor, one auto magazine editor, and one consultant from an auto research institution) expressed concern about "disorderly" competition in the domestic marketplace, due to liberal industrial regulation and reduced government support after WTO accession. Power is predicted to shift toward international partners and thus the ultimate strategy for domestic automakers is to promote technological innovation in vehicle design and supply chain optimization. Interviewees' comments on firms' future strategy include:

- Increasing R&D investment in whole car design and model adaptation. Large Chinese auto groups should maintain their learning process in established technical centers (such as the Pan Asian Technical Center in SGM). Besides, interviewees from research institutions suggest automakers diversify R&D channels by cooperating with local universities and business associations.
- Achieving economy of scale by investment in new operations. Although Chinese auto groups mass produce motor vehicles now, total national auto

output in 2003 was less than half of GM's global production. Large auto groups, in order to compete in the global market, still need to expand their production capacity and achieve global-standard economies of scale.

- Building sophisticated and efficient supply networks. Whole car assemblers, first-tier suppliers (component specialists or system integrators), and material providers are expected to work cooperatively in optimizing the overall supply and logistic network.
- Establishing distribution and service networks. Auto firms should improve their marketing strategy by not only providing quality products but also related services, such as financing, insurance, and auto maintenance. Diversified service demand and improved service network will also contribute to the overall industry competitiveness.
- Recruiting and retaining qualified staff. Interviewees considered easy human capital movement a threat to domestic auto firms. Indigenous firms should learn from their global partners to maintain an employee-oriented culture and a functional open structure.

China is currently a small exporter of automotive products—largely because it exports very few assembled vehicles. This situation may change in the near future. Honda, GM, and Toyota have plans to export vehicles from their Chinese facilities, a move that might become even more attractive with the substantial growth of surplus capacity in vehicle assembly in China (Humphrey, 2003). Moreover, China's own automakers, particularly Geely, have ambitious plans to export to North American and European markets.

A common problem in most Chinese auto joint ventures is that due to the intellectual property rights, sales of jointly developed vehicles are limited to the

domestic market. A sales manger from Hainan Mazda Co. Ltd offered an example of the current problem. The technology of the “Family” economy car model originated from Mazda Japan but after years of adaptation in the Chinese technical center, the model has been modified according to Chinese preference and has achieved a 75% localization rate. Several neighboring countries, such as Korea and Vietnam, expressed interest in importing the “Family” model while currently Hainan Mazda is not allowed to export vehicles under the Mazda brand name to other nations. This example demonstrates that China should develop its own branding for export in order to strengthen its international competitiveness.

In sum, future study should note whether it is the exports from domestic auto groups with high local content rate or exports from MNEs plants merely located in China that do not contribute to the international competitiveness of Chinese auto industry in the long term. Currently, the government is promoting export from joint venture and indigenous firms so that both contribute to the nation’s international competitiveness in the transition period.

7.3. Globalization of Component and Part Supply Market

As with other industrial sectors, China is becoming a key player in the auto industry. Two factors are of particular importance: first, China’s role as a market; second, China’s potential role as a significant exporter of components and assembled vehicles. Although WTO entry gives MNEs the opportunity to freely import components and sub-assemblies, carmakers may prefer domestic suppliers since they may consider the local sources of supply superior in terms of cost and quality, and they may desire to maintain healthy Chinese business relationships. This would suggest that the development of the local supply chain under local content restriction in the years prior to WTO entry had been successful.

The most urgent task for indigenous parts suppliers would be to improve their economy of scale and independent R&D capabilities. China's over1,000 parts producers need to go through a long consolidation process, after which China can have several competitive parts suppliers with global standard costs, high production capacity, and advanced R&D capabilities. Only when domestic parts producers are able to create components on their own technology and experience can they upgrade themselves as global component specialists.

Furthermore, domestic parts suppliers' self improvement should be accompanied by an expeditious industry standardization process. Product quality of Chinese first-tier suppliers is at, or close to, world standards. The main challenge now facing the supply sector lies in the extension of international best practices (i.e. the steady improvement of quality through diagnosing defects by groups of operatives, and the organization of a coordinated inflow of materials and the outflow of finished products (Sutton, 2004)) to the second and third tier component suppliers.

Finally, although China has few whole-car exports, a large amount of current auto product exports come out of the component and parts sector. Vehicle parts exports exceeded $4.4 million US in 2004 and ranked in China's top 30 export industries (NBS, 2005). As shown in Table 20, indigenous parts producers (and their joint ventures with multinationals) dominate the top ten exporter positions. They aim to become global component specialists and get involved in the MNEs' global sourcing network in the near future. Such ambition further encourages domestic parts producers to enhance research and production capacity, as well as promoting international best practices in the overall parts supply industry.

Table 20 Leading component exporters in China, 2003

Multinational or Multinational JV (M) Domestic (D)	Company	Exports US Millions	Item Exported
D	China FAW Group Corporation	44.3	Various
M	Kunshan Liufeng Machinery Industry Co. Ltd.	61.2	Aluminum alloy wheel hubs
M	Siemens VDO Automotive Huizhou Co. Ltd.	44.6	Car radios
*	Wanxiang Qianchao Co. Ltd.	43.0	Universal joint, bearings, drive shaft, constant velocity joint, rubber seal elements, ball bearings
M	Shanghai Yanfeng Johnson Controls Seats Co. Ltd.	43.0	Covers and parts for seats
D	Guangzhou City Huanan Rubber Tire Co. Ltd.	41.4	Covers for radial tires
D	Zhejiang Wanfeng Autocar Group	29.8	Aluminum wheels
D	Shandong Longji Group Co. Ltd.	19.6	Brake drums; break discs
D	Xiang Torch Investment Co. Ltd.	19.0	Break discs, lights, mirrors, sparks, plugs
D	Fujian Yuanguang Combined Wire Co. Ltd.	18.7	Wiring harness
Above 10 Total	364.6 million $		
Overall total parts export	2,617.7 million $		
Share of above 10	14%		

Note. * indicates a domestic firm with multiple foreign JV partners. CAAM, 2005.

Through more than two decades of foreign cooperation, China has built up a complete auto manufacturing and supply network. The quality of indigenous automobiles (with mostly local content and design) is approaching global standards. Prior to China's WTO accession, firm strategies (either forms of partnership or product mix) had been restricted by the government authorization process, and thus

the success of the project was often determined by the historical performance in China and relations with the government. In the future, it appears that commercial considerations will drive manufacturers' product strategies and there will be less bureaucratic obstacles; this will then lead to further intensification of competition and greater consumer choices.

In sum, WTO accession has had a critical impact on regulatory reform and internal restructuring in China's motor vehicle sector. Such restructuring is represented by a cost reduction following consolidation and rationalization and the net result is a movement of costs towards global norms. With restructuring, the final assembly industry can become competitive by world standards, while the parts industry becomes further integrated into the global industry through exports. China aims at exporting to the global auto market in order to improve its international competitiveness, whereas before it can achieve this goal, both indigenous auto assemblers and parts suppliers should upgrade themselves into global standard production capacity and research capability. We are looking forward to seeing the growth of China's automobile industry.

8. Limitations and Future Research

There are several limitations in this study that can be addressed in future research. First, this project includes a large amount of general information about China's automobile industry but provides limited analysis of the industry development from a theoretical standpoint. Measurements for industry competitiveness are analyzed in a descriptive manner instead of analytical methods. Thus, to further understand the industry, future study can incorporate more specific measurements on primary data, and draw conclusions on the interrelationship between theoretical indicators.

Secondly, analyses of firm strategy and related industries are conducted from the Chinese perspective. For example, when looking at SAIC's future strategy, some scholars predicted that SAIC will terminate its partnership with VW and GM when it is able to compete independently in the global market. However, global auto firms could adapt their strategy and take over the Chinese market as China moves toward a free market economy. Future studies can incorporate the strategic changes in both sides and predict the power balance between Chinese and global auto firms.

Similarly, conclusions of the competitiveness of China's auto industry are drawn mostly from Chinese data, which, due to the low internationalization rate, is limited to the domestic market. Once China gets more involved in the international auto industry, analysis of the industry's global competitiveness should incorporate more export-related measures. For example, demand conditions should not only address domestic customer needs but also include the auto quality and performance demands in target exporting market. Meanwhile, a comparison between China and other developing nations (with similar economic conditions and ambition in

promoting national auto industry, such as Mexico or Brazil) could offer further insights on China's competitive position on a world scale.

Though not directly explored in the current study, unrevealed social ties within the Chinese culture seem to play a significant role in business operations, such as the involvement of government in business administration and the communication channels among indigenous auto suppliers. Future study could look at the impact of social networks on business performance and strategy in China.

And finally, relative to government involvement, researches have showed that regional and local authorities may also provide support or present obstacles beyond the national government (Eun & Lee, 2002; Harwit, 1995; Qin, 2004). Future research could specifically analyze policy reforms and automakers' strategy changes in response to multi-level authorities in China. Upon finishing the five year transition period, China is required to implement all terms specified in the WTO agreement in 2006. Future studies can incorporate updated data and conduct a longitudinal study of China's development in the auto sector.

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Appendix A Proposed Measurements and Levels of analysis

Determinants	Measurements	Methodology	Source
General competitiveness	Top Chinese industries in terms of export value	To identify and compare competitive positions of auto industry in China and world export market	Porter, 1990; Ravenhill, 2005
	Annual growth of GDP percentage	National competitive improvement	Namaki, 2002
	Total vehicle output and Trade balance in auto industry	As a percentage of world total, to identify international global competitive position	Porter, 1990; Namaki, 2002
	FDI utilization in China per industry	To identify the portion of FDI in auto industry and its contribution	Lin & Lin, 2001
	Export of autos as percentage of national export	Measure auto industry contribution to overall national competitiveness	Porter, 1990
Factor conditions	Investment in basic infrastructure	As percentage of GDP expenditure By classifications	Barclay & Gray, 2001
	Technological advancement	Descriptive data, research specific in auto industry	Barclay & Gray, 2001
	R&D expenditure in auto industry	To identify and analyze R&D investment as percentage of sales revenues	Barclay & Gray, 2001
	Labor market classified by education levels	To calculate percentage and wage changes in skilled-labor market	Porter, 1990; Barclay & Gray, 2001
	Wages and salaries of labors		
	Auto productivity increases		
	Monetary policy changes	To analyze capital market relaxation (i.e. exchange rate, inflation, interest rate)	Greenwood, 2001
	Regulation on capital investment	Descriptive data, to identify availability of funds and the freedom of capital market	Huo & McKinley, 1992

	Regulation of MNEs in financial market	To discover availability auto loans provided by MNEs	Greenwood, 2001
Demand conditions	Population and private vehicle possession rate	To discover demand market size and distribution	Fan & Scott,2003
	Auto market composition	To identify opportunity in passenger car market	Huo & McKinley, 1992
	Personal saving rate	To identify government impact on domestic capital market	Greenwood, 2001
	Average income level in major cities/ per capita income	To identify potential markets for vehicles in different price ranges	Porter, 1990; Huo & McKinley, 1992
Related and supporting industries	List of domestic suppliers, joint ventures and foreign suppliers, and supplier size of each	To identify major suppliers (specific for case study)	Martin, Mitchell, & Swaminathan, 1995
	Geographic concentration of auto industry in China (assemblers and part suppliers)	For future implication into industry cluster	Fan & Scott , 2003
	Policy changes in auto industry	Descriptive data, changes from 1994 industrial policy to WTO agreement	Sit & Liu, 2000; Lai, 2003
	WTO agreement on removal of trade barriers, forms of alliance and other reform in auto industry	Same as above	Zhang, 2003
Firm strategy, structure and rivalry	List of major auto groups in China	Identify major competitors in China's whole car assembly market	Sit & Liu, 2000
	Market share of each	Percentage in whole car assembly market	Luo, 2002
	Production capability	Actual amount	Sit & Liu, 2000
	Major models	Number of major models	Sit & Liu, 2000
	Domestic sales	As percentage of total sales	Luo, 2002
	Profitability	Total revenue/total sales	Luo, 2002

	Specific to the joint ventures, percentage of shares controlled by MNEs	To identify power changes pre- and post-WTO accession between MNEs and indigenous automakers	Porter, 1990; Luo, 2002
	MNEs and indigenous automakers strategic differences	Descriptive data to identify rivalry and partner strategy differences	London & Hart, 2004
	Government control and policy changes on competition	Changes of government share and control in major alliances	Chen, 2004
	The impact of WTO on firm strategy and structure	Descriptive data, to discover power changes between indigenous and foreign auto firms	Breslin, 2004

Appendix B Qualitative Research Documents Summary

Legend for types

A: academic research, **C**: company report, **G**: government report, **IA**: industry association, and **TR**: trade journal or magazine.

Type	Author & Year	Document Title
A	Agarwal & Wu 2004	China's entry to WTO: global marketing issues, impact, and implications for China.
A	Ali et al., 2004	World Trade Organization (WTO) and the response of vehicle manufacturers in China: a comparative study.
G	Anonymous, 2001	The middle class and the emergence of a consumer culture.
TR	Anonymous, 2005	Shanghai GM's: incorporated globalized domestic supply chain system.
TR	Asia Times, 2005	Mixed outlook seen for auto exports.
A	Breslin, 2004	Globalization, international coalitions, and domestic reform.
IA	CAAM, 2005	Major automobile enterprise in China.
IA	CAAM, 2002	Automobile industry analysis and development forecast of 2003.
IA	CATARC, 2004	2003 World Automotive Statistics Yearbook.
A	Chen 2002	The structure of Chinese industry and the impact from China's WTO entry.
IA	China Automotive Yearbook, various year	China Automotive Yearbook, 1986-2005
A	Depner & Bathelt, 2005	Exporting the German model: the establishment of a new automobile industry cluster in Shanghai.
A	Eun and Lee, 2002	Is an industrial policy possible in China? The case of the automobile industry.
A	Fan & Scott, 2003	Industrial agglomeration and development: A survey of spatial economic issues in East Asia and a statistical analysis of Chinese regions.
A	Francois & Spinanger, 2004	Regulated efficiency, World Trade Organization accession, and the motor vehicle sector in China.
A	Gallagher, 2005	Foreign technology in China's automobile industry: Implication for energy, economic development, and environment.
TR	Gao, 2002	A tune-up for China's auto industry.
TR	Gong, 2004	GM charges Chery for alleged mini car piracy.
A	Han & Kim, 2003	FDI environment and policy competitiveness of Asia Pacific economies.
A	Harwit, 1995	China's automobile industry: policies, problems, and prospects.
TR	Humphrey, 2003	Globalization and supply chain network: the auto industry in Brazil and India.

Type	Author & Year	Document Title
A	Hutchings & Michailova, 2004	Facilitating knowledge sharing in Russian and Chinese subsidiaries: the role of personal networks and group membership.
IA	Invest in China 2005	Guiding manual on applications regarding foreign invested commercial (distribution) enterprises.
IA	Invest in China 2006	Foreign direct investment utilization in China's automotive industry.
A	Jing, 2005	Central competitiveness research on Chinese automobile enterprises.
TR	Kiefer, 1998	Volkswagen's Shanghai plant: between Chinese tradition and modernization strategy. In Between imitation and innovation.
A	Kister, 1998	Engineering growth: business group structure and firm performance in China's transition economy.
A	Koehn, 2002	The Shanghai outlook on the WTO: Local bureaucrats and accession-related reforms.
A	Lall, 2004	Reinventing industrial strategy: The role of government policy in building industrial competitiveness.
TR	Lee, 2000	Uphill drive.
TR	Li, 2005	Bejingers cope with higher fuel price.
TR	Lienert, 2003	The rising Chinese car market.
A	Lin & Lin, 2001	Emergence of the greater China circle economies: cooperation versus competition.
A	Luo, 2002	Partnering with foreign businesses: perspectives from Chinese firms.
G	Ma, 2005	Report on China's economic and social development for 2005.
G	MOFCOM, 2005	Understanding the 2004 industry policy.
G	NBS, 1994-2005	China Statistics Yearbook, 1994-2005.
A	Qin, 2004	WTO regulation of subsidies to state-owned enterprises (SOEs)—A critical appraisal of the China accession protocol.
A	Ravenhill, 2005	Why the East Asian auto industry is not regionalized… or why electronics may not be the future of the autos.
A	Sadler, 1998	Changing inter-firm relations in the European automotive industry: Increased dependence or enhanced autonomy for components producers?
A	Sadler, 1999	Internationalization and specialization in the European automotive components sector: implication for the hollowing-out thesis.
C	SAIC, 2004	2004 annual report.
A	Schwab & Porter, 2004	The global competitiveness report 2003-2004: World Economic Forum, Gevena, Switzerland, 2004.
TR	SGM, 2005	Shanghai GM: incorporating globalized domestic supply chain system.
C	SGM, 2006	joint R&D
A	Sit & Liu, 2000	Restructuring and spatial change of China's auto industry under institutional reform and globalization.
TR	Sutton, 2004	The auto-component supply chain in China and India-A benchmarking study.

Type	Author & Year	Document Title
C	SVW, 2005	Major statistics and annual reports from 1985 to 2004.
TR	Taylor III, 2004	Shanghai auto wants to be the world's next great car.
A	Teece, 1981	The multinational enterprises: market failure and market power considerations.
A	Thun, 2004	Industrial policy, Chinese-style: FDI, regulation, and dreams of national champions in the auto sector.
A	Veloso, 2000	The automotive supply chain organization: Global trends and perspectives.
TR	Wang, 1999	Policy reform and foreign direct investment: the case of the Chinese automotive industry.
G	WTO, 2001	Accession of the People's Republic of China. Decision of 10 November, 2001.
G	WTO, 2005	International Trade Statistics 2005.
A	Xing, 2002	Automakers in the fast lane.
TR	Xu, 2005	SVW is adopting new marketing strategy
IA	Yang & Liu, 2006	China will inevitably become an auto-export nation.
G	Yin & Zeng, 1999	The organizational framework of China enterprise groups.
G	Zeng & Wang, 2001	Report on China's National Economic and Social Development for 2001.
G	Zeng, 2000	Report on China's national economic and social development for 2000.
A	Zhao, Anand, & Mitchell, 2005	A dual network perspective on inter-organizational transfer of R&D capacities: international joint ventures in the Chinese automotive industry.
A	Zhu & Nyland, 2005	Marketization, globalization, and social protection reform in China: Implications for the global social protection debate and for foreign investors.

Appendix C Invitation Letter and Consent Form

October 12, 2006

To Whom It May Concern:

Re: Competitiveness of China's Auto industry study

My name is Di Wu and I am a Chinese student working on my Master of Science thesis at the University of Lethbridge Alberta, Canada. I would like to invite you to participate in a telephone interview for my research project on the competitive advantage of Chinese automobile industry.

The purpose of this study is to understand the competitive positions of domestic automakers, as well as the sources of competitiveness of the entire industry, such as related supporting industries, labor market, technology and managerial skill transfer, etc. Particularly in China, as government plays an important role in stimulating and regulating the overall market, the study is also intended to understand the contribution and limitation of current policies in auto sector.

Your participation will add significant value to the study of China's auto market. The benefits of this project are primarily academic but may have both policy and practical implications. Your participation in the interview is entirely voluntary. You have the right to not participate or not answer certain questions with no consequences. All the information received from you and your company/institution will be kept anonymous and confidential. The telephone interview will take approximately 40—60 minutes. If you are interested in the final findings of my research, you can contact me or my supervisor (by phone or by email) and request a copy of my thesis by the end of September 2006.

This study has been reviewed and approved by the University of Lethbridge Human Subject Research Committee. The study conforms to acceptable ethical guidelines and standards as described in the Tri-Council Policy Statement for ethical conduct of research involving humans. Questions regarding your rights as a participant in this research may be addressed to the Office of Research Services, University of Lethbridge (Phone: 403-329-2747).

I am looking forward to listening to your significant insights on China's auto industry!

Sincerely,

Di Wu MSc (Management) Candidate Tel: 1-403-332-4369 di.wu@uleth.ca
Bradley Olson Thesis supervisor Tel: 1-403-329-2134 bradley.olson@uleth.ca

If you think you do not have the information I request, I will really appreciate if you can introduce me to the people in your organization who have the full information.

Appendix D Interview Guide*

Group classification questions

1. Which group heading best describes your position in Chinese auto industry?
    a) Scholars in research institution specialized in auto industry
    b) Government staff
    c) Representatives from auto assembly plants in China
    d) Suppliers or distributors

General questions for all interviewees

2. What are, in general term, the strength, weakness, opportunity, and threat in Chinese auto market?
    a) Demand condition
    b) Basic factor conditions (natural resource, labor, and infrastructure)
    c) Advanced factor conditions (technology, financial resource, and quality and environmental standard)
    d) Suppliers and distributors in the value chain
    e) Domestic competitions
    f) Policy and/or regulations
3. What significant changes do you recognize in auto sector after WTO accession?
    a) Policy changes toward domestic and multinational automakers and suppliers
    b) Improvement in basic infrastructure
    c) Cluster development in major coastal industrial areas
    d) Financial infrastructure development
    e) Domestic competition
    f) Contribution of auto industry in national prosperity
    g) Others
4. What government can do to improve national competitiveness in auto sector?
    a) Development of supporting infrastructure
    b) Incentives to R&D institutions
    c) Capital market support
    d) Industrial policy reform

Question for personnel from research institutions

5. How do you describe the link between research institutions and auto assemblers and suppliers?
    a) Close link with research institutions
    b) Established their own R&D and training center
    c) Still depend on foreign technology and skills

Questions specific for personnel from auto assembly plants, suppliers or distributing organizations

6. What are the advantages of indigenous suppliers? If possible, please give an example.
    a) Cost efficiency
    b) Quality control
    c) Production capacity
    d) Managerial skills
    e) Technology advancement, network alignment
    f) Partnership with global parts suppliers
    g) Understanding domestic supply market
    h) Others

7. What are the disadvantages of indigenous suppliers? (Please choose from options in previous question and briefly explain)

8. Is there anything else you think missed in my questions but is important to understand the competitiveness of China's auto industry?

Thank you very much for your participation!

*Interview questions are adopted from Porter's original questionnaire in *The competitive advantages of nations* (1990), and Barragan's study on Mexican automobile industry (2005).