

UC Berkeley

UC Berkeley Electronic Theses and Dissertations

Title

Stumbling Toward Capitalism: The State, Global Production Networks, and the Unexpected Emergence of China's Independent Auto Industry

Permalink

<https://escholarship.org/uc/item/668100jj>

Author

Chang, Crystal Whai-ku

Publication Date

2011

Peer reviewed|Thesis/dissertation

STUMBLING TOWARD CAPITALISM: THE STATE, GLOBAL PRODUCTION NETWORKS, AND
THE UNEXPECTED EMERGENCE OF CHINA'S INDEPENDENT AUTO INDUSTRY

By
Crystal Whai-Ku Chang

A dissertation submitted in partial satisfaction of the
requirements for the degree of
Doctor of Philosophy
in
Political Science
in the
Graduate Division
of the
University of California, Berkeley

Committee in charge:

Professor John Zysman, Chair
Professor Kevin O'Brien
Professor Laura D. Tyson
Professor J. Nicholas Ziegler

Fall 2011

STUMBLING TOWARD CAPITALISM: THE STATE, GLOBAL PRODUCTION NETWORKS, AND
THE UNEXPECTED EMERGENCE OF CHINA'S INDEPENDENT AUTO INDUSTRY

© 2011

by Crystal Whai-Ku Chang

ABSTRACT

Stumbling Toward Capitalism: The State, Global Production Networks, and
The Unexpected Emergence of China's Independent Automakers

by
Crystal Whai-ku Chang

Doctor of Philosophy in Political Science
University of California, Berkeley

Professor John Zysman, Chair

The auto industry has long been of interest to political scientists because of the crucial role the state has played in brokering investment into local firms and coordinating relationships between suppliers and assemblers. In Japan and Korea, a centralized and institutionalized policymaking apparatus is often credited with establishing a globally competitive domestic auto industry without the need for foreign direct investment (FDI). Yet in China, where the policymaking apparatus is fragmented and decentralized, FDI was the primary policy tool used to infuse capital, technology, and management expertise into the backwards state-owned auto sector. Despite the central government's staunch support of state-owned firms, the most globally competitive domestic automakers in China today are not the traditional state-owned firms, but a group of new domestic firms with no ties to the central government or foreign automakers.

Contrary to those scholars that credit the Chinese party-state with the modernization of China's auto industry, this dissertation argues that one of the sector's most significant developments - the emergence of independent Chinese automakers - was not the outcome of well-executed industrial policies, as was the case in Japan and Korea. Rather, the ability of China's independent automakers to overcome financial, technological, and regulatory barriers to entry was largely shaped by China's accession to the World Trade Organization, the economic initiative of local governments, and China's integration into an increasingly fragmented global automotive production networks. This dissertation also explores the consequences of China's new appetite for cars, such as growing oil imports and greenhouse gas emissions, and assesses the prospect of vehicle electrification as a way to solve the country's dire energy and environmental problems.

This research examines from a sectoral perspective the inherent limitations to China's fragmented and decentralized approach to policymaking. Though this approach has been one of the primary drivers of economic growth up to now, it will hinder not only necessary consolidation in the Chinese auto industry, but the next stage of China's economic transition.

FOR SYMON, LILY, JOSEPHINE, AND DOUGLAS,
WITH ALL OF MY LOVE AND APPRECIATION

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ACRONYMS	vii
CHAPTER 1: INTRODUCTION	
RE-EVALUATING THE ROLE OF THE CHINESE STATE IN INDUSTRIAL DEVELOPMENT	1
1.1 A brief introduction to the Chinese auto industry	3
1.2 Conceptualization of key terms and categories	4
1.3 The research puzzle	6
1.4 The argument in brief	8
1.5 Research design and methodology	15
1.6 Roadmap of dissertation	17
1.7 Conclusion	18
CHAPTER 2: “MUDDLING THROUGH”	
ORIGINS AND EVOLUTION OF INDUSTRIAL POLICY IN THE CHINESE AUTO INDUSTRY	20
2.1 China’s auto sector development in comparative perspective	21
2.2 Phase I (1949-1977): Auto sector policy under the central plan	24
2.3 Phase II (1978-1991): Policy experimentation in the reform era	26
2.4 Phase III (1992-2000): Internal debate over the future of the state-owned sector	32
2.5 Phase IV (2001-present): China cautiously embraces the market	35
2.6 The failure to transform traditional SOEs into globally competitive firms	40
2.7 Conclusion	46
CHAPTER 3: LOWERING THE BARRIERS TO ENTRY	
ACCESSION TO THE WTO AND THE FRAGMENTATION OF GLOBAL PRODUCTION NETWORKS	47
3.1 China’s accession to the WTO and consequences for the domestic auto industry	48
3.2 The fragmentation of global production networks, the lure of the Chinese market, and the advantages of backwardness	56
3.3 The low-cost production model of independent automakers	61
3.4 Conclusion	66

CHAPTER 4: HARNESSING THE ECONOMIC ASPIRATIONS OF THE LOCAL STATE	
CASE STUDIES OF CHINA’S FOUR LEADING INDEPENDENT AUTOMAKERS	68
4.1 The role of the local state	69
4.2 Typology of China’s independent automakers	72
4.3 Case studies of China’s four leading independent automakers	74
4.3.1 Chery Auto	75
4.3.2 Great Wall Auto	80
4.3.3 BYD Auto	84
4.3.4 Geely Auto	88
4.4 Conclusion	91
CHAPTER 5: MANAGING THE CONSEQUENCES OF CHINA’S AUTO CONSUMPTION	
THE PROMISE AND CHALLENGE OF VEHICLE ELECTRIFICATION	93
5.1 Impact on China’s oil consumption and greenhouse gas emissions	95
5.2 China’s fragmented energy governance: Why widespread adoption of EVs is unlikely	98
5.3 China as a laboratory for global EV collaboration	108
5.4 Conclusion	118
CHAPTER 6: CONCLUSION	
STUMBLING TOWARD CAPITALISM	120
6.1 Argument revisited	120
6.2 China’s auto industry: Prospects and implications for the global auto industry	122
6.3 China’s energy policy and vehicle electrification: Problems ahead	124
6.4 China’s variety of capitalism: Limits of the decentralized approach to policymaking	125
6.5 Directions for future research	126
REFERENCES	128
APPENDIX A: PARTIAL LIST OF CHINA’S INDEPENDENT AUTOMAKERS	140
APPENDIX B: 2009 MAP OF AUTOMOTIVE PRODUCTION FACILITIES IN CHINA	141
APPENDIX C: EXAMPLES OF IP INFRINGEMENT BY CHINESE INDEPENDENT AUTOMAKERS	142
APPENDIX D: LIST OF FIELD INTERVIEWS (2007-2010)	143
APPENDIX E: CHINA’S QUEST FOR OIL AT HOME AND ABROAD	149
APPENDIX F: CHINA’S FUEL EFFICIENCY AND EMISSION STANDARDS	154

ACKNOWLEDGEMENTS

Writing this dissertation has been a long and difficult journey, and one that would not have been possible without the guiding light of faculty, friends, and family. I would first like to extend my deepest gratitude to my chair, mentor, and friend, John Zysman. John has always been there not only to help me see the forest for the trees, but also to show me the channels through which academics can contribute to the “real world”. I am incredibly indebted to Laura D’Andrea Tyson, who has taught me not only about international business strategy, but also about integrity and the art of teaching. I am grateful to Kevin O’Brien for his knowledge of China field and invaluable advice over the years. I would like to thank J. Nicholas Ziegler for introducing me to some of the most insightful books in comparative political economy, which have inspired my own work. Other distinguished members of the Berkeley faculty –Andrew Janos, Steve Weber, Laura Stoker, Pradeep Chhibber, and M. Steve Fish– have profoundly shaped my thinking as a scholar.

I am forever grateful to those individuals I interviewed for this project who were willing to speak with me frankly and at length about their views on the Chinese auto industry. I would like to recognize the following people for their insights: Phil Murtaugh, Lu Jian, Yang Jian, Kevin Huang, King Lam, Lu Feng, Frank Wang, Kevin Zhang, Sunny Bai, Kevin Chen, Zhou Liquan, Brian Yao, James Huang, Wu Lei, Steven Ribet, Zhang Gengshen, Bill Russo, Zhou Liquan, Wolfgang Wagner, and Li Xianjun. My fieldwork in China would not have been possible had it not been for the generous support of the UC Pac Rim Research Program, Richard S. Liu, the Center for Chinese Studies, and the Charles and Louise Travers Department of Political Science.

My research and graduate school experience were deeply enriched by my friends and colleagues at Berkeley. I could not have finished this project without the sincere dedication and emotional support of my writing group partners, Celeste Arrington and Danielle Lussier. I would like to extend loving gratitude to my dearest friends, Robin Higashi and Veronica Herrera, without whom I could not have endured the tediousness and loneliness of graduate school. I have also benefited tremendously from my intellectual interactions with Abraham Newman, Kenji Kushida, Bart Watson, Margaret Boittin, Roselyn Hsueh, Mark Dallas, and Rachel Stern.

My family has provided the life raft that has carried me on this journey. My father, Symon Chang, has instilled in me a life-long passion for learning and an appreciation for honest hard work. My mother, Lily Chang, has shown to me that what one perceives as an obstacle is simply a problem in need of a solution. My sister, Josephine Chang, has always been there to pick me up and hold my hand when I stumble. My grandmothers, Chih-Len Peng and Peiwu Wang Chang, have taught me the meaning of resilience and the honor of my heritage. Last but not least, I am eternally grateful to my husband, best friend, and partner in crime, Douglas Cohen. Without his unconditional love, patient support, and contagious laughter, I would have lost my way long ago. Doug continues to remind me that filing this dissertation is not the end, but rather the beginning.

LIST OF TABLES

- 1.1 Funds Raised by Private Chinese Automakers in Foreign Stock Markets (2002-2007)
- 2.1 Origins of China's Traditional State-Owned Automakers
- 2.2 List of Major Automotive Assembly Joint Ventures in China (1997-2005)
- 2.3 Comparison of Vehicles Produced per Employee for Select Chinese and Foreign Automakers
- 3.1 China's Leading Automotive Exporters (2007)
- 3.2 Factory Wage Differential between Joint Ventures and Independent Automakers
- 3.3 Price Comparison of Best-Selling Independent Models and Joint Venture Models (2009)
- 4.1 Typology of China's Independent Automakers
- 4.2 China's Four Leading Independent Automakers
- 4.3 Ownership Structure of Chery at the Company's Inception (1997)
- 4.4 Partial List of Chery's Foreign Technology Partnerships
- 4.5 Partial List of Loans to Chery by Chinese State-Owned Financial Institutions (2008-2011)
- 4.6 Equity Structure of Great Wall Auto (2008)
- 4.7 Compact Car Sales in China (2009)
- 4.8 The Quasi-Open Architecture of the Geely *Haoqing*
- 5.1 Transport-related Carbon Dioxide Emissions in the U.S., China, and the E.U. (1990-2030)
- 5.2 Energy Bureaucracy Re-Shuffling in China (1980-2010)
- 5.3 Partial List of Announced Plug-In Hybrids and All-Electric Vehicles

LIST OF FIGURES

- 1.1 Annual Production of Leading Independent Chinese Automakers (2001-2009)
- 1.2 Shift in Value of Assembled Vehicles from Assemblers to Suppliers (1955-1995)
- 2.1 Annual Growth of Passenger Cars in China (1986-2005)
- 2.2 Number of Chinese Automobile Enterprises (1992-2008)
- 2.3 Dongfeng Motor Corporation (DMC) Organizational Structure
- 3.1 China's Annual Vehicle Production and Imports (1980-2009)
- 3.2 Annual Production of China's Four Leading Independent Automakers (2001-2009)
- 5.1 China's Annual Motor Vehicle Production (1980-2010)
- 5.2 China's Domestic Oil Consumption, Oil Exports, and Oil Imports (1980-2009)
- 5.3 China's Electricity Consumption (1971-2009)
- 5.4 China's Per Capita Electricity Consumption (1971-2009)

LIST OF ACRONYMS

BAIC	Beijing Automotive Industry Corporation, previously BAW
CCP	Chinese Communist Party
CKD	Complete knock-down kit
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
EIA	Energy Information Administration (part of the US Department of Energy)
EV	Electric vehicle
FAW	First Automotive Works
FAW-VW	First Automotive Works-Volkswagen joint venture
FDI	Foreign direct investment
FYG	Five Year Guideline (previously known as the Five Year Plan)
GAIG	Guangzhou Automobile Industry Group
IEA	International Energy Agency
IP	Intellectual property
JV	Joint venture
MEP	Ministry of Environmental Protection
MIIT	Ministry of Industry and Information Technology
MOE	Ministry of Energy
MOF	Ministry of Finance
MOT	Ministry of Transportation
MOFTEC	Ministry of Foreign Trade and Economic Cooperation (now Ministry of Commerce)
MOST	Ministry of Science and Technology

NDRC	National Development and Reform Commission
NEA	National Energy Administration
NEC	National Energy Commission
NEB	National Energy Bureau
NELG	National Energy Leading Group
NOC	National oil company
PATAC	Pan Asia Technical Automotive Center (a division of SGM)
PLM	Product lifecycle management
R&D	Research and development
RMB	Renminbi (Chinese currency)
SAIC	Shanghai Automotive Industry Corporation
SASAC	State-owned Assets Supervision and Administration Commission
SAW	Second Automotive Works (later Dongfeng Motors)
SEC	State Energy Commission
SETC	State Economic and Trade Commission
SGM	Shanghai General Motors, joint venture between SAIC and GM
SOE	State-owned enterprise
SPC	State Planning Commission
SPDC	State Planning and Development Commission
SGCC	State Grid Corporation of China
SVW	Shanghai Volkswagen, joint venture between SAIC and Volkswagen
USD	United States dollar
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION: RE-EVALUATING THE ROLE OF THE CHINESE STATE IN INDUSTRIAL DEVELOPMENT

China is a rather extreme example of an auto industry plagued by scale diseconomies. In 1995, China produced 1.45 million motor vehicles. While this represents a ten-fold increase in a span of seventeen years and China is now the world's eleventh largest producer of motor vehicles after Brazil, Chinese automotive industry is among the most fragmented in the world. Why has the Chinese automotive industry persisted in being populated by smaller-than-optimal firms and why as the government's effort at restructuring the industry produced little effect so far?

Yasheng Huang, "Between Two Coordination Failures", 2002¹

Writing less than one decade ago, Yasheng Huang was deeply skeptical about the future of China's fragmented auto industry. Why? Huang argued that China lacked the requisite institutional characteristics, such as policy integration and bureaucratic competence, to implement successful automotive industrial policy. While this may be true, a narrow analysis of China's institutional capacity for industrial policy ignores both the regional dynamism of China's vast and diverse economy and the sectoral dynamism of the ever evolving global auto industry. This dissertation seeks to understand how and why China's independent auto industry has flourished in spite of the state's fragmented bureaucracy and inconsistent industrial policies.

The year 2010 was full of surprises. The Chinese auto industry shocked the world by producing more than 18 million vehicles to become the world's largest auto producer and its largest auto market. That same year, a small and unknown Chinese automaker, Geely Auto, finalized a historic deal to purchase the Volvo unit from Ford Motors for a whopping USD 1.3 billion in cash. Meanwhile, another obscure Chinese carmaker, Chery Auto, signed a memorandum of understanding with an American firm, Better Place, to jointly develop next generation switchable-battery electric vehicles. How did these small Chinese firms leap onto the global stage given the auto industry's historically high financial and technological barriers to entry? What role did government play? How will increased auto consumption affect Chinese energy security and the environment? These are some of the questions that motivated this study.

In recent years, many scholars have credited the Chinese state and its industrial policies for the modernization of China's automotive sector.² Gregory Chin (2010:8), for one, asserts that "the Chinese state has effectively mediated relations between the world's leading automakers and domestic automotive groups to push foreign automakers to transfer large amounts of investment capital, and advanced technologies, to China." In contrast to Chin, I find that while China's foreign direct investment strategy did bring billions of dollars of investment into the domestic auto sector, that strategy failed in its ultimate objective of transforming Chinese state-owned automakers into national automotive champions. In this dissertation, I will argue that one

¹ Huang (2002:538). The full title of Huang's article is "Between two coordination failures: automotive industrial

² Chin (2010) and Meier (2009) credit the party-state while Thun (2006) credits local governments.

of the sector's most significant developments – the emergence of China's independent automakers³ – is not a story about effective industrial policy, but rather a story about the decentralization of economic policymaking, the opening of the China's economy, and the integration of the domestic auto sector into global production networks.

What do these findings reveal about the role of the state in Chinese economic development? First, they suggest that the Center's role as integrator of the domestic and global economies, which peaked in China's accession to the World Trade Organization (WTO), has had a far greater impact on auto sector development than its role as coordinator of industrial policy.⁴ In contrast to the pilot agency-driven developmental models of Japan and Korea, industrial policymaking in the Chinese auto sector has been – and continues to be – quite disjointed, with many key decisions made by officials at the local level. Yet the shortcomings of China's industrial polices, particularly those that govern equity joint ventures, have had an unexpected silver lining; they created new points of entry for automotive entrepreneurs.

Second, these findings that China's transition from the central plan to a more market-driven economy has been an uneven and dynamic process in which the roles of central state institutions and the roles of the local state in economic development continue to evolve. De facto fiscal federalism – the devolution of economic policymaking and revenue generation to local governments – has arguably been one of the most dynamic aspects of Chinese economic reforms (Jin, Qian and Weingast 2005). Local officials are promoting regional auto sector development in new and innovative ways by tailoring policy solutions to local needs. At the same time, the Center continues to struggle with the optimal balance between uniformity of policy and local autonomy, for local officials acting in the interest of their locales often pursue economic policies that run counter to national development objectives.

Finally, these findings suggest that there continue to be divisions within the party-state over the future of the direction of the economy. Not only is there often ambiguity as to which agencies have control over which aspects of the economy, there still appears to be no consensus over the appropriate balance between state controls and market forces. To be sure, these divisions force policy compromise, which lends credibility to the view that while China is by no means democratic, it is also neither monolithic nor despotic. Yet at the same time, jurisdictional ambiguities can be detrimental to economic development in arenas, such as vehicle electrification, where more coordinated national policies would be more effective than the

³ By “independent”, I refer to those automakers that did not initially have the support of the central government, and thus were not eligible candidates for foreign direct investment. As this dissertation will show, the historical development of independent automakers has been distinctly different from that of traditional state-owned automakers. Luo (2005), Li (2009), and Chin (2010) also employ the term “independent” when referring to this group of companies, which includes but is not limited to: Chery, Geely, Great Wall, and BYD. Li and Xie (2010) refer to this group of firms as “emerging automotive firms.”

⁴ By “the Center” – *zhongyang* in Chinese— I refer to the main structure of authority in Beijing. Liberthal and Oksenberg (1988:22) describe the Center as comprised of four tiers: 1) the core group of twenty-five to thirty-five top leaders who articulate national policy; 2) the layer of staff, leadership groups, research centers, and institutes which link the elite to and buffer them from the bureaucracy; 3) State Council commissions and ministries that have supra-ministerial status and coordinate activities of line ministries and provinces; and 4) line ministries which implement policy. Though the Center is itself highly fragmented, for the purposes of this dissertation, it is still useful to distinguish its institutions and mandates from those at the local level.

proliferation of disparate local policies. Meanwhile, ideological divisions over “the state versus the market” are such that protectionist policies can at any moment trump market friendly policies. China may be on a path to a more market-based economy, but that path is not a straight one. In this sense, China is not marching but rather stumbling toward capitalism. What particular flavor of capitalism will emerge in China is still unclear.

This dissertation also investigates the broader consequences of China’s increasing appetite for cars, such as the steep increase in oil imports and greenhouse gas emissions. These problems will only escalate as auto production soars. Vehicle electrification has been proposed as an elegant way to lessen the impact of these problems. As Chapter Five will demonstrate, the Chinese independent auto industry is uniquely positioned to become a leading exporter of electric cars. But China is unlikely to become a leading adopter of electric cars because the mass adoption of electric cars will require an overall of energy policy and the implementation of national standards for charging infrastructure. As it turns out, the economic initiative of local officials and China’s fragmented bureaucratic institutions make solving these issues exceedingly difficult.

The remainder of this chapter is organized as follows. First, I provide a brief introduction the Chinese auto industry and key actors. Second, I clarify the research puzzle that first motivated the present study. Third, I elaborate upon my main argument about how independent automakers overcame technological and financial hurdles to break into the Chinese auto market. At the end of the chapter, I explain my research design, offer a roadmap of the dissertation, and conclude with the broader implications of my argument.

1.1. A BRIEF INTRODUCTION TO THE CHINESE AUTO INDUSTRY

James Womak et al. (1990) famously touted the automobile as “the machine that changed the world”. A fully integrated domestic auto industry not only generates thousands of manufacturing jobs in assembly plants and auto component factories, but stimulates employment and growth in upstream industries such as steel and rubber and downstream industries such as car loans, auto insurance, after-market parts and service, and dealerships. In numerical terms, the auto industry not only accounts for around 10 percent of gross domestic product (GDP) in developed economies, it uses 15 percent of the world’s steel, 40 percent of the world’s rubber and 25 percent of the world’s glass (Maxton and Wormald 2004:3,95). Given the economic potential of automotive production, it is not surprising that late industrializing nations target the auto sector as a focus of development.⁵

The auto industry exemplifies the aspirations of generations of Chinese leaders to promote industrial development, cultivate national champions, and reduce China’s dependence on foreign technology and imports. In the early years of the People’s Republic of China, Mao Zedong recognized the importance of investing in domestic truck production.⁶ With the help of Soviet technology, Mao established China’s first state-owned automotive factories. The trucks

⁵ For a detailed account of Malaysia’s effort to create a national car, see Tharu (1994) and Jomo, ed. (2007). For a detailed account of the Brazilian auto industry, see Shapiro (1994). For a cross-national comparison of auto sector development in various Latin American countries, see Tuman and Morris, ed. (1998).

⁶ First Auto Works, China’s first automaker, was established in 1953 in Jilin Province in northeastern China.

produced in these plants played an important role in China's heavy industrialization by transporting machinery, supplies, and soldiers. During the economic reform era, these state-owned factories were corporatized into state-owned enterprises (SOEs) and mated with the world's leading automakers.

At the beginning of the reform era (1978), the auto sector was in dire need of upgrading. With limited financial resources, the Chinese leadership's chief strategy under Deng Xiaoping was to experiment with foreign direct investment (FDI) and equity joint ventures (JVs). To prevent multinational automakers from dominating the Chinese domestic market, the Chinese government shrewdly capped foreign ownership in these automotive JV partnerships to 50 percent, with the Chinese state-owned partner retaining 50 percent. This limitation on foreign ownership proved effective in thwarting the domination of foreign firms, yet as Chapter Two will show, the JV model also unexpectedly prevented state-owned automakers from becoming national champions. Nonetheless, after two decades of difficult cooperation, foreign firms and their Chinese partners eventually established a domestic automotive supply chain and a burgeoning passenger car market.

To the surprise of both Chinese officials and industry executives, a crop of independent automakers with no ties to the Center emerged in the late 1990s and early 2000s at the low-end of the market. Although these firms received neither policy support from the Center nor investment from foreign automakers, they managed to corner 30 percent of the passenger car market by 2008. This dissertation seeks to understand *how* these independent automakers penetrated the Chinese market so quickly without being beneficiaries of the Center's industrial policies, particularly given the auto industry's historically high financial and technological barriers to entry. But before presenting a summary of the key arguments, the following section clarifies the categories of actors used in this study.

1.2. CONCEPTUALIZATION OF KEY TERMS AND CATEGORIES

This dissertation makes several distinctions at the level of the state, the sector, and the firm. First, this dissertation discerns between two levels of the state. When I refer to *the Center* or *the state*, I am referring to the main structure of authority in Beijing.⁷ Though the institutional structure of Center is highly fragmented, it is nonetheless useful to distinguish its institutions, incentives, and policies from those at the local level. Chapter Two will elaborate upon the Center's main bureaucratic organs responsible for economic policymaking. The terms *local state*, *local government*, and *regional government*⁸ are used synonymously and are assumed to be somewhat autonomous from the Center with respect to economic policymaking.

⁷ Liberthal and Oksenberg (1988:22) describe the Center as comprised of four tiers: 1) the core group of twenty-five to thirty-five top leaders who articulate national policy; 2) the layer of staff, leadership groups, research centers, and institutes which link the elite to and buffer them from the bureaucracy; 3) State Council commissions and ministries that have supra-ministerial status and coordinate activities of line ministries and provinces; and 4) line ministries which implement policy.

⁸ In most cases, when I refer to local or regional governments, I am referring to municipal governments, and not institutions at the provincial, township, or village levels.

Second, though there are many forms of foreign direct investment, this study focuses on equity joint ventures. The equity joint venture has been the primary format for direct investment in the auto industry, at least up until China's accession to the WTO when component suppliers were allowed to form wholly foreign-owned subsidiaries. Chinese leaders believed that joint ventures would allow the state to exert the greatest degree of control over foreign capital (Pearson 1991). Today, the Chinese government still requires auto assemblers to form equity joint ventures with state-owned automakers, and continues to limit foreign ownership in these joint ventures to 50 percent. Throughout the dissertation, there are instances when I refer to foreign direct investment and joint ventures interchangeably.

Third, this study is primarily concerned with the development of China's passenger car sector, which does not include the production or sale of heavy and commercial vehicles. In China, passenger cars comprise about 70-75 percent of total vehicle production. Included in this category are light commercial vehicles such as sports utility vehicles (SUVs) and minivans.⁹ The dynamics of the heavy and commercial vehicle market are distinctly different from the passenger car market and beyond the scope of this study. Hence, when I refer to the *auto sector*, I am in most cases referring to the passenger car market. There are, however, instances where I present data on total vehicle production, which does include heavy and commercial vehicles.

Finally, there are several important distinctions at the level of the firm. Two of the largest state-owned automakers, First Auto Works (FAW) and Second Auto Works (previously FAW and now known as Dongfeng), are referred to as *central SOEs*.¹⁰ These firms are large enterprise groups which remain majority-owned and managed by agencies at the Center. Top executive positions at these firms are appointed by the CCP's Organization Department, while lower level management positions are filled by the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council.

In contrast, *regional SOEs* are owned and managed by regional governments at the provincial and municipal levels, with significant though not complete autonomy from the Center. The largest regional SOEs are Shanghai Automotive Industry Corporation (SAIC), Beijing Automotive Industry Corporation (BAIC), and Guangzhou Automotive Industry Group (GAIG). Local officials, rather than the CCP Organization Department or SASAC, retain the authority to hire and fire regional SOE executives and managers. While the Center can exert considerable influence over regional SOEs through its policy mandates, it has less direct control over the management of regional SOEs compared to central SOEs.

Throughout the dissertation, I employ the terms *traditional SOEs* or *established automakers*, to refer to both central and regional SOEs. I loosely group these firms together to emphasize their shared traits, such as their lengthy history under the central plan and their

⁹ The dynamics of the heavy and commercial vehicle market are distinctly different from the passenger car market and beyond the scope of this study.

¹⁰ Chang-An Motors is also a central SOE, but its ownership and management are different from FAW or Dongfeng. Chang'An is a subsidiary of Southern Enterprise Group (Nanfang Gongye Jituan), itself a central SOE. Chang'An is not under the direct management of the central government.

bureaucratic style of management. All traditional SOEs began as bureaucratic departments within the communist state apparatus in charge of meeting the central plan's truck production quota. Though SOEs were corporatized in the 1990s, their organizational and management structure has changed little. Traditional SOEs are also the target beneficiaries of the Center's auto policies, including foreign direct investment. All of the traditional SOEs have formed JVs with foreign automakers.

Independent automakers constitute a separate category of firms that are distinct from traditional SOEs in terms of their management styles, corporate organization, and business model. Unlike traditional automakers which were established in the early Mao period, independent automakers launched operations in the late 1990s without the support of the Center and without foreign investment, though most received some support from local governments. While some independent automakers are owned and managed by local governments, others are privately-held. Although this study will focus on the four leading independent automakers –Chery Auto, Geely Auto, Great Wall Auto, and BYD Auto– there are more than a dozen independent automakers. Detailed case studies of these four firms are presented in Chapter Four. (See Appendix A for a list of other independent automakers.)

What is the nature of the relationships between these different actors? How have these relationships changed over time? The next section presents the research puzzle that motivated these questions.

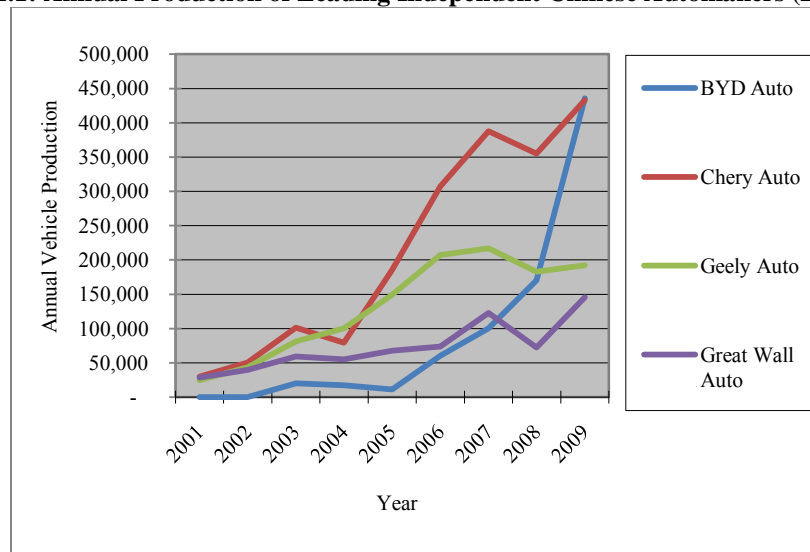
1.3. THE RESEARCH PUZZLE: WHAT FACTORS EXPLAIN THE EMERGENCE OF CHINA'S INDEPENDENT AUTOMAKERS?

After two decades of FDI and industrial upgrading, China's automotive strategy appeared to be paying off. In 2009, amidst the global recession, China surpassed the United States as the world's largest automotive market. In 2010, China surpassed Japan as the world's largest automotive producer. In many ways, the rapid development of China's auto industry could be seen as a natural step in the country's rapid industrialization. With its embrace of foreign investment and its large and unexploited labor pool, the country emerged as a manufacturing powerhouse in light and heavy industries alike, providing a strong foundation for automotive production. In terms of demand, more than three decades of over 8 percent GDP growth has lifted hundreds of millions of Chinese out of poverty and established a burgeoning middle class with rising incomes and aspirations of car ownership.

The tremendous growth in auto production and sales in the early 2000s was in part driven by the emergence of new independent automakers and the introduction of price competition at the low-end. In China, the introduction of new passenger cars at the low-end of the market (i.e., less than RMB 80,000 or less than USD 10,000) by independent automakers put tremendous pressure on small car prices, thus making cars much more affordable for the average Chinese consumer. Even today, cars produced by the Sino-foreign JVs have difficulty breaking through the RMB 80,000 barrier. As seen in Figure 1.1 below, the four leading independent Chinese automakers – BYD, Chery, Geely, and Great Wall – grew rapidly from 2001 to 2009. By 2009, these four companies comprised roughly 15 percent of China's

passenger car market. Combined with dozen or so other indigenous Chinese carmakers, these firms controlled 30 percent of the market in 2009.¹¹

Figure 1.1: Annual Production of Leading Independent Chinese Automakers (2001-2009)



Sources: China Automotive Industry Yearbook (various years); Automotive Resources Asia (2009)

Why is the emergence of independent Chinese automakers surprising? First, cars have become increasingly complex products over the last couple decades, not least because the average modern car has around eight thousand individual parts. Not only has there been an increase in the sheer number of parts (i.e., 8K to 10K discrete parts per vehicle), but there has been a proliferation of electronic control systems used in cars. Electronics are used to perform a myriad of tasks from managing the temperature of the engine to shifting gears. How did these Chinese start-ups gain access to the components and types of sophisticated technologies they needed to build cars to compete with the products of traditional SOEs and their foreign partners? And how were they able to get car models to market so quickly and so cheaply?

Second, given the billions of dollars of FDI that poured into the Chinese auto industry, it would have been reasonable to expect that world-renowned brands like General Motors would put independent automakers out of business. Historically, open FDI policies led to the denationalization of local auto industries in many developing countries, including Mexico and Brazil.¹² To be sure, these countries have thriving auto industries that employ millions of workers and contribute significantly to economic growth; but their auto industries are dominated by multinational automakers rather than domestic firms. In both cases, domestically branded cars were crowded out by foreign brands back in the 1970s and local automakers were forced to close their doors. To this day, we have not seen the rise of new domestic automakers in either Mexico or Brazil. Why, despite billions of dollars of FDI, has denationalization not occurred in China?

¹¹ *Automotive Resources Asia*, 2010. “China Automotive Monthly Market Trends”, June.

¹² For a detailed account of the denationalization of the Mexican auto industry, see Bennett and Sharpe (1985). For a similar account of Brazil, see Shapiro (1994) and Kronish and Mericle (1984).

Third, the Center has geared all of its resources and efforts toward modernizing traditional SOEs, with no intention of encouraging new domestic competitors in the auto sector. The Center favors the traditional SOEs, not only because of their size and historical role in China's industrial development, but because their many dependents make them politically difficult to abandon (Thun 2006:188). These traditional SOEs employ and provide services to hundreds of thousands of Chinese workers. The Center's industrial policies, including FDI, were designed to benefit traditional SOEs by modernizing their operations with the hope that these firms would maintain employment and eventually become national automotive champions. Independent automakers, however, did not have the advantage of receiving subsidized state credit or forming JVs with foreign firms.¹³ So where did independent automakers get their funding?

These are the puzzles and questions that motivated this study. The following section summarizes my key arguments and answers to these questions.

1.4. THE ARGUMENT IN BRIEF: HOW INDEPENDENT AUTOMAKERS OVERCAME TECHNOLOGICAL, FINANCIAL, AND REGULATORY OBSTACLES

My argument is predicated on two key assumptions. The first is that firms are at the heart of the industrial development process. Firms employ workers, consume resources, produce goods and services, and ultimately drive a nation's economic growth. Thus to understand how sectors grow, it is imperative to understand how firms grow. The second is that firm strategy is shaped by government policies at the central and local state levels, as well as the broader domestic and international business environment in which it operates. Yet, the specific way in which firm strategy is shaped by a given policy is not in every case clear to policymakers at the outset. The development of the Chinese auto industry suggests that the *unintended* consequences of policy can often be as, if not more, important than the original policy objectives.

The central argument of this dissertation is that the emergence of China's independent auto industry is not a narrow story about successful industrial policy, but rather a broader and more complex story of three sets of policies interacting with a shifting global business environment. The first set of policies concerns China's sector-specific industrial policy, a policy which has relied heavily on foreign participation in joint ventures (JVs) with backwards state-owned firms. The JV model has left state-owned automakers overly reliant on their foreign partners and precluded them from becoming national automotive champions.

¹³ Independent automakers were initially discriminated against by the state-controlled credit system which preferred lending to SOEs, particularly those engaged in capital-intensive industries. Kelle Tsai writes that "private businesses have been systematically denied access to loans from state banks, prohibited from conducting business in several sectors, and subjected to higher rates of taxation than collective and foreign businesses" (Tsai 2007:56). Although there was no official discriminatory policy banning loans to private firms, Chinese banks practiced self-imposed sanctions against private firms. Non-performing loans to private firms would automatically lead to suspicions that loan officers were guilty of embezzlement and collusion with entrepreneurs (Peng 2001). Moreover, banks in many cases are expressly directed by the central government to extend "policy loans" to specific failing state-owned enterprises. Steinfeld estimates that these types of policy loans accounted for 60 to 80 percent of the loans extended by the central bank to the nation's financial system in the 1990s (Steinfeld 1998:21).

Meanwhile, the failure of China's JV model left the market open to ambitious domestic competitors.

The second set of policies concerns China's economic liberalization policies, which culminated in China's accession to the WTO. The more reform-minded leaders within the CCP were betting that the opening of China's trade and investment regime would force the state-owned sector to be more competitive. What they did not foresee, however, was the way in which market reforms would lower financial and technological barriers to entry for non-state firms. The emergence of independent automakers took Chinese leaders by complete surprise. At first unwelcome by Beijing, independent automakers are now often held up as models of indigenous innovation.¹⁴

The third and final set of policies concerns local level policies, which gave nascent domestic automakers access to critical resources such as inexpensive land leases to build factories. The Chinese auto industry exemplifies the economic initiative of local officials and reveals new models of government-business relationships. In some cases, officials have themselves become entrepreneurs by starting and running their own local automakers; in other cases, local officials have preferred to support a local private automaker through preferential policies and refrain from interfering with the firm's daily operations. At least initially, the support of local governments has supplanted the lack of financial and policy support from the Center.

These three sets of policies interacted with a shifting global business environment, which ultimately enabled nascent Chinese automakers to access key automotive technologies. Not only were auto markets in the developed countries saturating, thus causing multinational automakers to look for new growth markets like China, but the auto industry's closed and vertically integrated production model was morphing into a more open and increasingly modularized one, which put more of the value creation in the hands of global suppliers. When these suppliers followed their multinational automaker clients to China, they saw independent automakers as potentially high growth customers and were willing to form technology partnerships with them. These technology partnerships enabled independent automakers to keep research and development (R&D) costs low, speed up the product development process, and produce cars that could compete with those produced by the JVs in the competitive Chinese marketplace.

The following sections explain in more detail each building block of this argument.

¹⁴ During a 2009 visit to Geely, Premier Wen Jiabao said, "Recently, I noticed Geely in a document, and then made a special comment to publicize the experiences accumulated by Geely in the independently persistent innovation...I hope Geely will generate more innovations and accomplish better development. I hope Geely will maintain good momentum of development. I hope reports about Geely will be presented to my desk in the near future. I will continuously support Geely for its development." Geely website.

http://www.geely.com/Brands/international/news/international_news/28825.html . Accessed 15 June 2011.

1.4.1. THE FIRST SET OF POLICIES: HOW THE FAILURE OF CHINA'S INDUSTRIAL POLICY OPENED A WINDOW OF OPPORTUNITY FOR NEW DOMESTIC COMPETITORS

China's restriction on foreign ownership of automotive JVs created large profits for Chinese SOEs and prevented multinational automakers from dominating the domestic market. Yet, as a whole, China's auto policies ultimately fell short in several important respects. First, Chinese leaders did not ensure that cars produced by JVs would be sold under domestic brand names. Because all of the cars produced by JVs carry the brand names of the multinational partner, Chinese consumers equate quality cars with foreign brand names like Buick, Volkswagen and BMW, and not with the brands of the traditional SOEs like FAW, Dongfeng, or SAIC. This would have consequences for traditional SOEs as they tried to sell cars under their own brands. This lack of control over branding is in contrast to the Korean government which mandated that all cars produced with foreign technology partners carried the name of Korean brands.¹⁵

Second, the Center has carefully guarded entry into the domestic auto industry in order to protect traditional SOEs from excessive competition. Chinese leaders did not consider how competition from private Chinese automakers could contribute to the development of the Chinese auto market by creating more consumer choice and bringing down prices. The government eventually relinquished its control over market entry in the late 1990s, but only did so reluctantly to comply with WTO requirements. Once the restriction was relaxed, many independent firms found creative ways to enter the rapidly growing auto market. The government's propensity to favor traditional SOEs over private firms persists, which has negative effects on the development of the industry as a whole. Scarce state resources continue to be wasted on poor performing state-owned firms.

Third, although traditional SOEs have been corporatized with shares listed on domestic stock exchanges, government bureaus at the national and local level retain majority ownership, which can create perverse managerial incentives. For one, many SOE executives are assigned to their positions by government bureaus for fixed terms and often have their sights set on appointment to high level government positions either locally or in Beijing after their terms are up.¹⁶ In other words the interests of SOE executives are not necessarily driven by the bottom line. The political ambitions of SOE executives often contribute to self-serving management decisions, like organizational expansion and an emphasis on production levels, rather than firm profits. In addition, even poor performing SOEs have privileged access to subsidized credit from state-owned banks, which leads to moral hazard and large non-performing loan portfolios. Though many small SOEs have been forced to close their doors, China's largest traditional SOEs are the epitome of firms that are "too big to fail."

¹⁵ Though it is not clear why the Chinese government failed to include the issue of brands in its JV policy, it may be because of its naiveté in marketing issues. After all, at the time the first automotive JVs were negotiated in the early 1980s, China was just beginning to throw off the shackles of the central plan.

¹⁶ For example, Wei Miao, once the President of state-owned Dongfeng Motors, became Party Secretary of Wuhan City, and is today the Vice Minister of the Ministry of Industry and Information Technology (MIIT), the ministry responsible for writing and implementing the state's key automotive industry policies.

Perhaps most importantly, Chinese leaders could not have foreseen the way in which JV relationships would keep production costs high and hamper the R&D and marketing capabilities of traditional SOEs. In most JV partnerships, the foreign partner is in charge of R&D and marketing while the Chinese partner is responsible for local component sourcing and production. Not surprisingly, most foreign firms prefer to keep the development of intellectual property (IP) in their home countries rather than share or co-develop IP with their Chinese partners,¹⁷ breeding resentment by their Chinese partners looking to upgrade their knowledge and skills. Furthermore, the cost of producing cars at JV factories remains high because foreign firms charge pricey royalties for their IP. Chinese firms retaliate by charging higher prices to produce the cars. As one former VW executive from Germany put it, “JVs still haven’t found a way to produce a low-end cheap car. JVs are running into a wall. Innovation is slow in a JV because there are two partners with often divergent interests.”¹⁸

These miscalculations are not surprising given China’s uncertain transition from a centrally-planned economy to a more market-driven economy. There was no model of reform to follow. Rather than adopt wholesale the market mechanisms of Western capitalism, Chinese leaders preferred to implement reforms in a cautious manner while maintaining state ownership in key sectors. As Chapter Two will show, because there was often disagreement within the top leadership over whether auto policies should be more protectionist or more market friendly, auto policies were inconsistent.

Yet there was a silver lining in the Chinese government’s inability to produce consistent policies and failure to transform traditional SOEs into national champions. Because SOEs and their foreign automakers were tied up in costly and difficult JV partnerships, a window of opportunity was left open for new domestic competitors. Yet this window of opportunity alone would not be enough, for nascent Chinese automakers still needed the capital and technology required to build cars that could compete with those produced by the JVs.

1.4.2. THE SECOND SET OF POLICIES: HOW CHINA’S INTEGRATION INTO GLOBAL CAPITAL AND TECHNOLOGY MARKETS LOWERED THE BARRIERS TO ENTRY

Building and operating a state-of-the-art automotive factory costs hundreds of millions of dollars and sophisticated production expertise. These extraordinarily high costs and knowledge requirements often preclude firms from entering the auto industry. Governments in developing countries have often looked to foreign direct investment as a way to bring both badly needed capital and technology into a struggling domestic auto sector.

As a capital scarce and technologically backward country, the Chinese government decided to open its domestic auto industry to FDI. Yet because the Center only allowed traditional SOEs to be the recipients of FDI and subsidized credit from state-owned banks,

¹⁷ General Motors has been the exception. At the behest of the Chinese government, GM agreed to open a joint technology development center with its Chinese partner. The center, called the Pan Asia Technical Automotive Center (PATAC), was initially funded with US\$50 million and today employs over 18,000 people.

¹⁸ Interview 83 with ex-VW executive from Germany, 13 April 2009.

newly formed independent automakers had little choice but to look beyond China for capital and technology. To that end, independent automakers firms piggybacked on several of the Chinese government’s economic liberalization policies, which were not only necessary to gain accession to the WTO, but were also believed to make traditional SOEs more competitive.

First, the government began to lower trade restrictions, such as import tariffs and trading rights, which made it easier for domestic firms especially private firms to buy materials, components, and specialty machinery from abroad. Changes to the trade regime were also accompanied by reforms to the foreign exchange system and the Chinese currency, the renminbi (RMB). Domestic firms were allowed to retain an increasing share of their foreign exchange earnings, which gave them the ability to finance imports without the need to ask the government for permission to purchase foreign exchange. For Chinese automakers, the relaxation of trade and investment rules allowed them to import high quality steel, electronic components, metal stamping machines, test systems, robotics, and more.

Second, the government allowed foreign automotive component suppliers to form wholly owned subsidiaries, which prompted them to invest aggressively in China. Component companies set up operations to both produce parts for export to other regional markets and to serve the multinational automakers that had formed assembly JVs in China. Once these suppliers became well-established in China, they began to court the business of independent automakers. After all, one of these firms could become the next Toyota or Hyundai. Not surprisingly, the technology partnerships formed between global suppliers and independent automakers would prove vital to the ability of independent automakers to produce cars that could compete with those made by the JVs.

Table 1.1: Funds Raised by Private Chinese Automakers in Foreign Stock Markets (2002-2007)

Private Chinese Automaker	Year of IPO	Foreign Stock Exchange	Stock Ticker	Amount Raised through IPO (in USD)
BYD Company , Ltd. (owner of BYD Auto)	2002	Hong Kong Stock Exchange	1211	210 million
Geely Automobile Holdings, Ltd.	2004, 2009	Hong Kong Stock Exchange	0175	113 million, 138 million
Great Wall Motor Company, Ltd.	2003, 2007	Hong Kong Stock Exchange	2333	207 million, 220 million

Sources: Company websites, Businessweek.com, Chinadaily.com.

Third, the government allowed domestic firms to list abroad, which would give cash-strapped independent automakers the ability to raise capital for expansion. At first, the government intended access to foreign stock exchanges as a vehicle through which restructured SOEs could raise hard currency to finance imports.¹⁹ As rules governing overseas

¹⁹ To prevent poor-quality SOEs from rushing to foreign stock markets, the government instated an initial public offering (IPO) quota system which would be divided among the provinces and ministries as the Chinese Securities

listing were further liberalized as part of China's WTO commitments, private Chinese firms – including several in the auto sector – began to take advantage of the opportunity to raise capital abroad. Table 1.1 above shows the large amount of money Chinese independent automakers were able to raise on the Hong Kong Stock Exchange. As a result of these foreign listings, these firms could build factories and buy production equipment, much of which had to be purchased in U.S. dollars. Unlike the RMB, the Hong Kong dollar could be easily converted into U.S. dollars in currency markets.

Chapter Three will delve deeper into each of China's liberalization policies show how access to foreign technology and capital shaped the low-cost business models of independent automakers. There are also, however, many local resources without which independent automakers could not have launched their operations. The following section will discuss how local officials interested in promoting a local auto manufacturing industry have proven to be valuable partners to independent firms.

1.4.3. THE THIRD SET OF POLICIES: HOW LOCAL GOVERNMENTS SUPPORTED INDEPENDENT AUTOMAKERS BY PROVIDING ACCESS TO VITAL LOCAL RESOURCES

As a result of fiscal decentralization in the early reform era, local governments in rural areas gained greater leeway in economic policymaking and developed an avid interest in local economic development. Scholars such as Jean Oi (1992;1995) have carefully documented the way in which fiscal reforms created incentives and political leeway for local officials to pursue local economic development. In particular, fiscal reform assigned to local governments property rights and greater control over locally-generated tax income. A burgeoning local auto industry is desirable because it has the potential to create a large number of local jobs and high tax revenues. For example, because BYD Auto is one of the largest taxpayers and one of the largest employers in Shenzhen (i.e., 120,000 employees across all operations), Shenzhen officials have shown the firm significant support by giving the firm subsidized leases on local lands and procurement contracts for local taxi fleets.²⁰

There is no “one size fits all” developmental model at the national level, let alone at the local level. The auto sector provides an empirical lens onto understudied models of government-business relationships at the local level. Whereas Eric Thun (2006) focuses on the relationships between local governments and traditional SOEs, I focus on newly formed relationships between local governments and independent automakers, many of which are privately-held. The latter relationships are markedly different from the former in that local governments have shown that they can be supportive partners to private enterprise without necessarily meddling in the firm's international operations.

Local governments have provided each independent automakers with vital resources such as access to favorable terms on local land leases, local credit institutions, government fleet procurement contracts, as well as production licenses and equipment from bankrupt local

Regulatory Commission (CSRC) saw fit. In 2000, the CSRC replaced the IPO quota system with new rules, which reduced the CSRC's power to approve IPOs and increased the responsibility of lead underwriters.

²⁰ Interview 62 with BYD manager, December 29, 2008.

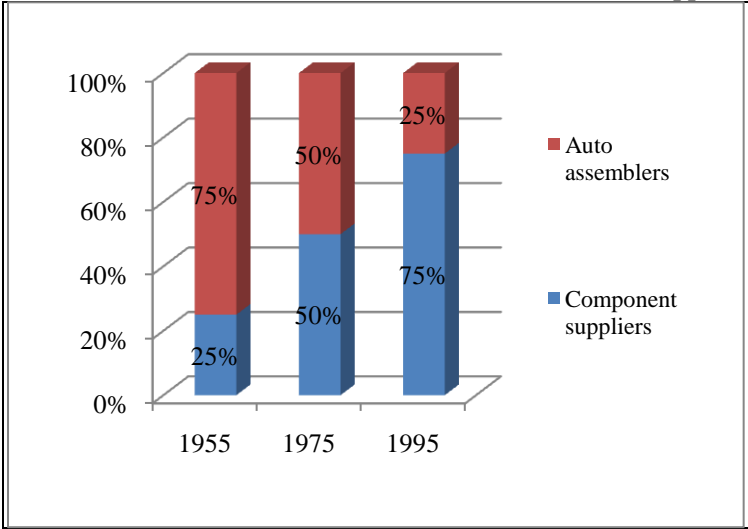
auto factories. In some cases, local governments have themselves become majority or minority shareholders in independent automakers, such as with Chery and Great Wall, while in other cases, they remain arms-length partners, such as with Geely and BYD. Chapter Four will present case studies of each of these four firms and show the ways in which local governments shaped their business models.

As mentioned earlier, the emergence of independent automakers was the unlikely result of these three sets of policies and a shifting business environment. It is to this final piece of the puzzle that we now turn.

1.4.4. A SHIFTING BUSINESS ENVIRONMENT: HOW INDEPENDENT AUTOMAKERS UTILIZED THE FRAGMENTATION OF PRODUCTION NETWORKS

As cars grew in complexity, the major global automakers realized that it would be increasingly costly and difficult to keep the research and design of components and subsystems in-house. Designing a new car platform could easily take seven years and cost hundreds of millions of dollars. To address the burgeoning costs of vertical integration, the form of corporate organization in which all parts and subsystems are designed and manufactured in-house, vehicle manufacturers began to outsource technology development to outside suppliers. This trend came to a head when the big American car companies, General Motors and Ford Motors, spun off their component divisions in the form of Delphi and Visteon in the 1990s.

Figure 1.2: Shift in Value of Assembled Vehicles from Assemblers to Suppliers (1955-1995)



Source: Reproduced from Maxton and Wormald (2004:145).

Consequently, the model of automobile production has evolved into one in which component suppliers control more and more of the value of new cars. Maxton and Wormald (2004:140) write that “the ownership of the technologies involved in creating the ‘feel’ of a vehicle is passing from the vehicle manufacturers to systems and component suppliers.” As Figure 1.2 above shows, the world’s leading auto manufacturers today are estimated to control only about 25 percent of the value of the cars they produce, while suppliers control the other

75 percent. This is a dramatic change from the era when Henry Ford manufactured nearly every part that went into his cars.

The fragmentation of automotive production networks, in which the process of designing and producing automotive components was increasingly outsourced, put more power and value creation into the hands of component suppliers. As FDI restrictions were relaxed, global suppliers followed their multinational customers into China. Once component suppliers set up operations in China to service their multinational partners, they turned their attention to up and coming private and semi-private Chinese automakers and the fast-growing domestic car market.

The willingness of global suppliers to co-develop key technologies like engines and transmissions with nascent automakers meant that the Chinese firms did not have to “reinvent the wheel.” Rather, than having to develop and produce every part in-house, they could fill gaps in their technical knowledge and product development process by forming partnerships with global suppliers. To be sure, independent automakers also “borrowed” technology from foreign suppliers by reverse-engineering or outright pirating existing components and whole car designs. (See Appendix C for examples of intellectual property (IP) infringement by Chinese automakers.) Yet since then, Chinese automakers have moved beyond blatant IP infringement and are now developing their own proprietary platforms, just as Japanese and Korean automakers did before them. The case studies in Chapter Four will discuss in greater detail how independent automakers went from “borrowing technology” to “developing technology.”

One arena in which independent automakers may prove to have a lasting competitive advantage beyond just low-cost manufacturing is the electric car market. With growing international concern over the intimate link between cars and air pollution, traffic congestion, energy security, and climate change grow, the electric car has been held up as an elegant way to simultaneously solve all of these problems. To pursue this opportunity, independent automakers are building new business models which take advantage of China’s integration into global automotive production networks and China’s strong position in electronics manufacturing, especially lithium ion batteries and electric motors. Next generation plug-in hybrid and all-electric cars are likely to be built with lithium battery technology. China happens to be the leading producer of lithium ion batteries. China also possesses an advantage in the production of rare earth materials used in electric propulsion systems. Could this combination of strengths create the perfect storm that will finally launch the Chinese auto industry onto the global stage? Chapter Five will attempt to answer this question.

1.5. RESEARCH DESIGN AND METHODOLOGY

This dissertation analyzes the interactions of these actors at three levels of analysis. The first level of analysis is cross-national. An underlying premise of this dissertation is that only through a comparative perspective can we demonstrate the specific ways in which a country’s

path of industrialization differs from those of previous late industrializing nations.²¹ Though the primary empirical focus of this study is auto sector development in China, the theoretical framework was constructed by analyzing the Chinese case in the context of other well-documented country cases such as Japan and Korea.

The second level of analysis is the sector.²² Given the complexity of China's ever-evolving political economy, this dissertation utilizes a sectoral lens to sharpen our understanding of how state roles shape industrial transformation.²³ Sectors are those subsets of the economy that involve a combination of highly complementary activities that must operate in coordination to produce a certain end product.²⁴ The purpose of a sectoral lens is not only to theorize about a particular sector but rather to sharpen ideas about state roles and how they shape possibilities for industrial transformation (Evans 1995). Specific developmental needs vary significantly by sector. Firms must address a range of challenges from the management of human and financial capital to the management of business-government and inter-firm relations, but the specific nature of these challenges are likely to be similar within a single sector.²⁵ For example, a capital and labor intensive sector like the auto industry places very different demands on the state and on local firms compared to a less resource intensive sector like retail services.

The ability of firms within a sector to meet these needs is central to the process of industrial development, and success is fundamentally shaped by the context of institutions in which the firms operate (Thun 2007:9). By focusing on the opportunity structure of a single sector, I can hold constant the key challenges faced by fledgling domestic firms across national cases and across time: access to financial capital, automotive component technology, and production expertise. As we will see, the way in which local automakers are able to access to these key resources has changed dramatically from the 1960s to today.

The third and final level of analysis is the firm. Through in-depth interviews with firm executives and industry experts in China, I examine the many ways in which the strategies and business models of Chinese automakers were shaped by their political economic environment. I find patterns of behavior – such as the types of linkages to foreign firms and foreign capital – that distinctly separate China's independent automakers from their state-owned counterparts. By looking closely at four different independent firms and three different traditional SOEs, I ensure that my findings are not unique to a single firm or a single category

²¹ Gerring (2007:84-85) elaborates further upon this point: "Whatever the field, and whatever the tools, case studies and cross-case studies should be viewed as partners in the iterative task of causal investigation. Cross-case arguments draw on within-case assumptions, and within-case arguments draw on cross-case assumptions. Neither works very well when isolated from the other... The larger point, then, is that cross-case analysis is presumed in all case study analysis. The case study is, by definition, a study of some phenomenon broader than the unit under investigation."

²² In this dissertation, the terms "sector" and "industry" are used interchangeably.

²³ Peter Evans (1995:11) writes that "the purpose of a sectoral lens is to allow the concrete investigation of general concepts." The aim is not to theorize about a particular sector but rather to sharpen general ideas about state structures, state-society relations, and how they shape possibilities for industrial transformation.

²⁴ This definition is from Hollingsworth, Schmitter and Streeck (1994:8), quoted in Thun (2007:19).

²⁵ For more on different approaches to and empirical examples of sectoral analysis, see Frieden (1991), Kitschelt (1991), and Shafer (1994). For an example of a cross-sectoral analysis in China, see Segal and Thun (2001).

of firm. This inductive approach led to me to the conclusion that China's FDI and JV policies have precluded the traditional SOEs from becoming national automotive champions and unwittingly opened the door to ambitious automotive start-ups. My focus on the emergence of Chinese independent automakers is a marked departure from previous studies of the Chinese auto industry which have focused exclusively on the interactions between the state, SOEs and multinational firms.²⁶

I utilize several data sources. Most of the empirical data for the Chinese case was gathered through open-ended interviews with government officials, firm representatives, university researchers, and a variety of industry experts. From 2007-2009, I conducted eighty-four interviews through snowball sampling. Interviews were conducted in Beijing, Shanghai, Guangzhou, Shenzhen, Tianjin and Baoding. As a rule, I do not identify by name interviewees with Chinese citizenship in order to protect their confidentiality, but I do provide the date and location of the interview along with the affiliation of the source. (See Appendix D for a full list of interviews conducted for this study.)

I gather most of my numerical data about the international auto industry from the website of Organization of Motor Vehicle Manufacturers (OICA), based in Paris. Numerical data about the Chinese auto industry were primarily compiled from the *China Automotive Industry Yearbook* series published by the China Automotive Technology and Research Center (CATARC) in Tianjin, as well as the *China Automotive Monthly* newsletters published by Automotive Resources Asia, an arm of JD Power and Associates, a reputable global market research firm. I also reference Chinese government documents, newspaper and magazine articles, as well as scholarly books and articles.

1.6. ROADMAP OF THE DISSERTATION

As mentioned earlier, I argue that the emergence of China's independent auto industry was the result of three sets of policies interacting with a shifting business environment. The rest of this dissertation is organized according to the four dimensions of my argument. Chapter 2 analyzes the first set of policies: China's automotive industrial policy from 1949 to the present. This chapter discusses why the state's FDI strategy has ultimately failed to turn SOEs into globally competitive firms and opened a window of opportunity for new domestic entrants.

Chapter 3 examines the second set of policies: China's economic liberalization policies which culminated in the country's accession to the WTO. These policies unexpectedly lowered financial and technological barriers to entry for China's independent automakers. This chapter also describes how independent automakers benefited from a shifting business environment, namely the saturation of automotive markets in the developed countries and the fragmentation of automotive production networks.

²⁶ A rich tradition of scholarship has emerged around the topic of the Chinese auto industry, but these authors have all focused on the relationships between the government actors, the established state-owned automakers and the major multinational automakers. Such studies include Harwitt (1995), Huang (2002), Gallagher (2006), Thun (2006), Meier (2009) and Chin (2010).

Chapter 4 examines the third set of policies that were implemented at the local level. In search of new sources of economic growth and revenues, local officials have provided independent automakers with a number of valuable local resources such as land leases and procurement contracts. This chapter also presents detailed case studies of the four leading independent automakers: Chery, Great Wall, BYD and Geely. These four case studies offer empirical evidence for my argument.

Chapter 5 investigates the consequences of China's increasing consumption of automobiles for the country's energy security and environment. The chapter analyzes the prospects for vehicle electrification as a potential solution to the problems caused by China's growing appetite for cars and concludes that although China is unlikely to become a leading adopter of electric vehicles, the Chinese auto industry could be uniquely positioned to become a leading exporter of electric vehicles.

Chapter 6 begins by summarizing my main argument and empirical findings, and then elaborates upon the broader implications of my analysis of the Chinese auto industry as well as proposed areas of future research.

1.7. CONCLUSION

A subject of continual debate in comparative political economy has been the appropriate level of state intervention in the economy. While neo-liberal economists assert that states should stay out of markets, developmental economists and political scientists suggest that some level of state intervention in the economy might not only be desirable but necessary, especially in late industrializing nations playing "catch-up". As Peter Evans (1996:10) points out, "state involvement is a given. The appropriate question is not 'how much' but 'what kind'".

Nowhere is the debate over the role of the state in economic development more contentious than in the Chinese case. While some observers praise the economic effectiveness of what they perceive as an all-powerful Chinese state, others scrutinize that same reach of the Chinese state.²⁷ One oft-cited indicator of the Chinese state's negative impact on the economy is the government's continued favoritism of state-owned enterprises over private enterprises. Yasheng Huang (2002; 2003; 2008), a vocal proponent of this view, argues that the Chinese government systematically discriminates against indigenous private firms and laments that the size of the country's private sector remains quite small.²⁸ Kellee Tsai (2002:2) calculates that in 2000, less than 1 percent of loans from the entire national banking system had gone to the

²⁷ See for example, Ramzy, A., 2009. "Why China's State-Owned Companies are Making a Comeback," *Time Magazine*, 29 April. In the article, the Ramzy writes, "Many of China's state-owned enterprises (SOEs) have grown into giants, eclipsing the relatively young, private companies that have contributed heavily to the country's progress. That trend is being reinforced as China implements economic stimulus measures that in practice boost state-owned giants while private companies are left largely to fend for themselves."

²⁸ Huang (2008) sees "capitalism with Chinese characteristics" as the balance between entrepreneurial, market-driven rural China vis-à-vis the state-led urban China.

private sector.²⁹ More recently, during the recent global economic recession, it was reported that the lending to the private sector has decreased even as overall lending as swelled.³⁰

Yet despite systematic state discrimination against the private sector, privately-held firms are thriving in the Chinese auto industry. One of the core contentions of this dissertation is that the Chinese state had a very important role in shaping the emergence of the independent auto industry, not through its auto industrial policies, but rather through its market liberalization policies. China's accession to the WTO and related commitments unexpectedly allowed non-state firms to form linkages to foreign capital and technology markets, thus allowing-them to bypass the need for state support. Rather ironically, as the following chapter will show, the state's concerted efforts to bolster state-owned automakers have actually made them less, not more, competitive, thus leaving the market open to new and ambitious domestic automakers.

²⁹ Steinfeld (1998:21) writes that banks continue lending to insolvent state-owned firms for several reasons. First, banks in many cases are expressly directed by the central government to extend "policy loans" to specific failing enterprises. Second, banks frequently receive pressure from local governmental agencies to extend preferential loans to favored firms. Third, new financial intermediaries have emerged, some of which have ties to specific SOEs or state industrial groups. On occasion, these banks serve as conduits for channeling household savings into their parent industrial organizations.

³⁰ The All China Federation of Industry and Commerce reported that loans to private firms in January 2009 totaled US\$61.7 billion, down \$102.5 million from the previous month (Ramzy 2009).

CHAPTER 2

“MUDDLING THROUGH”: ORIGINS AND EVOLUTION OF INDUSTRIAL POLICY IN THE CHINESE AUTO INDUSTRY

Reforms have been gradual and evolutionary. Reforms were not clearly foreseen or designed in advance, and so the elements of the reform have inescapably been time dependent. Reforming without a blueprint (Lin 1989), neither the process nor the ultimate objective was clearly envisaged beforehand. The Chinese expression for this process is “groping for stones to cross the river,” a metaphor that implies that each step depends on the previous step. Since the reform process has been marked by substantial ex post coherence, and by significant resilience as well, such an approach might be admired as the strategy of not having a strategy, or as we might say, of “muddling through” (Lindblom 1959).”

Barry Naughton, *Growing Out of the Plan*, 1995³¹

Barry Naughton (1985;1995) famously coined the expression “growing out of the plan” to describe the iterative and experimental nature of economic reforms in post-Mao China. At the onset of reforms in the late 1970s, there was no clear precedent for how and in what order the Chinese state should dismantle the central plan and introduce market mechanisms. While Chinese leaders often talked about emulating the success of Korea, they could not have foreseen the ways in which the legacies of the central plan would obstruct their ability to emulate the so-called “developmental state model”. This was particularly evident in the auto industry, where the Chinese state struggled for decades to modernize the sector’s production capabilities.

Chapter One argued that the emergence of China’s independent automakers was the unexpected outcome of three sets of policies interacting with a shifting business environment. This chapter focuses on the first of those three sets of policies, China’s auto-related industrial policies. This chapter has two main objectives. The chapter’s broad objective is to reveal how dramatically different China’s industrial policy has been from its East Asian neighbors. Whereas Korean industrial policy is often characterized as having a “high degree of policy integration” (Huang 2002), Chinese auto policies exemplify what Naughton (1995) calls “the strategy of not having a strategy”, or what Lindblom (1959) calls “muddling through.” China’s policy-making institutions are fragmented and have undergone several re-organizations, which resulted in automotive policies that have alternated between embracing market mechanisms and reasserting state controls in the domestic auto sector. “Growing out of the plan” has been an ongoing intra-party battle between more conservative leaders, whose interests lie in preserving state control over the economy, and those more reform-minded leaders, whose interests lie in unleashing market forces into the domestic economy. Meanwhile, as will be discussed in Chapter Four, the true agents of industrial change have been local governments.

The second and more specific objective of the chapter is to explain how China’s reliance on FDI has ultimately hindered the ability of state-owned automakers to become national

³¹ Naughton (1995:8).

automotive champions. Because state-owned firms have largely been kept out of the product development process by their foreign partners, they have struggled to develop their own R&D capabilities. The competitiveness of SOEs is further limited by the inertia of bureaucratic managers. The unexpected silver lining in this policy failure has been the opening of new entry points for low-cost domestic competitors.

This chapter is organized as follows. First, I compare China's developmental path to the developmental state model of Japan and Korea. The rest of the chapter details the zigzagging nature of Chinese auto sector reforms from the initial phase (1949-1977) of auto production under the central plan, to the second phase (1978-1991) in which the state begins experiment with FDI, to the third phase (1992-2000) in which the state attempts to reassert control over foreign investors, and finally to the fourth phase (2001-2009) in which the state relaxes the restrictions on foreign investment in its quest to join the WTO. The chapter concludes with an analysis of how the dependent nature of the joint venture business model precluded the transformation of state-owned firms into national automotive champions.

2.1. CHINA'S AUTO SECTOR DEVELOPMENT IN COMPARATIVE PERSPECTIVE

Given the rapid pace of industrialization in China over the past decade, it is not surprising that scholars would compare China's industrial policies to those of its highly successful East Asian neighbors, Japan and Korea (Meier 2009; Thun 2006; Huang 2002; Xia 2000). And because of the crucial role the state has played in auto sector development in Japan and Korea, it is no wonder that these same scholars have focused on the role of institutional arrangements in China.

While the findings of this dissertation do not at all dispute the centrality of institutions in China's economic development, they do suggest that the particular way in which industrial policy is conceived and the peculiar way in which policy shapes firm behavior is far more complex than the mechanism portrayed in the developmental state model. The complexity of policy interactions stems in part from China's enormous size and diversity and in part from China's unwieldy transition from a centrally planned economy to a more market-based one. Moreover, the fact that the state in China continues to be the majority shareholder of firms in pillar industries like the auto sector complicates the state's duties as regulator and disciplinarian. In order to demonstrate the ways in which China's industrial model has differed from that of Japan and Korea, the following section presents the origins of the developmental state model.

2.1.1. ORIGINS OF THE DEVELOPMENTAL STATE MODEL

Long before the rise of East Asia, a rich scholarship had developed around the proposition that an active and effective state apparatus is an essential element in successful industrialization (List 1885; Polanyi 1957; Hirshman 1958; Gerschenkron 1962; Gilpin 1987; Zysman 1983; Evans 1989). State involvement is a given. The appropriate question is not 'how much' but 'what kind' (Evans 1989:10). The dramatic successes of first Japan and then Korea naturally piqued the interest of scholars of the state. Out of this tradition emerged the concept of the developmental state, which has become short hand for the web of political, bureaucratic, and moneyed influences that facilitated rapid economic development in Japan and Korea.

Chalmers Johnson (1982) was the first to characterize the Japanese economic planning bureaucracy, the Ministry of International Trade and Industry, as a Weberian ideal type of interventionist state that was neither socialist in which both ownership and management remained in the hands of the state, nor entirely free market. Rather, Japan's "plan-rational capitalist developmental state" conjoined private ownership and state guidance. Johnson's argument came to be seen as a causal argument linking interventionism with rapid economic growth (Woo-Cumings 1999:2). Nowhere was the Japanese success more visible than in the auto sector. In 1957, Japan's Toyota Motors exported the first Japanese car to the United States. By the end of the 1960s, Toyota had a worldwide presence and was producing millions of cars per year. The Japanese model of development was hailed as a phenomenal success and one to be emulated by other developing countries.

During the period 1951-1973, the global auto industry was growing at an annual average rate of 5.9 percent (Maxton and Wormald 2004:4). This is often referred to as the golden era of the global automobile industry, as well as the critical years during which Japanese automakers were rapidly catching up and Korean automakers were beginning to enter the market as well. Unlike Chinese traditional SOEs, Japanese and Korean car companies were private corporations that produced passenger cars for sale both domestically and internationally. Though Japanese and Korean firms had close relationships to their respective governments, unlike traditional Chinese SOEs, they were not extensions of the state apparatus. The fact that Japanese and Korean automakers were not state-owned was critical to the success of their respective indigenous auto sectors, not least because government officials were willing to allow poorly-managed firms to fail.

As Alice Amsden (1989:14) argues, where Korea differs from most other late industrializing countries is the discipline its state exercises over private firms. For Amsden, this state discipline over big business has two key dimensions: penalizing poor performers and rewarding only good ones. Discipline has taken the form of refusal on the part of the government to bail out relative large scale but poorly managed firms in otherwise healthy industries.³² In 1976, Korea's Hyundai Motors produced its first originally designed model, the Pony, which would eventually become its first global best-selling model. Like Japan, Korea's developmental strategy was praised as a successful example of restrained state intervention in the market. To date, Amsden's version of the Korean success story has not been significantly challenged. Allowing state-owned firms to fail would prove much more difficult in China given the legacies of the central plan and of the state's heavy hand in the economy.

2.1.2. CHINA IS NOT ANOTHER DEVELOPMENTAL STATE

As this chapter will show, China was not another developmental state. Nicola Meir (2009) argues that China has evolved into a developmental state similar in its core characteristics to the leading East Asian countries, albeit one that combines certain legacies of the command economy and

³² When Shinjin, one of Korea's earliest automakers, went bankrupt the state refused to bail out the company and instead transferred Shinjin's holdings to Daewoo Motors. According to Korea, the state's tough stance toward industry is largely responsible for the domestic auto industry's global success.

market mechanisms. In contrast to Meir's focus on the central state, Eric Thun (2006) argues that local governments are increasingly the agents of industrial transformation in China. In his typology of local institutions, the unified bureaucratic structure and hierarchical firm relations in Shanghai exemplify what he calls a "local developmental state". Before Thun or Meir, Ming Xia (2000) had already captured this dual structure between the Center and the local state in his book aptly titled, *The Dual Developmental State*.

My findings suggest that China's developmental path has differed dramatically from the Japanese and Korean models. The Chinese model was based on what Johnson would call a "plan-irrational" socialist state. There has been little discipline over firms for two reasons. First, the state has been loath to force hard budget constraints on traditional SOEs in which it remains the majority shareholder. As a result, despite the enterprise reforms of the 1990s, most of China's traditional SOEs are still mired by many of the same managerial problems they had under the central plan (Steinfeld 1998). In the state-owned firm, controlling costs, improving efficiency, and responding to rapidly changing market conditions are considered far less important than increasing production, maintaining employment, and providing social stability. Second, as the rest of this chapter will show, China's divided and decentralized bureaucratic arrangements have made it difficult to coordinate a coherent industrial policy given overlapping jurisdictions and competing interests within the vast state apparatus.

And yet, the Chinese state has also proven to be remarkably flexible and adaptive and willing to experiment. As Chapter Three will show, the Chinese leadership's decision to join the WTO was politically very risky considering the staunch resistance of many high level leaders within the Chinese Communist Party. China's accession to the WTO and its integration into the global economy would have far-reaching and unexpected consequences for the Chinese auto industry, especially nascent independent automakers.

2.1.3. THE ROLE OF FOREIGN DIRECT INVESTMENT IN CHINA'S DEVELOPMENT

In addition to the lack of firm discipline and the absence of a centralized and insulated pilot planning agency, China's developmental model has also differed from Japan and Korea in its openness to foreign direct investment. Whereas the Japanese and Koreans preferred to protect their infant industries by keeping out foreign firms during their period of rapid industrial development, the Chinese have invited foreigners to invest tens of billions of dollars in their domestic auto sector.

This chapter argues that China's embrace of FDI has been a mixed blessing. On the one hand, FDI has brought tens of billions of dollars into a capital scarce country, along with sophisticated technologies, production expertise, and management know-how. China's economic development has been very capital intensive, and thus would not have occurred so rapidly had it not been for the massive infusion of foreign capital. On the other hand, my findings suggest that FDI in the auto industry, specifically in the form of the joint venture (JV) model, has in many ways limited the abilities of state-owned firms. In most cases, the foreign firm has purposely kept its Chinese partner out of the product development and marketing process.

An important counterfactual to consider is whether China had any other options but to embrace foreign investment. The necessity for an infusion of foreign capital and technology is hard to dispute given the extent of China's industrial and economic backwardness. Whatever the time period and whatever the firm structure, learners rely heavily on foreign know-how to narrow the gap (Amsden 1989:20). The interesting difference is that the Korean government opted to license foreign technology rather than permit foreign investment. Why didn't China focus on licensing foreign technology instead of opening up to FDI?

The short answer is that China did try to license technology from abroad. Kelly Sims Gallagher (2006:31) explains that the Chinese government in fact attempted to license automotive technology from the Japanese; but after models based on that technology entered into production, the technology stagnated and was not updated. Chinese auto factories were so backwards that they possessed limited ability to absorb and extend the life of licensed automotive technology, not to mention that passenger car production had been neglected under the central plan. Chinese state-owned factories needed intimate hands-on instruction on how to build modern assembly lines, institute quality control mechanisms, and build up a local supply chain. Though lack of technology was certainly part of the problem, management and operational know-how were equally, if not more, important. Whereas Japanese and Korean firms were private corporations accustomed to competition and bottom lines, Chinese factories were state-owned, bureaucratic in their management styles, and not at all acquainted with modern corporate governance. As the next section will show, the backwardness of Chinese factories in the late 1970s was in large part due to their genesis under the centrally planned economy.

2.2. PHASE I (1949-1977): AUTO SECTOR POLICY UNDER THE CENTRAL PLAN

At the beginning of the 20th century, a weakened Qing government had little capacity to promote economic development, let alone establish a domestic auto industry. Late Qing rulers found themselves mired in leadership struggles, domestic upheavals, foreign occupation, and a humiliating war with Japan. The Reform Movement of 1898, which intended to use "Western learning for practical development" (Spence 1990:225), failed to bring about the type of military modernization that would be required to fend off the Western powers that were competing to expand their colonial presence in China.³³ Although Chinese civilization had for centuries been known for inventions like papermaking, the compass, printing and gunpowder, these technological developments remained within the Chinese court and were never fully commercialized. While Western Europe and later Japan industrialized, China remained an industrial backwater.³⁴ As a result, during the Qing dynasty, China largely relied on automotive imports.³⁵

³³ For a detailed history of the late Qing dynasty, see Spence (1990).

³⁴ There are a number of explanations for why China didn't industrialize earlier. Some argue that it is because China, with its abundant and inexpensive manpower, did not need mechanization to replace what could be done manually. Others, such as Diamond (1997) have pointed to the fact that Chinese civilization for many centuries faced little external competition. Meanwhile in Europe, rivalries among nations meant that countries had to either progress or fall victim to more powerful neighbors.

³⁵ Most of these early imports were passenger cars brought in by foreign residents living in China, especially Shanghai. Many of these cars were of American origin. GM began exporting cars to China in 1922 and by the 1930s, one of every six vehicles on Chinese roads had a Buick nameplate (Gallagher 2006:63). Notably, the Chinese also built small quantities of trucks in Shanghai in 1936 with engines and know-how borrowed from Germany's Daimler Benz (Posth 2006).

The Communist Revolution of 1949 ushered in a new era of industrialization. With Chairman Mao Zedong at the helm, the new communist government moved quickly to reduce China's reliance on auto imports and create its own large-scale utility vehicle industry that could provide the country with efficient transport of agricultural products and greater military mobility. Due to the extent of their industrial backwardness, the Chinese turned to the Soviet Union for technology. With the help of the Soviets, the Chinese established First Automotive Works (FAW), China's first automotive factory, in the northeast city of Changchun in Jilin Province. Mao chose this city in large part because of the industrial infrastructure left behind from the Japanese occupation. The main objective for FAW was to produce heavy trucks.³⁶

After FAW opened, the Chinese government established a number of other automotive factories focused on producing trucks and utility vehicles. Paranoid that a foreign attack on China could potentially take out the country's industrial base, Mao made sure that new automotive factories were spread out all over China, especially in the hinterland away from the sea. This strategy had path dependent consequences for China's long-term auto sector development. In particular, the fragmentation of production ensured that the industry as a whole would have difficulty reaching efficient economies of scale. Table 2.1 below provides basic information about the major automotive SOEs and the diverse locations of their headquarters.³⁷

Table 2.1: Origins of China's Traditional State-Owned Automakers³⁸

Year of First Production	Name of State-Owned Automaker	Type of SOE	First Vehicles Produced	Location
1956	First Automotive Works (FAW)	Central	Trucks, Passenger Cars	Changchun, Jilin Province
1957	Chang'An Factory, now Chongqing Chang'An Automobile Company (or Chana)	Central	Jeeps	Chongqing
1958	Beijing Automotive Works (BAW), now Beijing Automotive Industry Corporation (BAIC)	Regional	Trucks	Beijing
1959	Shanghai Automotive Assembly Plant (SAAP), now Shanghai Automotive Industry Corporation (SAIC)	Regional	Passenger Cars	Shanghai
1966	Guangzhou Automotive Manufacturing Plant (GAM), now Guangzhou Automotive Industry Group (GAIG)	Regional	Trucks, Buses	Guangzhou, Guangdong Province
1967	Second Automotive Works (SAW), now Dongfeng Motor Corporation (DMC)	Central	Trucks	Shiyan (later Wuhan), Hubei Province

Source: Various company websites.

³⁶ The FAW Jiefang ('liberation') model truck was based on the Soviet model ZIS 150 and had 81 percent Soviet-made parts in 1956, though localization – domestic production of parts – would reach 100 percent by 1965. The FAW Jiefang ('liberation') model truck was based on the Soviet model ZIS 150 and had 81 percent Soviet-made parts in 1956, though localization – domestic production of parts – would reach 100 percent by 1965 (Harwit 1995:19).

³⁷ Many of these traditional SOEs today have manufacturing operations and subsidiaries in other parts of the country. However, the headquarters remain in the cities listed in Table 3.1.

³⁸ This list is not exhaustive. There were a number of other regional automotive factories that were established during the Mao era. This list, however, does include those factories that would emerge as China's largest and most important state-owned automakers in the reform period.

During this period, the bureaucratic agency in charge of automobile investment was the Ministry of Machine Building. Production was driven by quotas set in the central plan, not by market demand. There was no market. Fulfilling the plan, maintaining full employment, and providing social services like housing, education and healthcare trumped concerns over increasing production efficiency, innovating new products, and controlling operational costs. Though there would be some corporate governance reform of SOEs in the mid-1990s, traditional SOEs would find it very difficult to transform their bureaucratic management styles.³⁹

Truck production received the bulk of investment in the early years of Communist rule. Conversely, passenger car production received very little attention. The few sedans that were produced were intended for transporting high-level officials, not for general consumption. FAW's *Hongqi* ('red flag') limousine and the Shanghai Automobile Assembly Plant's *Fenghuan* ('phoenix') sedan were roughly modeled on Daimler Benz's model 220 and hand-built in very small quantities. Under the tenets of socialism, private car ownership was discouraged, though some cars were imported for use by government officials. In 1960, China produced only 98 passenger cars, while it imported 1,400 units Harwit (1995:18-21). Because domestic production techniques during this period were very primitive, the quality was quite low.

After the Sino-Soviet split of 1960, China's auto sector development came to a virtual standstill. Soviet technicians were sent home, which greatly hampered China's ability to learn and absorb foreign technology. Mao's insistence on self-reliance meant that the Chinese also rejected the idea of licensing foreign technology to update local products. In the ensuing Cultural Revolution (1965-1975), the production of passenger cars ceased altogether and truck production slowed dramatically. Yet because the rhetoric of the Cultural Revolution emphasized the spirit of geographical self-sufficiency, hundreds more small would-be auto manufacturers sprung up in every corner of the country. According to Harwit (1990:21), there were 1,950 factories in 1976 ostensibly producing trucks, cars, motorcycles and parts.

China's developmental approach during this first phase was primarily driven by heavy industrialization, national security concerns, and Mao's desire for self-reliance. Given its adoption of socialism as a political and economic model, China was not interested in promoting domestic automobile consumption or engaging with the global economy. Although Mao managed to establish a primitive production base, his small and technologically backward factories peppered across the Chinese countryside hardly constituted an indigenous auto industry.

2.3. PHASE II (1978-1991): POLICY EXPERIMENTATION IN THE REFORM ERA

With Mao's exit, Chinese reformers began to turn away from the central plan and cautiously toward the global economy. The goal of the new leadership under Deng Xiaoping was to maintain the core of the plan – including the state-owned sector – while slowly introducing limited price reforms and experimenting with foreign direct investment in special economic zones. Though the changes to the economy during the reform era would be incremental, the changes in the economic mindset of the Chinese leadership were palpable. The state's new

³⁹ See Naughton (2007) Chapter 13 for details on the transformation of corporate governance in the state sector in the 1990s.

attitude toward economic growth can be summed up in two of Deng's most famous aphorisms: "It doesn't matter if it's a cat is black or white as long as it catches the mice" and "Poverty is not socialism. To be rich is glorious."

Yet rather than completely relinquishing control over the economy all at once, Deng preferred to slowly loosen the state's grip. To address some of the economic distortions of the command economy, for example, state-owned factories and township and village enterprises were now permitted to sell their over quota products in an emerging domestic marketplace. Market prices were phased in, enterprise ownership was diversified, and industrial competition was created *within* the existing socialist institutional framework. China's peculiar political economic arrangement came to be known as "socialism with Chinese characteristics." Instead of dismantling the socialist model and nullifying the legitimacy of the Chinese Communist Party, Chinese leaders hope to reform the socialist system to make it work better.

One of the major challenging facing Chinese leaders was the modernization of China's backward auto factories. In 1978, China's auto sector was highly fragmented with 56 regionally dispersed auto assembly plants that produced 149,062 vehicles of all types and 2,640 sedans.⁴⁰ Rather than privatizing state-owned automakers, Chinese officials experimented with different ways to improve incentives and management capabilities within state-owned enterprises.

First, the government sought to encourage industrial consolidation of small factories into large enterprise groups (*jituan qiye*) akin to the *chaebol* in Korea and the *keiretsu* in Japan. Large enterprise groups were thought to be a solution to the problems that plagued the Chinese auto industry: fragmented production, uncoordinated technology transfer, low R&D capability, weak brands and poor overall quality (Thun 2006:50).

Second, the government opted to experiment with FDI. A capital scarce country, China looked to foreigners to help fund the upgrading of traditional SOEs. Joint ventures between established SOEs and the world's premier automakers were seen as the solution to the problems of technological backwardness, industry fragmentation, and diseconomies of scale. While it is not entirely clear why China chose to open the auto sector to FDI before other sectors, one could speculate that it was because of the very immediate need to produce vehicles to transport goods in the rapidly growing domestic economy.

Yet the decision to bring foreign investment to China was not easily made. There was a divergence of opinion within the top leadership on the precise path China should take to develop a domestic passenger car industry. While some officials called for protecting the domestic sector from the encroachment of foreign firms, others called for limiting joint ventures to Japanese companies (Harwit 1990:32-33). Some officials even called for extending FDI to Western firms.

As a compromise, foreign ownership of automotive assembly joint ventures would be capped at 50 percent to ensure that foreign automakers would not take over the domestic market. Chinese leaders sought to avoid the level of "denationalization" –transfer of state-owned assets to foreign firms – that occurred in Mexico and Brazil. This 50 percent limitation on foreign

⁴⁰ Ministry of Machine Industry (1994:63 and 73), quoted in Thun (2006:54).

ownership would have important long term consequences not only for the foreign automakers, but for the traditional SOEs. The next section presents the challenging experiences of the Chinese auto sector's first joint ventures.

2.3.1. CHINA'S FIRST REGIONAL JOINT VENTURE EXPERIMENTS: BEIJING JEEP, SHANGHAI VOLKSWAGEN, AND GUANGZHOU PEUGEOT

The first automotive JVs were formed between foreign firms and regional SOEs. Why did the government choose regional SOEs rather than central SOEs as the initial targets of foreign investment? It may have been that Chinese leaders opted to experiment with regional SOEs before subjecting central SOEs to yet proven JV model. These first JV experiments, two of which were failures and one of which turned out a success, would have important consequences for both future automotive policy and the developmental trajectory of the Chinese auto industry.

In 1984, the first JV deal was struck between American Motor Company (AMC) and Beijing Automotive Works (BAW), later known as Beijing Automotive Industry Corporation (BAIC).⁴¹ The resulting JV, Beijing Jeep, was the first major manufacturing JV of any kind in China. The entire venture was worth US\$51 million, of which AMC contributed only US\$16 million. AMC concluded that designing and developing a new vehicle for the Chinese market, which could cost between US\$700 million and US\$1 billion, was simply not feasible. It was also not obvious to AMC that the Chinese consumer market in the early 1980s would be able to absorb the millions of cars necessary to make such an investment worthwhile.

Rather than designing a car specifically tailored to the needs of the Chinese market, AMC decided to import complete knock-down (CKD) kits. Each CKD kit, composed of subsystems and components designed and manufactured in the United States, could be easily assembled at Beijing Jeep. This structure reduced the need for AMC to transfer to their Chinese partners any knowledge about how key technologies were developed, but ensured that production costs would be high. Although Beijing Jeep is the longest-standing automotive JV in China, Chinese engineers at the company feel they have not been able to acquire any advanced technological capabilities (Gallagher 2006:59). Overall, Beijing Jeep has not been considered a successful venture by either the Chinese or the Americans.⁴²

In 1984, a second JV was established between Germany's Volkswagen and Shanghai Automobile Assembly Plant, later incorporated into Shanghai Automotive Industry Corporation (SAIC).⁴³ Shanghai Volkswagen (SVW), as the JV is commonly known, would prove to be the most successful of the early joint ventures. Eric Thun (2006) argues that the bureaucratic structure of Shanghai was particularly well suited to auto sector development and that the local government played a pivotal role with respect to capital accumulation and investment.

⁴¹ BAW became a subsidiary of Beijing Automotive Industry Corporation (BAIC), which is owned and managed by the Beijing Municipal government.

⁴² For more on the Beijing Jeep JV, see Harwit (1995), Mann (1997), and Gallagher (2006) .

⁴³ For more details about the Shanghai Volkswagen joint venture, see Thun (2006) and Posth (2006).

Due to China's lack of a domestic automotive supply chain, a nascent SVW had no choice but to import CKD kits from Germany. Wang Rongjun, SVW's second managing director recalls, "You have to understand that technically, the Chinese automotive supplies industry in 1986 was 30 years behind that of the automotive supplies industry in Europe, Japan or the USA. At that time, suppliers produced parts and components for trucks and not for cars. What we needed was a paradigm shift, not only in parts design, but also in technology. Initially, there wasn't a single supplier capable of producing even a single part for the Santana."⁴⁴

Under the pivotal leadership of Zhu Rongji, Shanghai mayor (1987-1991) and local party secretary (1989-1991), the Shanghai government established a localization tax fund to upgrade the capabilities of local parts suppliers.⁴⁵ From 1988 to 1994, a hefty tax was levied on every new passenger car sold in Shanghai. For the first two years, the tax amounted to RMB28K (~US\$3.3K) per new car. In 1990, the tax was lowered to RMB 23K. Over the course of six years, the Shanghai government collected over 5 billion RMB (~US\$580M). These funds were used to assist local component firms in upgrading their capabilities, including the transfer of more than 140 modern technologies to Chinese manufacturers (Posth 2006:165). However, this localization effort took time and did not really bear fruit until the mid-1990s.⁴⁶ The establishment of Shanghai's automotive supply network was the first in China and provided the foundation for SVW's long-term success. For years afterward, automakers in other parts of the country would source parts from Shanghai.

In 1985, yet a third JV was launched between France's Peugeot and Guangzhou Automotive Manufacturing Plant (GAM), now known as Guangzhou Automotive Industry Group (GAIG). Guangzhou Peugeot's initial capital was US\$52 million, making it France's biggest JV in China. From the outset, the ownership structure was rather complex. GAIG took 42 percent, Peugeot 22 percent, regional investment and banking entities in Guangzhou 20 percent, the National Bank of Paris 4 percent, and the World Bank's International Finance Corporation 8 percent, including a USD 29 million loan (Harwit 1995:118).⁴⁷ The JV, which produced trucks and station wagons based on CKD kits shipped from France, met with some early success. However, the venture struggled with localization and never reached the production levels originally envisioned by Peugeot or local officials. In 1998, Peugeot's stake was sold to Japan's Honda.

Unlike Shanghai, Beijing and Guangzhou suffered from a weak local supply chain as well as fragmented local institutions and incentives (Thun 2006). Yet the success of the Shanghai experiment would convince the Center to open the industry to further greater foreign investment in the 1990s.

⁴⁴ Quoted in Posth (2006:156).

⁴⁵ Localization refers to the process of transferring the production of components that were previously manufactured abroad to local suppliers. Localization is the key to strengthening the local supply chain and enabling an indigenous auto industry.

⁴⁶ According to Harwit (1990:102), then Shanghai mayor, Zhu Rongji, seemed to make the revitalization of Shanghai industrial development his own private mission. His unusually aggressive leadership style became even more apparent when he became the country's Premier in 1998. As Premier, Zhu pushed through painful but necessary SOE reforms and was largely responsible for steering China into the WTO in 2001. Clearly, Shanghai benefited greatly from having Zhu as mayor.

⁴⁷ Harwit (1995:118).

2.3.2. THE CHALLENGE OF INDUSTRIAL CONSOLIDATION

The next big push to modernize the sector through industrial policy began in 1986 when the central state for the first time designated the auto sector as a “pillar industry” (*zhizhu chanye*) in the 7th Five Year Plan (1986-1990). The main goals were to consolidate production, ban independent regional production, prioritize the development production of passenger cars, upgrade the technological capabilities of the industry, increase local content, and increase production to 600,000 units per year.⁴⁸ The desire for a state-led industrial policy was at its peak during this period, with Korea’s developmental model held up as an example (Huang 2002).

The Ministry of Machine Building hoped to consolidate the industry into the three largest SOEs. FAW and SAIC would handle mid-sized cars, while Dongfeng (previously SAW) would handle smaller cars. However, there was resistance from regional governments who wanted to widen consolidation plans to include more regional SOEs (Noble et al 2005). To appease these regional leaders, the Center announced the “Big Three, Little Three” (*sanda sanxiao*) scheme in 1988. According to the plan, China’s designated “big three” automakers to be FAW, Dongfeng Motors, and SAIC. The “little three” would be Beijing Jeep, Guangzhou Peugeot, and Tianjin Automotive Industry Corporation. Though there was some consolidation of firms engaged in auto assembly (from 124 to 117), the goal of merging the remaining firms into the “Big Three, Little Three” was not met.

The Chinese leadership recognized that fragmented production led duplication of investment and the inability of any single factory to achieve real economies of scale.⁴⁹ Resistance came from entrenched interests within the bureaucracy and regional governments that had a stake in keeping their fingers in the auto industry. For example, when the Chinese military wanted to enter the auto industry, it found strong backers in the national ministries. Hence, the “Big Three, Little Three” scheme was expanded into the “Big Three, Little Three, and Two Tiny” to accommodate two new military-owned automakers: Chang’An Automobile Corporation and Guizhou Aviation Industry Corporation. Later, there would be additional military-backed state-owned automakers, including Chang He Auto and Hafei Motors, which are subsidiaries of Change He Aircraft Industries Corporation and Harbin Aircraft Manufacturing Corporation respectively.

At the regional level, local automakers are not only a source of pride for local officials, they also provide jobs, contribute to local economic growth figures, and create stimulate growth in related industries like steel and automotive components. As a result, even if local automakers are neither profitable nor producing at economies of scale, regional officials often subsidize their operations to keep them in business. The combination of continued social burdens in locally controlled firms and fewer resources to meet these needs meant that local governments did everything possible to keep local firms afloat both as a source of revenue and employment, often in direct opposition to the Center’s directives (Thun 2002:88). The role of local governments in the auto sector is the subject of Chapter Four.

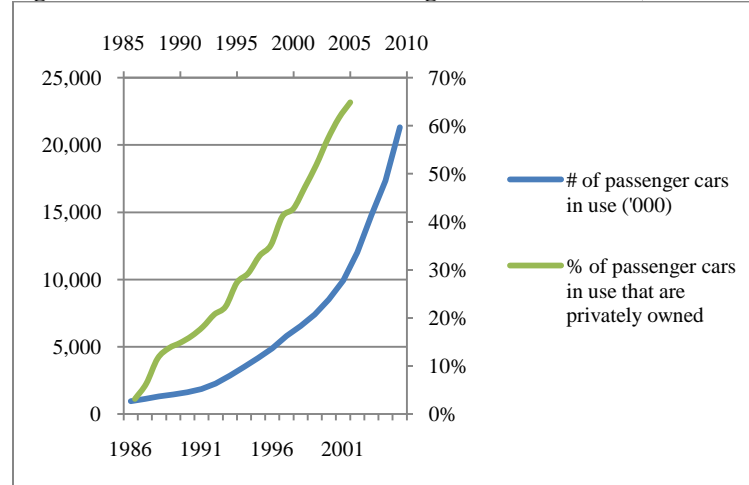
⁴⁸ Thun (2006:55).

⁴⁹ For the average multinational automaker, 250K units per year is generally considered to be an adequate economy of scale for a single factory. Most of the traditional SOEs in China in the early reform period produced less than 1K units per year.

Despite the Center’s designation of the auto sector as a pillar industry, passenger car production increased very slowly during this period. In 1991, only about 81,000 passenger cars were produced, accounting for roughly 11 percent of total vehicle production.⁵⁰ To be sure, this was an improvement from the beginning of the reform era when passenger car production was at a standstill. But compared to the production volumes of the major automotive producing countries, China’s numbers were paltry. As a point of comparison, North America was producing on the order of 7 to 7.5 million passenger cars per year in the early 1990s.⁵¹

Equally disappointing to Chinese leaders was the number of cars exported from China. Of the 81,000 cars produced, only about 2,000 units were exported. Vehicle imports, which put pressure on China’s balance of payments, also rose dramatically from the late 1980s to the early 1990s because domestic supply could not meet the increasing demand.⁵² In the early to mid-1990s, most of the domestic demand for passenger cars came from regional governments either to transport local officials or to expand state-run taxi fleets. As Figure 2.1 below demonstrates, private car ownership would not surpass 50 percent until 2002.

Figure 2.1 Annual Growth of Passenger Cars in China (1986-2005)



Source: *Automotive Industry Yearbook 2006*

In sum, the results of this phase of auto sector development were mixed. Investment from abroad began to trickle in, but technology was not being transferred and absorbed as quickly as the Chinese leadership would have liked. Chinese state-owned factories remained technologically backward, the local supply chain weak, the industry fragmented, and production levels low. A lively debate emerged within the central leadership about whether China should try to foster its own indigenous auto industry at all. Was it too late to catch up? Proponents of the latter view argued that it would not be possible to compete with the foreign automakers (Harwit 1995). If foreigners were willing to manufacture cars in China, the country could at least benefit from the jobs created and the tax revenues collected from imported CKD kits and domestic car sales. Nonetheless, the economic nationalists pushing for greater technological self-reliance

⁵⁰ *China Automotive Industry Yearbook* (2007).

⁵¹ This figure was collected from www.wardsauto.com. Accessed 21 June 2011.

⁵² Total vehicle imports rose from 67,182 in 1988 to 209,774 in 1992 (Harwit 1995:31).

would gain the upper hand in industrial policymaking in the third phase of auto sector development.

2.4. PHASE III (1992-2000): INTERNAL DEBATE OVER THE FUTURE OF THE STATE-OWNED AUTO SECTOR

The third phase of auto sector development took form in the wake of a series of events that shook Beijing. After the Tiananmen Square Incident (1989), the fall of the Berlin Wall (1989), and the collapse of the Soviet Union (1991), Chinese leaders were very eager to avoid the political, economic, and social costs associated with the rapid unraveling of socialist institutions in Eastern Europe and Eurasia. The Chinese leadership viewed the “big bang” approach to economic and political reform as the source of the Soviet Union’s demise, preferring instead their gradual approach to reforms. However, as this section shows, the leadership was divided on whether to deepen economic reforms and whether to re-centralize power in the Center.

In 1992, Deng Xiaoping went on his famous “Southern Tour” which took him to the Special Economic Zones in southern China. Along the tour, Deng re-emphasized the need to accelerate economic reform and specifically re-affirmed a non-ideological pragmatic approach to policy experimentation (Naughton 2007:99). In response to Deng’s call, the 14th Congress of the Chinese Communist Party (CCP) endorsed a “socialist market economy” and made it clear that the market mechanism should be extended to all main sectors of the economy.

At this time, Zhu Rongji was beginning to emerge as a dominant voice in policy-making. Zhu, who became Vice Premier in 1993, focused on industrial policy and led the drive to reform debt-ridden and unprofitable SOEs. His plan was to create a trimmed-down state sector of efficient, profitable, high-tech enterprises, along the lines of the state sector in contemporary Germany or France (Nathan and Gilley 2003:205-208). Zhu championed the Company Law in 1994, which provided a uniform legal framework for corporatizing state-owned factories (Naughton 2007:301). This corporatization allowed SOEs to diversify their ownership by selling off some of their shares, and in some cases enabling new hybrid ownership forms. As the state-owned sector was corporatized, there was a gradual shift away from plan fulfillment toward profitability as the most important indicator of enterprise performance. The combination of increased competition, improved incentives, and more effective monitoring served to improve SOE performance through the 1990s, though a debate continues over whether the moderate performance improvements in the state sector were large enough to be considered “successful” (Steinfeld 1998; Naughton 2007).

Zhu’s ability to push through more SOE reforms was somewhat tempered by opposition from within the top leadership. Zhu often faced opposition from his superiors, Premier Li Peng, whom Zhu would not replace until 1998, and Jiang Zemin, who became President when Zhu became Vice-Premier in 1993. Li and Jiang were both conservatives that strongly advocated for the maintenance of a large state-owned sector. In a speech to the 15th Party Conference, then President Jiang Zemin said: “The leading role of the state-owned sector should manifest itself mainly in its control power. We should make a strategic readjustment of the state-owned sector

of the economy. The state-owned sector must be in a dominant position in major industries and key areas that concern the life-blood of the national economy” (quoted in Nolan 2001:17).

Despite divisions over exactly how to strengthen the state-owned sector, there was a clear move toward greater recentralization of authority in the Center with respect to fiscal policy and regulation. The auto sector was no exception. Due to the tension between more reform-minded leaders like Zhu and more conservative leaders like Li and Jiang, China’s 1994 auto policy exhibited an unsettling combination of limited market reforms and continued state controls.

2.4.1. THE 1994 COMPREHENSIVE AUTOMOBILE PRODUCTION INDUSTRY POLICY : A RETURN TO PROTECTIONISM

On March 12, 1994, the State Council – China’s Cabinet – announced the Automobile Production Industry Policy (*qiche gongye chanye zhengce*).⁵³ This was the government’s first attempt at a comprehensive industrial policy for the auto sector. The policy was a joint effort between the State Council, the SPC, the State Economic and Trade Commission (SETC), and the Ministry of Machine Building, which resulted in an odd combination of market reforms and state controls. The policy was supposed to attract more FDI but at the same time retained the 50 percent cap on foreign ownership of JVs. And because the first three JVs failed to transfer significant technology transfer to the Chinese SOEs, the new auto policy included higher requirements for localization of component production and greater technology transfer as a condition of foreign investment.

The new policy also echoed the broader economic policy slogan that emerged in the early 1990s of “grasping the large, letting go of the small”. The policy emphasized that the auto industry should have two to three large and powerful auto enterprise groups and six to seven “backbone” auto enterprise groups. At the same time, the large enterprises groups and the backbone enterprise groups should consolidate, such that by 2010 there would be three to four globally competitive large auto enterprise groups”.⁵⁴ Rather than letting the market decide which enterprise groups would survive, the policy clearly preferred to see consolidation into the largest existing SOEs. Not surprisingly, these were the groups with the greatest lobbying power in Beijing.

Several aspects of the new policy were designed to specifically protect and promote the development of China’s traditional SOEs. For example, import quotas and stiff tariffs (80-100 percent) were placed on both vehicles and parts to stifle international competition. Joint ventures were issued new localization requirements of at least 40 percent, with incentives to go beyond compliance. Foreign firms that wanted to enter the Chinese market would be required to transfer even more technology to their Chinese partners and to establish joint technological development centers for training Chinese engineers and workers. Furthermore, the document specifically

⁵³ Many other scholars simply translate this policy as “1994 Automotive Policy”. I have translated the policy literally in order to emphasize the *gongye* – or production – aspect of the Chinese name of the policy. Later in the 2004 policy, the policy name drops *gongye* in favor of *fazhan* - or development. The difference in the name does signify the fundamental change in tone of the policy from one that focuses on state controls to one that begins to recognize the importance of the market mechanism.

⁵⁴ 1994 *Automotive Industry Policy*, Section 1: “Policy objectives and product development focus”, Paragraph 2.

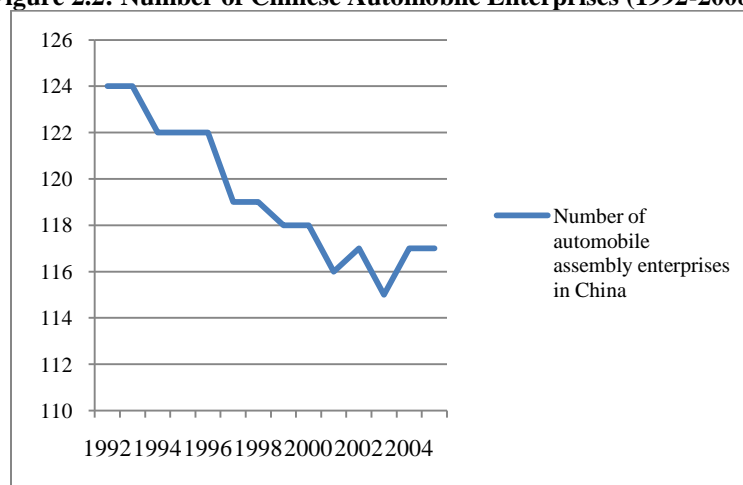
indicated that Chinese automakers should develop independent R&D capabilities, independent production, independent sales networks, and independent development.

The language and tone of the 1994 policy was reminiscent of the central plan. In the first section of the policy entitled “policy objectives and product development focus”, the document focuses on meeting specific production targets rather than meeting the needs of China’s new middle class consumers or reducing barriers to selling cars in the domestic market. The policy stated that the Chinese auto industry must meet more than 90 percent of domestic vehicle demand (50 percent of passenger car demand) and begin exporting vehicles in volume by the year 2000, as if the industry could easily do so via mandate only. The document also specified which technologies should be developed over which timeframes and in which sequence. The 1994 policy contained few if any initiatives which could be considered market-enhancing.

2.4.2. THE EFFECTS OF THE 1994 AUTOMOBILE PRODUCTION INDUSTRY POLICY

The 1994 policy failed to achieve many of the Center’s key objectives, including industry consolidation, large volume exports, and the transformation of traditional SOEs into globally competitive national champions. As Figure 2.2 below demonstrates, the number of enterprises has not dropped below one hundred. Out of thirty-one provinces, only five do not have their own auto assembly plant (Thun 2006:59). And while an annual production of 200,000 to 250,000 units of a given model is considered a minimum efficient scale in the global auto industry (Maxton and Wormald 2004:97), the average production volume in the Chinese auto industry across 119 plants was 14,165 units. As Thun and others have shown, Chinese auto plants were extremely inefficient.

Figure 2.2: Number of Chinese Automobile Enterprises (1992-2008)⁵⁵



Source: *Automobile Industry Yearbook 2006*

⁵⁵ These figures include those enterprises engaged in the production of completely assembled vehicles (heavy commercial vehicles, light commercial vehicles, and passenger cars). The figures do not include those enterprises engaged in retrofitting vehicles or the production of motorcycles, engines or automotive components.

Yet domestic auto production in the aggregate was slowly picking up and more foreign automakers were beginning to consider significant investments in China. But because of the 1994 auto policy's higher tariffs and stricter localization requirements, most of the foreign automakers waited until after China formally became a member of the WTO to finalize their joint ventures.

General Motors (GM) was an exception. Perhaps anticipating that WTO membership would bring more foreign investment and hence competition, GM stepped up to make a record deal with the Chinese government well ahead of China's 2001 accession. GM put in USD 1.3 billion of capital, which in 1997 was considered the single largest foreign investment ever in China. To the surprise of many outside observers, GM agreed to bring sophisticated technology to China and to invest in a joint R&D center with SAIC, known as the Pan-Asia Technical Automotive Center. The commitment to joint R&D was unprecedented in the Chinese auto industry. Honda was the only other foreign automaker to invest in China prior to WTO accession. According to government statistics, total investment commitments into the motor vehicle and related industries, including components, totaled nearly USD 60 billion during the 1990s (Gallagher 2006:40).

Despite these new investments, the integration of new technologies into domestically produced models was slow. The SVW Santana sedan, little changed since its market debut in the early 1980s, continued to be the best selling car well into the 2000s. The 1994 policy's protectionist measures – such as import quotas and high tariffs – did not produce the desired result of a more sophisticated domestic industry. Moreover, retail car prices remained high while quality and reliability remained low. The one bright spot was that the strict localization requirements gave foreign automakers no choice but to participate in the upgrading of the local supply chain. The limitations of the 1994 policy, combined with China's preparation for WTO membership, would result in an updated auto policy that lessened state controls on FDI.

2.5. PHASE IV (2001-PRESENT): CHINA CAUTIOUSLY EMBRACES THE MARKET

If the voices of conservatives prevailed during the third phase of development, those of the reformers triumphed in the fourth phase. The fourth phase of auto sector development is marked by three key events which further opened China to the global economy, thus creating new linkages between the domestic economy and international capital markets and global production networks. As Chapter Three will show, China's economic opening would have important consequences for the emergence of China's independent automakers.

The first and most important event was China's accession to the WTO in 2001. Chinese leaders had to accept and conform to WTO rules, including the dismantling of many barriers to trade and investment. China was compelled to open many previously protected domestic industries to more FDI. In the auto sector, the government was pressured to eliminate the 50 percent ownership limitation on JVs in the auto sector. Though the government refused to eliminate the 50 percent limitation in auto assembly, it did eliminate the 50 percent limitation in auto components. The loosening of FDI restrictions brought billions of dollars of investment into component manufacturing, thus expanding and deepening the domestic supply chains. Joining

the WTO also forced the Chinese government to relax some of the more stringent aspects of the 1994 auto policy, which brought in more FDI into auto assembly. As Table 2.2 below demonstrates, automotive joint ventures surged after China's 2001 accession to the WTO. The next chapter will explain in greater detail how China's independent automakers benefitted from China's increasingly sophisticated domestic supply chain.

Table 2.2 List of Major Automotive Assembly Joint Ventures in China (1997-2005)

Year of JV deal	Foreign partner	Traditional SOE partner	Name of JV
	(% equity ownership)	(% equity ownership)	
1997	GM (50%)	SAIC (50%)	Shanghai GM (SGM)
1998	Honda (50%)	GAIG (50%)	Guangzhou Honda
2001	Ford (50%), Mazda (15%)	Chang'An (35%)	Chang-An Ford
2002	Hyundai (50%)	BAIC (50%)	Beijing Hyundai
2002	Kia (50%)	Dongfeng Motors (25%)	Dongfeng Yueda Kia
2003	Honda (50%)	Dongfeng Motors (50%)	Dongfeng Honda
2003	Nissan (50%)	Dongfeng Motors (50%)	Dongfeng Nissan
2003	BMW (50%)	Brilliance (50%)	BMW Brilliance
2003	Toyota (50%)	FAW (50%)	Tianjin FAW Toyota
2004	Toyota (50%)	GAIG (50%)	Guangqi Toyota
2005	Daimler AG (50%)	BAIC (50%)	Beijing Benz

Source: *Automotive News* (2009)

The second crucial event was the smooth leadership succession from Zhu Rongji to Wen Jiabao in 2002. Zhu had been carefully grooming Wen, who served under Zhu as Vice Premier from 1998-2002. Wen created a reputation for himself as a quick study of complex economic issues and an unwavering proponent of state enterprise reform and global economic integration (Nathan and Gilley 2003:101). Having another reform-minded Premier at the helm of economic policy-making would prove crucial in the formulation of a more market-enhancing auto policy.

The third event was the 2003 reshuffling and streamlining of the institutions responsible for managing the economy. For one, the State-Owned Assets Supervision and Administration Commission (SASAC) was created to manage state-owned enterprises. The mandate of SASAC combined powers previously dispersed among different ministries and agencies, permitting SASAC to operate as a kind of super ministry in charge of managing the 196 largest and most important traditional SOEs, including FAW and Dongfeng. The core responsibilities of SASAC

are to monitor SOE operations, dispatch supervisors to audit SOEs, appoint SOE managers, approve major decisions in enterprise operation, and report on SOE performance to the appropriate level of government. Notably, SASAC is *not* to infringe on the operational autonomy of the SOE or combine social policy with enterprise management. Yet the formation of SASAC did not completely eliminate political intervention in the affairs of SOEs. The CCP's Organization Department, for example, retains the power to appoint the top executives at SOEs. As I discuss in the following sections, continued political control over SOE operations – especially the appointment of firm managers and executives – has important implications for the professionalization of management at state-owned firms.

The other key institutional change was the creation of the National Development and Reform Commission (NDRC) in 2003. The new NDRC combined the SDPC (the previous planning body), the State Council Office for Restructuring the Economic System, and the industry section of the SETC, thus bringing under one umbrella all of the disparate government bodies involved in industrial policymaking. The Chinese word for 'planning' (*jihua*) disappeared from the Commission's title and the word for 'reform' (*gaige*) was added, signifying the NDRC's mandate to reform rather than to plan the Chinese economy. Officially, the authority of the NDRC was changed from that of the 'Center' (*zhongyang renmin zhengfu*) to that of the nation of the PRC (*zhonghua renmin gongheguo*). Again this was a symbolic change to further separate the NDRC from the legacy of the central plan.

Thus the NDRC emerged as a very different organization than the SPDC that preceded it. Not only was the NDRC formed under the auspice of reform rather than planning, but it received sole authority for the industrial policy and industrial restructuring. This bureaucratic reorganization would have important implications for the tone and focus of the new auto policy which was initially circulated in draft form in 2003 and formally introduced in 2004.

2.5.1. THE 2004 AUTOMOBILE INDUSTRY DEVELOPMENT POLICY: BUREAUCRATIC REORGANIZATION AND A RE-ORIENTATION TOWARD MARKET-BASED POLICIES

In 2004, China announced an updated automotive policy (*qiche changye fazhan zhengce*). Whereas the 1994 policy was announced by the State Council, the 2004 policy was put forth by the NDRC with approval from the State Council. Not only did the commission's title figure prominently on the first page of the document, but so did the signature of the new NDRC Chairman, Ma Kai. The NDRC's ownership of the contents of the 2004 policy and Ma's attachment of personal responsibility for the policy are a noticeable departure from the more ambiguous authorship of the 1994 policy. Together they signified greater responsibility and accountability on the part of the NDRC for both the contents of the policy and its implementation. As this section intends to show, the 2004 policy reflects China's WTO commitments and a step away from a state-directed industry toward a more market-driven one.

Subtle changes in the naming of the 2004 policy also indicated a new orientation of industrial policy. The name of the policy omitted the Chinese word for 'industry' (*gongye*), which is associated with the type of industrial production under the central plan, and added the Chinese word for 'development' (*fazhan*) was added to emphasize the need to develop many

aspects of the auto industry and to de-emphasize specific production targets (common in the 1994 policy).⁵⁶

Certain aspects of the 1994 policy were carried forward, such as the call for greater industrial consolidation and a continuation of the 50 percent limitation on foreign ownership in auto assembly JVs. Yet there was also a marked difference in the language of the 2004 policy that resulted from China's accession to WTO. The document at several points emphasizes the importance of the market. In the section entitled "Policy Objectives", the document reads: "Permit market competition to shape the country's large, globally competitive automotive enterprise groups."⁵⁷ Implicit in this statement is the notion that the market rather than the government should decide the industry's winners and losers. This language, which can be found throughout the 2004 policy, is distinctly different from that used in the 1994 policy.

The 2004 auto policy also encouraged greater R&D activities through preferential tax policies rather than explicitly requiring foreign firms to open R&D facilities in China. The Center's desire for China's technological self-reliance, however, sits somewhat uneasily with its desire to allow market forces to stimulate competition and efficiency, for there was some uncertainty as to whether more foreign competition would benefit or hurt the prospects of traditional SOEs. As before, there continued to be tension between those within the leadership that want to prop up the state-owned sector and those that believe the market should decide the industry's winners and losers.⁵⁸

2.5.2. *THE EFFECTS OF THE 2004 AUTOMOBILE INDUSTRY DEVELOPMENT POLICY*

Arguably, the significance of the 2004 policy may have been more symbolic than tangible. As Table 2.2 showed, most of the new joint ventures were finalized after WTO accession and before the announcement of the 2004 policy. Nonetheless, the language of the 2004 policy signaled to foreign investors that the government was going to stand by its commitment to further open the domestic auto industry. The wording and orientation of the 2004 policy suggests that the Center is no longer singularly focused on increasing production through quotas and is instead beginning to see the need to develop the industry through the liberalization of trade and investment. Phil Murtaugh, the ex-CEO of SGM puts it this way: "In 1994, the government made all the operating decisions inside the auto SOEs and all the policies. In the late 1990s, they were trying to get out of the daily operation side of it and focus on policy. By 2004, they were focused on policy."⁵⁹

However, there remains considerable debate within the leadership as to the appropriate level of state intervention in the auto industry. In February 2009, for example, the Chinese government announced a restructuring plan which once again aimed to consolidate the industry into the "Big Four, Small Four" (*dasi xiaosi*). The "big four" are designated as SAIC, FAW, Dongfeng and Chang'An; the "four small" are BAIC, GAIC, Chery and Sinotruk. This plan

⁵⁶ I owe this revelation about the wording of the 1994 and 2004 policies to Professor Li Xianjun of Tsinghua University's Department of Automotive Engineering.

⁵⁷ In Chinese, "*tongguo shichang jingzhengli xincheng jijia guojingzhenglidaxing qiche qiye jituan.*"

⁵⁸ The telecommunications sector and the Chinese government's TD-SCDMA project present another clear example of the tension between protection of Chinese interests and unfettered market competition. See Ho (29 Feb 2008).

⁵⁹ Interview 67 with Phil Murtaugh, ex-CEO of SGM, 27 February 2009.

recalls earlier slogans such as “Big Three, Little Three” or the “Big Three, Little Three, and Two Tiny”. These types of campaigns which emphasize the desire to see state-owned automakers lead the industry indicate that conservative voices within the leadership, as well as those with entrenched interests in the survival of particular SOEs, remain strong.

According to Chen Jianguo, deputy director of the NDRC’s Department of Industry⁶⁰, the announcement of “Big Four, Little Four” is intended only as guidance. In his comments at the September 2010 Global Automotive Forum, Chen indicated that the plan was only meant to express a concept and that, in matters of mergers and acquisitions, the government can only offer a direction (*fangxiang*).⁶¹ However, Chen Jianguo’s superior at the NDRC’s Department of Industry, Chen Bin, appears to have a slightly different and more state-centric perspective. At a press conference in October 2009, Chen Bin said, “In this crucial period of economic stabilization and recovery, the promotion of structural adjustment is essential. There has been a consensus... those of us in charge of formulating policy should not only adhere to the principle and adoption of the market mechanism, but we should also take necessary control measures. It is necessary to strictly control the excess capacity and put forward the countermeasures and a policy to guide the healthy development of industry.”⁶² As comments by the two Chens demonstrate, Chinese policymakers continue to struggle over the appropriate balance of state controls and market forces.

2.5.3. 2009 AUTOMOTIVE INDUSTRY READJUSTMENT AND REVITALIZATION PLAN: EXPERIMENTING WITH DEMAND SIDE STIMULUS POLICIES

Due to the severity of the 2008 global economic recession, it was not surprising that the Chinese government responded quickly to maintain growth in China. What was surprising, however, was the size of the Chinese economic stimulus package and some of the measures included did surprise outside observers. As part of China’s 2009 RMB 4 trillion (USD 586 billion)⁶³ economic stimulus package, the NDRC issued the Automotive Industry Readjustment and Revitalization Plan. Though the 2009 plan echoed familiar calls for greater industrial consolidation and indigenous innovation, it also contained unprecedented provisions that were designed to stimulate car consumption. The 2009 plan marked the first time the Chinese government used demand side incentives.

For example, the 2009 plan included rural subsidies for farmers who traded in old and dilapidated vehicles for new and less polluting models. Specifically, farmers could receive a 10 percent discount with a maximum subsidy of RMB 5K (USD 733) if they bought light trucks and minivans, with the limitation that each rural household buy only one new vehicle. On the whole,

⁶⁰ According to the NDRC website, the Department of Industry “is responsible for analyzing major issues concerning the development of industry and service industry, drafting comprehensive industrial policies, studying and proposing comprehensive policy recommendations; coordinating and harmonizing the industry and service industry development plans with national economic and social development plans and programs; coordinating the dissemination and use of major technical equipments as well as building of major industrial bases; drafting the development strategies and key policies of service industry in cooperation with relevant agencies, coordinating key issues of service industry development.”
http://en.ndrc.gov.cn/mfod/t20081218_252195.htm . Accessed on 16 November 2010.

⁶¹ Sohu.com auto-related news website. <http://auto.sohu.com/20100916/n274974455.shtml> . Accessed on 15 November 2010.

⁶² *Sina.com News*. <http://finance.sina.com.cn/g/20091015/11136842766.shtml> . Accessed on 15 November 2010.

⁶³ The RMB to USD conversion is based on the exchange rate in December 2009 of RMB 6.82 to USD 1.0.

these measures were very successful in increasing vehicle demand, thereby helping to maintain China's economic growth amidst the global recession. According to the Ministry of Finance, by the end of December 2009, the Chinese government had subsidized the purchase of 5.83 million cars for a total of RMB 8.68 billion (USD 1.27 billion).⁶⁴

The 2009 plan also reduced the vehicle purchase tax from 10 percent to 5 percent on passenger cars with an engine displacement of 1.6 liters or less.⁶⁵ Notably, both the rural subsidy and the tax break disproportionately benefited independent automakers over JVs. Cars sold by independent automakers were both smaller and less expensive, such that the small subsidy and tax break would together make a significant dent in the purchase price. The 2009 stimulus measures not only increased the mini-car market as a whole by 36 percent, but increased the market share of four independent automaker models to 55 percent within a month of announcing the tax breaks and subsidies (Automotive Resources Asia 2009). These four models were the Chery QQ, BYD F0, Geely Panda and Great Wall Peri.

Chinese policymakers were likely aware that the 2009 plan would disproportionately benefit independent automakers, and thus the plan may represent a shift in the Center's attitude toward these previously ignored firms. This view is somewhat supported by the government's 2010 announcement of a pilot program to subsidize the sale of plug-in hybrids and electric vehicles. The program, which offers a maximum subsidy of RMB 50,000 (~US 7,000) for plug-in hybrids and RMB 60,000 (~USD 8,000) for electric cars, is widely believed to be targeted at two traditional SOEs (SAIC and FAW) and three independent automakers (Geely, BYD, and Chery). Though Beijing did not explicitly say why it chose Shanghai, Changchun, Hangzhou, Shenzhen and Hefei as the first pilot cities for the subsidy program, industry experts suggest that it may be because these cities are the headquarters of the five aforementioned firms (Yang 2010). Put differently, it appears that the Center may no longer only favor traditional state-owned firms. At least some Chinese leaders are embracing the possibility that independent automakers rather than traditional SOEs are better positioned to lead the Chinese auto industry.

2.6. THE FAILURE TO TRANSFORM TRADITIONAL SOES INTO GLOBALLY COMPETITIVE FIRMS

As the following sections show, the state-owned sector is still hampered by poor management and the peculiarities of the joint venture business model. At this stage, it would appear that the Center's original developmental objective of transforming traditional SOEs into national automotive champions has largely failed. Whether these firms can overcome these structural challenges and become globally competitive automakers remains to be seen.

2.6.1. THE STAGNATION OF SOE REFORM

While there has been some effort to corporatize SOEs by diversifying their ownership, such as through stock listings on domestic and foreign stock exchanges, the Center continues to be the

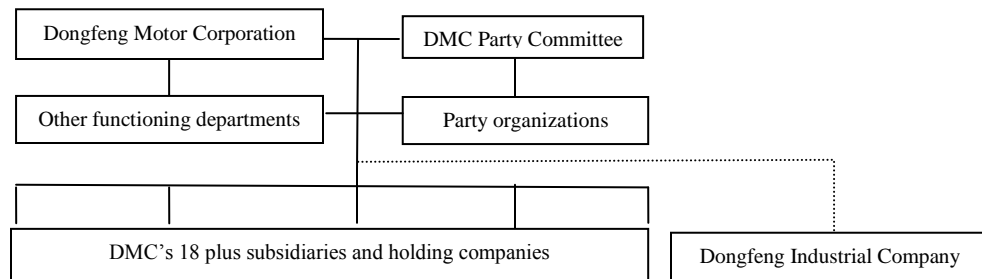
⁶⁴ This figure was quoted in Li (2010:18).

⁶⁵ The vehicle purchase tax was raised to 7.5 percent in 2010.

dominant and controlling shareholder.⁶⁶ As a result, many aspects of SOE operations and management continue to be opaque, even for those SOEs that have publicly listed subsidiaries. A German manager at FAW’s joint venture with VW put it this way, “the management inside the Chinese SOEs like FAW and SAIC depends on the individuals...if the person is appointed by the Party, then the performance is usually rather poor. However, if the person is young with a good education and work experience, the performance is usually better.”⁶⁷

While it may be possible to talk about the Party outside of the context of the state, it is not possible to talk about the state outside of the context of the Party.⁶⁸ The Party’s penetration into the day-to-day operations of SOEs is evidenced by the replication of Party organization within the firm’s organization. One industry consultant interviewed for this study says that most SOEs have “internal management structures that mirror those in the government.”⁶⁹ Each SOE has its own party committee and party secretary, whose power is usually greater than that of the firm’s chairman, except when both positions are shared by the same person. The party secretary is appointed by the Party’s all-powerful Organization Department. Figure 2.3 below illustrates this phenomenon in one of China’s largest traditional state-owned automakers, Dongfeng Motor Corporation.

Figure 2.3 Dongfeng Motor Corporation (DMC) Organizational Structure



Source: Company website⁷⁰

Another indicator of the CCP’s control over state-owned firms is the red telephone, which can be found on the desks of the heads of the fifty or so largest SOEs. Through an encrypted network, these so-called “red machines” connect only with similar phones throughout Beijing in offices of top ranking officials. According to Richard McGregor, the *Financial Times* reporter that has written about these phones, “For the chairmen and women of the top state companies, who have every modern communications device at their fingertips, the ‘red machine’ is a sign they have arrived, not just at the top of the company, but in the senior ranks of the Party

⁶⁶ Subsidiaries of all three of the central SOEs in the auto sector – FAW, Dongfeng and Chang’An – are all listed on domestic exchanges. FAW subsidiaries are listed in Shanghai and Shenzhen. Dongfeng subsidiaries are listed in Hong Kong and Shanghai. One of Chang’An’s subsidiaries is listed in Shenzhen.

⁶⁷ Interview 9 with German manager at FAW-VW, 20 June 2008.

⁶⁸ Nathan and Gilley (2003:8) write, “On paper just a Party organ, the Politburo Standing Committee in fact makes all important decisions on the economy, social policy, foreign affairs, defense, science and technology, education, and culture – national policy in every sphere of life. It can deal with any issues it wants. No other organ of the Party or government has the power to contract its decisions.”

⁶⁹ Interview 40 with American industry consultant based in Beijing, 11 September 2008.

⁷⁰ This chart was reproduced from the Dongfeng website. http://www.dfm.com.cn/info/organization_en.aspx . Accessed on 21 November 2010.

and the government. The phones are the ultimate status symbol, as they are only given out to people in jobs with the rank of vice-minister and above” (2010:8-9).

Because top SOE management positions are appointed by the Party, it is not hard to imagine why the allegiance of SOE managers to the Party might be greater than their allegiance to the SOE. Many SOE managers begin their careers in government and see SOE appointments as stepping stones in their political careers. As a result, their operating decisions may reflect their desire to advance not the interests of the SOE, but their own desire to ascend the ranks of the Party. As mentioned earlier, it is quite common for the chairman of the board to simultaneously hold the position of party secretary.

This type of ambition is exemplified by the career of Miao Wei.⁷¹ Miao was the deputy director of the Automotive Department of the Ministry of Machine Building in the mid-1990s. In 1997, he became party secretary at Dongfeng Motors. Two years later, Miao became Dongfeng’s general manager (equivalent to CEO), at the same time retaining the title of party secretary. In 2005, Miao was promoted to party secretary of Wuhan city. Three years after that, he was promoted once again to Deputy Minister of the Ministry of Industry and Information Technology (MIIT)⁷², an alternate member of the 17th Central Committee of the CPP, and a member of the Party Secretariat.⁷³ On December 25, 2010, Miao was promoted to Minister of MIIT, a very powerful agency which not only oversees many aspects of auto industry policy and regulation, such as the approval of new car models, but also oversees policy in a number of other industries.

Zhu Yanfeng’s career followed a similar path.⁷⁴ He began his career working at FAW in various positions in the Measuring Department and the Foreign Sales Department. He was promoted to deputy general manager in March 1997, then general manager and deputy party secretary of FAW in May of the same year. After his advancement within FAW, Zhu was promoted to vice governor of Jilin Province and a member of the 17th Central Committee of the CCP in 2007.⁷⁵ These are powerful and influential positions within the CCP hierarchy.

Finally, there is the case of Zhang Fangyou⁷⁶, the current chairman of the board and party secretary of GAIG. Zhang, a graduate of the CCP Central Party School, became deputy party secretary general of the Guangzhou municipal government and director of the city’s Automotive Industry Office in 1996. From 1997-1998, Zhang was promoted to chairman of the board and party secretary of GAIG. Today, he is also chairman of the board of GAIG’s two biggest joint ventures, Guangzhou Honda and Guangzhou Toyota. Zhang’s case demonstrates that the party secretary of the SOE can be influential in the operations of the SOE’s joint ventures.⁷⁷

⁷¹ In Chinese, 苗圩.

⁷² MIIT is the successor to the Ministry of Machine Building.

⁷³ Miao’s bio can be found at the Ministry of Industry and Information Technology website: <http://miaowei.miit.gov.cn/>. Accessed on 22 November 2010.

⁷⁴ In Chinese, 竺延风.

⁷⁵ Zhu’s bio can be found on the Jilin Province government website: <http://www.jl.gov.cn/zfjg/szfld/fsz/zyf/>. Accessed on 22 November 2010.

⁷⁶ In Chinese, 张房有.

⁷⁷ One more example is the career of Chen Xianglin. Chen spent the early part of his career in local government, where he served as a member of the Shanghai Planning Commission and deputy secretary general of the Shanghai municipal government. When

Not only do personal political ambitions interfere with SOE management, the Center also intervenes in the affairs of SOEs. On occasion, a large SOE is pressured to merge with a smaller and money-losing SOE, even though there may not be any synergies between the firms. In 2007, SAIC was forced to merge with faltering regional SOE, Nanjing Automotive Group. SAIC had to pay USD 285.6 million for the assets of Nanjing Auto, a company that in 2007 produced a mere 80K units that year, compared to SAIC's 1.25 million units. Sources familiar with the deal, including the former president of SAIC, have said that the merger was coerced from the Center which did not want to see Nanjing Auto go into bankruptcy. The former president of SAIC admitted that "SOEs suffer too much government intervention."⁷⁸

Not only is the specter of political intervention problematic for the future of SOEs, but so too is the JV business model. Though the JV model has served to modernize SOEs in many ways, it is today inhibiting SOEs from becoming globally competitive automakers capable of representing China in world automotive markets. This argument is elaborated upon below.

2.6.2. *THE JOINT VENTURE BUSINESS MODEL IS "RUNNING INTO A WALL"*

While the JVs have been profitable for traditional SOEs, there is ample evidence that these firms have learned very little about developing new products⁷⁹. Most foreign firms, perhaps with the exception of GM, have not been willing to share intellectual property with their Chinese partners. From the perspective of foreign firms, there is little incentive to share technology with their Chinese partners given the high potential for IP infringement and the very real possibility that their Chinese partners will become future competitors.⁸⁰ As a result, engineers at traditional SOEs are rarely brought into the product development process, which tends to remain in the home countries of the multinational automakers.

Few, if any, of the Chinese or foreign executives interviewed for this study expressed much optimism for the future of the JV model.⁸¹ One German industry consultant based in Beijing said, "[the] JV policy is not that successful for either side. There is very little tech transfer. High costs for the multinational partner and lots of headaches." In a similar vein, an ex-SVW executive from Germany succinctly summed up the past and present utility of the JV model: "JVs were the only way for China to start up its auto industry. JVs educated Chinese people and helped to build a basic supply chain. But today, JVs are running into a wall. Innovation is slow in a JV because there are two partners with often divergent interests. Multinational automakers have a continued interest in producing cars for the Chinese market, but definitely want to see an end to the 50-50 policy."⁸²

he was appointed to become chairman and party secretary of SAIC, he maintained one foot in local party apparatus by securing a seat in the Shanghai Party Standing Committee. Chen's bio can be found at: <http://money.finance.sina.com.cn>.

⁷⁸ Interview 72 with ex-SAIC executive, 11 March 2009.

⁷⁹ See for example, Gallagher (2006); Li (2009).

⁸⁰ It is rumored that SAIC leaked IP related to the design of the GM Daewoo Matiz (aka Chevrolet Spark) to Chery during the brief relationship between SAIC and Chery from 2001-2004. Chery was accused of using this leaked IP to produce its first successful minicar, the QQ, which looks almost identical to the Matiz. GM Daewoo tried to sue Chery in 2004 for US\$9.5 million, but to no avail. However, to appease its partner GM, SAIC decided to end its relationship with Chery.

⁸¹ The sole exception was SGM. SAIC and GM executives expressed that this relationship was beneficial to both sides. China is GM's most profitable market and the company sells more Buicks in China than it does in the U.S.

⁸² Interview 83 with ex-SVW executive, 13 April 2009.

A senior researcher from the Korean Institute for Industrial Economy and Trade said, “[the] JV model is not a good model. The JVs will eventually fail because neither side is completely satisfied in the relationship. There is a lot of mistrust.”⁸³ An interviewee, a Chinese engineering manager at SAIC, exemplifies this mistrust. The manager complained that, “Chinese firms got too little out of the JVs. A little management training and production knowledge, but working in these JVs feels like ‘coolie labor’ (苦工).”⁸⁴ As Guo and Zhang (2008) have argued, the technology transfer from the multinational automakers has not brought substantive improvement to the Chinese passenger vehicle industry, but rather has caused a tendency toward even more dependency on foreign technology.

2.6.3. INABILITY OF TRADITIONAL SOES TO DEVELOP INDIGENOUS BRANDS

Without the necessary technological design know-how, developing new platforms and models is both expensive and risky. Foreign automakers built their corporate culture and supply chain relationships upon decades and decades of design and engineering experience, leveraging their marketing and branding expertise across all continents. In contrast, traditional SOEs have relatively weak internal R&D capability and know little about marketing. These overly bureaucratic firms have spent most of their existence building commercial trucks according to the central plan. To further complicate matters, SOEs continue to have bloated organizations, a legacy of the Mao era when SOEs were tasked with employing as many workers as possible. See Table 2.3 below for a comparison of the number of vehicles produced per employee at several Chinese and foreign automakers. This figure is one rough measure of firm efficiency.

Table 2.3 Comparison of Vehicles Produced per Employee for Select Chinese and Foreign Automakers⁸⁵

Automaker	Number of employees worldwide in 2009	Numbers of vehicles produced in 2009	Vehicles produced per employee in 2009
General Motors	266,000	6,459,053	24.3
Ford Motors	198,000	4,685,394	23.7
Toyota	320,808	7,234,439	22.6
SAIC	140,000	2,720,000	19.4
Volkswagen	370,000	6,067,208	16.4
Dongfeng	121,000	1,900,000	15.7
FAW	130,000	1,945,000	15.0

Source: Company websites

⁸³ Interview 82 with auto industry consultant, 13 April 2009.

⁸⁴ Interview 37 with a deputy managing director of Component Development at SAIC, 9 September 2008.

⁸⁵ It should be noted that the production figures for American automakers were historically-speaking quite low in 2009 due to the global recession. Their ratios of vehicles produced per employee were much higher in previous years, even taking into account layoffs.

Not only are traditional SOEs less efficient than their foreign counterparts, they are not adequately incentivized to develop their own brands. Producing cars for their JV operations are quite lucrative and overall much less risky than investing hundreds of millions of dollars to develop and produce their own line of cars. A GM engineer stationed at one of SGM's Shanghai factories put it this way, "Even though SAIC is big, it doesn't really seem to have the ambition to develop its own cars from beginning to end. It is in a pretty cozy position with GM and VW and making plenty of money without having to bear the brunt of the risk. Why try harder? The Chinese government might be pressing SAIC to build their own cars but SAIC might not be hungry enough."⁸⁶

Indeed, SAIC's efforts to establish their own brand of cars have, to date, not been as successful as local officials would have liked. Sales of SAIC's Roewe branded sedans – based on technology purchased from British Rover – have been modest (26K units in 2008), while sales of the company's MG brand – part of its merger with Nanjing Auto – were a mere 9K units.⁸⁷ Furthermore, SAIC failed to yield any marketable products from its large investment into Korea's Ssangyong Motors.⁸⁸ Notably, all of the current passenger car models within the SAIC portfolio were purchased from abroad; none were developed internally. Even so, SAIC's efforts to establish their own brands have been much more aggressive than other traditional SOEs.

FAW is far less ambitious than SAIC with respect to developing its own brands. FAW's best selling sedan, the Bestern, is built with a Mazda designed engine, transmission and chassis, and outfitted with a slightly modified body based on the original Mazda 6. In fact, the Bestern rolls off the same assembly line as the Mazda 6, which is produced by a joint venture between FAW and Mazda. Both cars share most of the same components under different brand names. Under its Xiali brand, FAW produces a line of small cars entirely based on old Toyota and Daihatsu technology. This type of imitation business model is likely not what the Chinese government had in mind when it called for "self-reliant product development." In addition, FAW may be too distracted by its many JVs. In the passenger car segment alone, FAW has partnerships with no less than five foreign firms – Volkswagen, Audi, Toyota, Mazda and Toyota.

An ex-Volkswagen executive interviewed for this study sums the prospects of state-owned automakers nicely: "SOEs have some potential to build their own brands, but many obstacles stand in the way. Companies are run by government bureaucrats. They are more concerned about the profitability of their JVs [their low-risk cash cow]. SOEs are too risk averse to run an entrepreneurial unit. SOEs don't really try that hard to build their own cars... For small independent automakers, survival is a necessity and drives them to succeed in building and selling their own branded cars."⁸⁹

⁸⁶ Interview 3 with GM engineer stationed at SGM's Shanghai factory, 26 December 2007.

⁸⁷ *China Automotive Monthly*, Automotive Resources Asia, December 2008.

⁸⁸ SAIC lost management control of SsangYong Motors in 2010 as the Korean company went into bankruptcy. The debacle has been very embarrassing for the SAIC management.

⁸⁹ Interview 83 with ex-VW executive, 13 April 2009.

2.7. CONCLUSION

At first glance, it would appear that Chinese government's industrial strategy has been a resounding success. China has become the world's largest market for autos and second largest automobile producer. The industry has created hundreds of thousands of jobs in upstream and downstream industries, contributed to the country's phenomenal economic growth rate, and established a lucrative source of new tax revenues. The automotive industry as a whole contributed about 7 percent of GDP in 2007, up from 2.5 percent in 1990.⁹⁰

Yet when specific initiatives are examined separately, it is clear that many policies did not meet the government's objectives. Not only has industrial consolidation been thwarted on many occasions because of entrenched interests within the state, but little technology was transferred between multinational automakers and their Chinese JV partners. As a result, Chinese "Big 3" – FAW, SAIC and Dongfeng – have not become national champions on par with Japan's Toyota or Korea's Hyundai. Because traditional SOEs continue to rely on their foreign partners for product development and marketing, they have not harnessed the ability to develop their own cutting edge platforms from concept to mass production. Efforts by the Chinese Big 3 to produce their own line of cars have not been well-received by Chinese consumers, and none have successfully penetrated foreign markets. They remain narrowly focused on the Chinese market and most of their attention is focused on their less-risky and more lucrative JV operations. At the same time, their cost structures are relatively high and their management structures bureaucratic, which makes it difficult for them to compete with independent automakers in the low-end.

This chapter has also demonstrated that there continues to be debate within the upper echelons of the Chinese leadership over how much the government should intervene in the development of the domestic auto sector. While some leaders advocate for the continued protection and promotion of the state-owned firms, despite their poor performance, others advocate for allowing the market to pick winners. The 2009 stimulus package suggests that there may also now be some within the leadership that believe government should support the up and coming independent automakers whose indigenous brands have a better chance of penetrating global markets. However, because there conservatives in the top leadership that promote exclusive support of state-owned automakers, the possibility remains that auto policy could swing back toward more protectionism.

The shortcomings of Chinese auto policies and traditional SOEs left the market open to more nimble and aggressive independent automakers that are neither burdened by bloated bureaucratic organizations nor saddled with JV business models. Yet the failed transformation of traditional SOEs alone is not enough to explain the success of independent firms, for that part of the story says little about how nascent domestic automakers overcame key financial and technological hurdles to take advantage of that market opening. The following chapter looks at this next part of the story, which includes China's accession to the WTO and the new linkages it created between domestic firms and global capital markets and production networks.

⁹⁰ *China Automotive Industry Yearbook* (1991, 2008). National Bureau of Statistics of China (www.stats.gov.cn).

CHAPTER 3

LOWERING THE BARRIERS TO ENTRY: ACCESSION TO THE WTO AND THE FRAGMENTATION OF AUTOMOTIVE PRODUCTION NETWORKS

Skeptics about China's entry into the World Trade Organization emphasize the high potential costs of adjusting to a more open trading system. They point to the adjustment costs that under the best of circumstances could lead to worker unrest even more widespread than that of the late 1990s and, under less favorable circumstances, could lead to the collapse of the regime. The adverse effects of WTO entry on output and employment are forecast to be particularly adverse in the motor vehicle industry, agriculture, and financial services, especially banking...Perhaps the most frequently cited example of a highly protected sector in which imports are forecast to grow significantly is motor vehicles.

Nicholas Lardy, *Integrating China into the Global Economy*, 2002⁹¹

In the years leading up to China's WTO accession, there was fierce debate within the Chinese leadership and among China scholars over whether greater market reforms would destroy the Chinese state-owned sector or make it more competitive. Would allowing more foreign competition into the domestic economy put Chinese state-owned automakers out of business and lead to the loss of tens of thousands of jobs? This was a real concern of the more conservative leaders within the Party. Given the amount of disagreement and uncertainty about the benefits of WTO membership, it is rather remarkable that the Chinese government agreed to the concessions that were necessary to join the trade organization. Even more remarkable is the fact instead of giving away the Chinese market to foreign automakers, the reforms leading up to China's WTO accession actually created a domestic auto industry that was stronger than ever. The purpose of this chapter is to explain why the most competitive domestic automakers to emerge out of Chinese WTO-related reforms were not traditional SOEs, but rather a crop of new automakers with no ties to the Center.

Chapter One argued that the emergence of China's independent automakers was the unlikely outcome of three sets of policies interacting with a shifting business environment, namely the tremendous market opportunity in China and the fragmentation of the global automotive supply chain. Chapter Two laid out the evolution of industrial policy, the first of the three sets of policies. The Center's primary policy tool, foreign direct investment, succeeded in attracting foreign investment and establishing a domestic passenger auto industry by creating joint venture partnerships between backwards state-owned automakers and leading global automakers. This JV model, however, failed to transform traditional SOEs into national automotive champions, thus leaving the door open to nascent domestic competitors.

⁹¹ Lardy (2002:107).

This chapter focuses on the second set of policies implemented at the national level that created new business opportunities for China's independent automakers. The gradual opening of the Chinese economy to the outside, which culminated in the country's accession to the WTO, allowed the formation of new linkages between domestic firms and the global economy. By dismantling China's trade and investment regime, the Chinese leadership unknowingly lowered financial and technological barriers to entry for new automotive competitors.

But WTO accession is only part of the story. At the same time China was opening up to the world economy, key changes were taking place in the global auto industry that would down the line enable a low-cost product development model for Chinese automakers. Not only were car markets in the industrialized countries stagnating, thus driving global automakers to invest in new growth markets like China, but the industry's vertically-integrated production model was morphing into a more open and increasingly modularized production model. As this chapter will show, the trend toward greater modularity in the global auto industry, which increased the relative power of component suppliers vis-à-vis auto assemblers, would have far reaching consequences for the business models of boot-strapped Chinese automakers.

The rest of this chapter is organized as follows. First, I explain how China's accession to the WTO lowered key trade and investment barriers, thus opening the door to new business opportunities for independent automakers. Second, I analyze how a shifting business environment, particularly the lure of China's rapidly growing economy and the decomposition of global automotive production networks, shaped the ability of independent automakers to leverage China's increased economic openness and acquire new technologies. Finally, I explain how trade liberalization and shifts in the global auto industry together enabled a new low-cost automotive business model in China.

3.1. CHINA'S ACCESSION TO THE WTO AND CONSEQUENCES FOR THE DOMESTIC AUTO INDUSTRY

Accession to the WTO solidified China's transition from a centrally planned economy toward a more market-based economy. The purpose of this section is two-fold. The first is to show that the decision to join the WTO was an incredibly risky move by Chinese reformers because of the internal political battles that would be fought, and because the consequences of market liberalization were completely unknown. Many Chinese leaders were very concerned about how market reforms would affect the state-owned sector. That trade liberalization would open new opportunities for private firms, such as those in the auto industry, was completely unexpected. The second purpose of this section is to explain how key reforms would permit new linkages between China's independent automakers and foreign technology and capital markets.

3.1.1. BACKGROUND TO CHINA'S WTO MEMBERSHIP

China initiated the process of becoming a member of the General Agreement on Tariffs and Trade (GATT), the predecessor to the WTO, in the mid-1980s. It took 15 long years of negotiation for China to fully embrace the principles of the multilateral trading system and

become a member of the WTO in 2001. Chinese leaders had to accept and conform to many of the WTO's rules, which resulted in fundamental changes to China's economy. Compared with the GATT, WTO membership required liberalization on a much broader range of domestic economic activity, including areas traditionally regarded by most developing countries as very sensitive (e.g., intellectual property protection, deregulation of telecommunications and financial service industries, and reduction of tariffs and quotas).⁹²

Many within the CCP feared that accession to the WTO would be followed by severe competition from foreign firms, resulting in extensive job losses at struggling SOEs, and perhaps even lead to the collapse of the regime.⁹³ The auto industry was one of the sectors predicted to be the hardest hit. For example, the State Council's Development Research Center⁹⁴ estimated that as a result of China's entry into the WTO, there would be a 15 percent reduction in auto industry output, a 14.5 percent reduction in employment, a 105 percent increase in imports, and a 7.8 percent reduction in exports.⁹⁵ Skeptics of the WTO also believed that many of the domestic firms without foreign affiliations would fail to compete, which would cause significant unemployment and labor market dislocations across the country.

On the eve of China's accession to the WTO, the industry most frequently mentioned as vulnerable was motor vehicles, which the State Council warned that employment in the auto industry could fall by 480,000 (Burt and Jacob 2000). Why? In order to satisfy the requirements of WTO membership, China had to commit to reduce tariffs on all automobile imports to 25 percent and those on auto parts to an average of 10 percent by 2006, with proportionately larger cuts in earlier years (Lardy 2002:106-107). These market opening policies were expected to place enormous pressure on China's backward state-owned automakers.

Given these concerns about potential social instability, why were Chinese political leaders willing to impose reforms? First and foremost, despite deep divisions within the top leadership over the details of economic reform, there was near unanimity that economic growth was absolutely necessary for retaining political power, especially in the wake of the fall of the Berlin Wall (1989) and the dissolution of the Soviet Union (1991). Second, it was clear that something had to be done to stem the severe losses in the state-owned sector. In 1985, losses at SOEs amounted to RMB 2.7 billion (US\$329 million). By 1995, losses had risen to RMB 40.9 billion (US\$4.9 billion).⁹⁶ Greater foreign competition was considered by some reformists as a crucial part of the solution to improve efficiency at ailing SOEs.

Third, reform-minded leaders led by Premier Zhu Rongji and Foreign Trade Minister Wu Yi, steadily gained influence and power over the 1990s. Zhu was promoted to Vice Premier and governor of the central bank in 1993 and then elevated to Premier in 1998, effectively becoming second in command to President Jiang Zemin. Reformers under the pivotal leadership

⁹² For details, see Lardy (2002).

⁹³ For more on the internal WTO battle between conservatives and reformers, see Lardy (2002), Hui (2006), and Noble et al (2005).

⁹⁴ The State Council is the chief administrative authority (i.e., Cabinet) of China. It is chaired by the Premier and includes the heads of each government department and agency.

⁹⁵ Li and Wang (1998), quoted in Gallagher (2006:26).

⁹⁶ Steinfeld (1998:18).

of Zhu and Wu were able to generate enough support within the CCP to push through the tough economic reforms required to gain entry to the WTO. Joining the WTO, reformers argued, would be a concrete signal to foreign governments and corporations that the Chinese leadership was committed to an outward looking economic strategy and would welcome foreign investment on increasingly favorable terms (Noble et al: 2005:9). At a 1999 conference with President Clinton in Washington Premier Zhu stated, “The competition arising from WTO membership will also promote a more rapid and healthier development of China’s national economy.”⁹⁷

Finally, consensus within the Chinese leadership was further cemented by the Asian Financial Crisis of 1997-1998 which shook the region. Nicholas Lardy argues that China’s top leadership in the wake of the Asian crisis saw that there was no viable alternative to the globalization of production and that, indeed, China through WTO membership would benefit from greater participation in the trend (2002:20). Lardy refers to speeches made by Long Yongtu, vice minister of trade and China’s chief global trade negotiator, in which he talked extensively about the increasing fragmentation of production that was occurring on a global scale. Given declining international transaction costs, it was becoming more cost effective to locate different stages of the production process in different countries, depending on the availability of labor and capital. In Long’s words, “China’s economy must become a market economy in order to become part of the global economic system, as well as the economic globalization process.”⁹⁸ This view ultimately won over the skeptics within the Party.

The following sections introduce several key reforms that were carried out in preparation for entry to the WTO, and present specific examples of how China’s ambitious nascent automakers piggybacked on these reforms.

3.1.2. DISMANTLING THE RIGID TRADE REGIME AND FOREIGN EXCHANGE SYSTEM

Under the central plan, the State Planning Commission (SPC) tightly controlled all imports into and exports out of China. The SPC did not consider exports as directly contributing to economic growth but rather as a mechanism for financing exports. Prior to 1978, a handful of foreign trade corporations owned and controlled by the Ministry of Foreign Trade were responsible for implementing the SPC’s trade plan at officially designated quantities and prices. This restrictive system resulted in a low overall volume of trade.

In 1985, as China began to consider WTO membership, the National People’s began to implement the first changes to the tariff schedule. Statutory tariff rates, which were among the highest of all developing countries in the 1980s, fell to almost certainly the lowest of any developing country (Lardy 2002:45). More specifically, China reduced the average tariff from 43 percent down to 15 percent by 2001.⁹⁹ Many capital goods brought into China by joint venture

⁹⁷ The White House, Office of the Press Secretary, “Joint Press Conference of the President and Premier Zhu Rongji of the People’s Republic of China,” April 8, 1999. Quoted in Lardy (2002:20).

⁹⁸ *People’s Daily*, 2000. “PRC Trade Official Long Yongtu on China, Economic Globalization, WTO Entry.” 10 July. Quoted in Lardy (2002:21).

⁹⁹ See Lardy (2002:34-35) for a detailed history of tariff cuts from 1982-2001.

and wholly foreign-owned companies were eventually exempted from import duties, though the passage of the 1994 Auto Policy reversed some of these exemptions in the auto sector.

The government also began to loosen nontariff barriers such as import licenses and quotas. In 1985, the Ministry of Foreign Trade approved the creation of more than 800 separate corporations authorized to engage in foreign trade. In 1997, China allowed the first Sino-foreign joint venture trading companies to be formed. The following year, the State Council permitted the creation of the first private trading companies. In 1999, the State Council announced that it would lower the size threshold for private firms to be eligible to apply for trading rights, which began to level the playing field between state-owned and privately-held firms.

Over the nearly two decades leading up to China's accession to the WTO, China's trading system had been transformed from one that was heavily centralized to one that was increasingly decentralized and open to the participation of private firms. The loosening of trade restrictions made it easier for domestic firms, including automakers, to import materials, components and specialty machinery that could not be made in China. Such items included high quality steel from Japan, sophisticated electronic control systems, metal stamping machines, welding equipment, test systems and crash dummies, and robotics, to name a few.

Though the lowered cost of imports was intended to benefit traditional SOEs, independent automakers were also able to leverage the increasing openness of the trade regime. Once the government lowered the barriers, it had considerably less control over which firms crossed between the domestic economy and the international marketplace. For nascent automakers, lower tariffs for imported goods like machinery and parts enabled them to jumpstart production off the ground with limited budgets.

Over time, the restrictive system governing exports was replaced by decentralized, more market-oriented transactions. By 1998, the share of export goods for which trading rights were monopolized or limited was less than 4 percent of all exports (Lardy (2002:46). Although China does not export nearly as many vehicles compared to major auto producing countries like Japan or the U.S., an impressive number of vehicles are exported by independent automakers, especially as a ratio of their total production. As Table 3.1 below demonstrates, exports have been far more important for independent firms than their state-owned counterparts which tend to be focused on the domestic market.¹⁰⁰

Exports are crucial for independent automakers not only because they generate hard currency to finance imports, but because they help build economies of scale in production. Furthermore, they give these firms a head start in learning about and adapting to the needs, tastes, and preferences of consumers in foreign markets. The exposure to international markets is proving very valuable to independent automakers as they strive to become globally competitive.

¹⁰⁰ Export data is spotty for previous annual volumes of the *China Automotive Industry Yearbook*.

Table 3.1 China's Leading Auto Exporters (2007)

Name of Automaker	Type of Automaker	Number of Passenger Cars Exported in 2007¹⁰¹	Ratio of Exports to Total Vehicles Produced by Automaker
Chery	Independent	119,891	31%
Dongfeng	Traditional SOE	38,770	3%
FAW	Traditional SOE	37,700	3%
Geely	Independent	29,067	13%
Great Wall	Independent	28,519	23%
Chang An	Traditional SOE	16,718	2%
BYD	Independent	6,489	6%
SAIC	Traditional SOE	796	0%

Source: *China Automotive Industry Yearbook 2008*.

The changes to the trade regime were accompanied by simultaneous reforms of the foreign exchange system and of the Chinese currency. In the pre-reform era, the state had fixed the exchange rates at an overvalued level to subsidize the import of high-priority capital goods that could not be produced domestically. This system not only forced producers of exports to sell their output to the state at low domestic prices, but led to an excess demand for foreign exchange relative to supply. Under the central plan, exporters were forced to surrender 100 percent of their foreign exchange earnings to state, while individuals were restricted from holding foreign currency. There were also strict controls on the outflow of capital from the country.

As the state began to relax the country's rigid system of foreign exchange, domestic firms were allowed to retain an increasing share of their foreign exchange earnings, which gave them the ability to finance imports without the need to seek permission to purchase foreign exchange. Individuals were allowed to open foreign currency accounts at the Bank of China and other banks authorized to deal in foreign currency. Perhaps most importantly, the state began to devalue the domestic currency, the renminbi (RMB). In December 1989, for instance, the official exchange rate was devalued by 21.2 percent (Lardy 2002:48). With subsequent devaluations, Chinese exports became increasingly competitive.

Another important policy change to reduce the bias against exporters was the State Council's decision to exempt export products from the value-added tax (VAT).¹⁰² In 1994,

¹⁰¹ These export figures include both light and heavy vehicles exported under domestic brand names, but does not include those vehicles exported under foreign brand names. However, the number of vehicles exported under foreign brand names is also relatively low compare to the total number of vehicles produced.

¹⁰² The "value added" to a product by a business is the sale price charged to its customer, minus the cost of materials and other taxable inputs. A VAT is like a sales tax in that ultimately only the end consumer is taxed. It differs from the sales tax in that, with the latter, the tax is collected and remitted to the government only once, at the point of

inventory taxes were unified into a single VAT of 17% on all manufacturing, repair, and assembly activities. The VAT became the state's main source of income, accounting for half of government revenue. Value-added tax rebates are permitted by the WTO because they allow firms in countries like China to compete fairly with firms in countries like the United States, which generate tax revenue through direct taxes. Independent automaker Great Wall, for example, relies heavily on VAT rebates to make up for losses associated with exporting its cars to markets demanding particularly low prices.¹⁰³

3.1.3. INCREASING ACCESS TO GLOBAL CAPITAL MARKETS

At the same time China began dismantling its trading system, it loosened its grip over capital markets. As a capital scarce country, China looked to foreign sources of funding, particular in the form of FDI, to finance its rapid economic development. Chapter Two, for example, argued that FDI was the main policy tool at the disposal of the state to upgrade the manufacturing capabilities of the state-owned auto sector. As the state began to learn more about financing options in global capital markets, it saw foreign stock exchanges as an additional mechanism by which Chinese firms could raise funds.

The Chinese government first allowed domestic firms to list abroad in 1993 when it issued "A Special Regulation on Raising Capital and Listing Overseas by a Joint-Stock Company", the first regulation on overseas listings. Soon thereafter, Tsingtao Brewery became the first company to list abroad on the Hong Kong Stock Exchange. Initially, the government saw overseas listings as a way for restructured SOEs to raise badly needed capital. Yet to prevent poor-quality SOEs from rushing to foreign stock markets, the government instated an initial public offering (IPO) quota system which would be divided among the provinces and ministries as the Chinese Securities Regulatory Commission (CSRC) saw fit.

In 2000, the CSRC replaced the IPO quota system with new rules, which effectively reduced the CSRC's power to approve IPOs and increased the responsibility of lead underwriters. As rules governing overseas listings were liberalized, and as the CSRC's direct control over which firms could list abroad was reduced, private Chinese firms – including several in the auto sector – piggybacked on the reforms to raise capital abroad. The ability to raise money abroad was crucial, not only because private automakers were not considered by the state as suitable candidates for FDI, but also because the private sector had long faced discrimination by the state-controlled banking system. China's risk-averse banks prefer to extend credit to state and collective enterprises rather than to private firms. As of 2000, less than 1 percent of loans from the entire national banking system had gone to the private sector (Tsai 2002:2). Table 1.1 in Chapter 1 shows the hundreds of millions of dollars raised by three of China's leading independent automakers through IPOs. Chery, the lone state-owned independent automaker, has yet to file an IPO. This is largely because Chery, unlike its private counterparts, has the luxury of state-subsidized credit.

purchase by the end consumer. With the VAT, collections, remittances to the government, and credits for taxes already paid occur each time a business in the supply chain purchases products from another business.

¹⁰³ Interview 56 with Great Wall manager, 3 December 2008.

Access to foreign capital markets has been crucial to the operational expansion of independent automakers. Without such access, these firms may not have been able to bring competitive products to market quickly, if at all. In addition to raising funds to buy expensive production equipment and hire engineers, there are other benefits to listing abroad. For example, these companies are forced to incorporate more transparent international accounting standards and corporate governance practices in order to comply with the Hong Kong Stock Exchange's regulations. Being listed on a foreign exchange also gives these firms greater legitimacy abroad in the eyes of potential customers, partners, and investors. As the mini-case studies in Section 3.4 will show, independent automakers are also learning to tap foreign private equity.

3.1.4. RELAXING RESTRICTIONS ON FOREIGN DIRECT INVESTMENT

As China sought to join the WTO, it came under tremendous pressure to remove restrictions on foreign direct investment across a number of highly protected sectors, including the auto sector. China's 50 percent limitation on foreign ownership of auto-related joint ventures was a keystone of the government's FDI policy. Chinese leaders saw this limitation as a way to prevent the domination of the domestic market by foreign automakers. This ownership restriction, however, has long been considered undesirable by foreign automakers which preferred greater control over their China operations. One of the greatest shortfalls of the 50-50 joint venture business model was that all operating decisions had to be approved by a consensus between the foreign partner and the traditional SOE. Due to often divergent interests between the foreign and Chinese partners, major decisions concerning the JV took a long time to negotiate.

As a result, many foreign automakers found this model cumbersome and pressured their home country governments to push China to eliminate FDI restrictions during WTO negotiations. Despite foreign pressure, the state remained steadfast and unwilling to relent on its 50 percent limitation on foreign ownership of assembly joint ventures, but as a concession, it removed the 50 percent limitation on foreign investments in auto component manufacturing.

This change in FDI policy prompted a number of the world's leading component manufacturers to invest aggressively in majority-owned or wholly-foreign owned enterprises in China. With the saturation of auto markets in the industrialized countries, multinational assemblers and suppliers looked for new growth markets. At the time of China's WTO accession, the domestic car market was just beginning to take off and represented a potentially huge opportunity for the global auto industry. Component makers became increasingly interested in setting up manufacturing operations in China not only to serve their home markets, but the rapidly expanding domestic market. Over the last decade, China has attracted billions of dollars of investment by tier one global automotive component companies.

In 2002, TRW Automotive, one of the largest American component companies, established a wholly-owned subsidiary in Shanghai to manufacture airbag electronic control units and steering gear assemblies. These facilities were expanded in 2005 to almost five times the original factory site.¹⁰⁴ Similarly, American Delphi Automotive Systems, the world's largest auto parts supplier, announced in 2003 that it planned to invest tens of millions of dollars in a

¹⁰⁴ *Automotive Intelligence*. <http://www.autointell.com/news.htm>. Accessed on 31 December 2010.

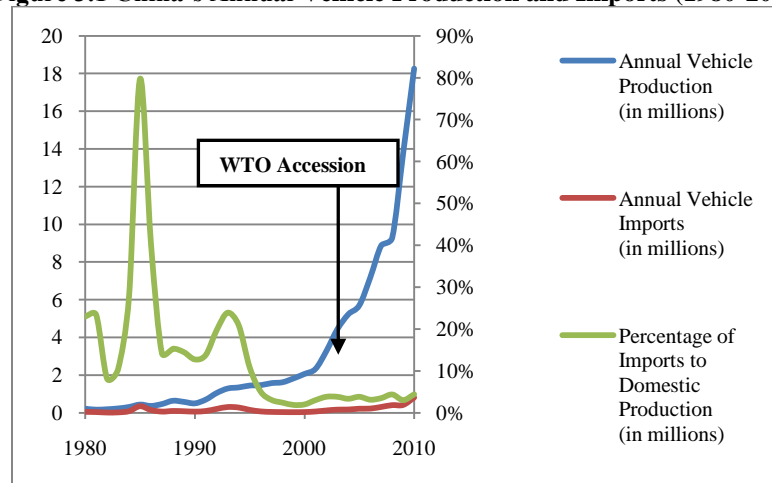
wholly-owned technical center in Shanghai to develop components and support application and systems engineering for several local customers in the country in addition to global customers. The center officially opened in 2005.¹⁰⁵ Germany's Robert Bosch GmbH, the world's second largest automotive component supplier and an early investor in China, has established nine wholly-owned subsidiaries in the country.¹⁰⁶ These are just a few of the many examples of large foreign investments by global component suppliers. Once these firms were well-established in China, they began to court the business of independent automakers. As the mini-case studies will later show, several of these firms formed joint ventures with independent automakers.

Changes to China's trade regime, capital markets, and FDI regulations were part of the Chinese government's plan to accelerate market reform and gain accession to the WTO. Many of the reforms were intended to help traditional SOEs transform into globally competitive firms. Nonetheless, these changes ultimately resulted in a web of deep linkages between the domestic economy and the global economy, thereby opening new avenues for independent automakers to access foreign sources of capital and technology without the support of the state.

3.1.5. IMPACT OF CHINA'S WTO MEMBERSHIP ON THE DOMESTIC AUTO INDUSTRY

Contrary to the pessimistic scenarios, China's auto industry boomed after joining the WTO. To the surprise of the WTO skeptics within the government, the domestic market was not swamped by automotive imports. In fact, in the years following China's WTO accession, domestic production grew exponentially, while imports have risen only modestly. As Figure 3.1 below shows, vehicle imports as a ratio of domestic vehicle production has remained around 5 percent since 1996. As Chapter 2 argued, this ramp up of domestic production was the result of China's 2004 Auto Policy, which brought billions of dollars of FDI into the domestic auto sector.

Figure 3.1 China's Annual Vehicle Production and Imports (1980-2010)



Sources: *China Automotive Industry Yearbooks* (1980-2010); OICA (2008-2009)¹⁰⁷; Various news sites

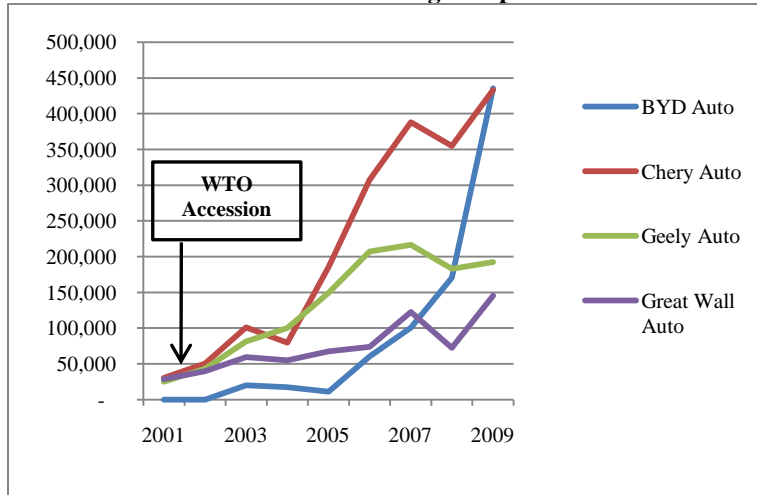
¹⁰⁵ *Automotive Intelligence*. <http://www.autointell.com/news.htm>. Accessed 31 December 2010.

¹⁰⁶ Company website. http://www.bosch.com.cn/new/web/press/press_release_detail02_en.htm. Accessed 31 December 2010.

¹⁰⁷ The production statistics for 2008-2009 are from www.oica.net.

Although most of this growth in Chinese auto production is attributed to joint venture enterprises, the production of independent automakers also grew quickly in the years following China's 2001 WTO accession. Given that these firms only began producing cars in the late 1990s after various barriers to entry were effectively lowered, their production growth over the last decade is indeed impressive, as seen in Figure 3.2 below.¹⁰⁸

Figure 3.2: Annual Production of China's Four Leading Independent Chinese Automakers (2001-2009)



Source: *China Automotive Industry Yearbook* (2005-2008); Company websites.

Why did the production of independent automakers increase so dramatically over the past decade? As Section 3.1 showed, part of the answer lied in trade liberalization which allowed independent automakers to form new linkages to global capital and technology markets. Yet WTO-related market reforms only explain *how* domestic firms accessed foreign sources of technology, but they do not explain *what* technologies these firms had access to. As the following section will explain, the rest of the answer is rooted in fundamental changes within the organization of the global auto industry itself.

3.2. THE FRAGMENTATION OF GLOBAL AUTOMOTIVE PRODUCTION NETWORKS, THE LURE OF THE CHINESE MARKET, AND THE ADVANTAGES OF BACKWARDNESS

As Dan Breznitz (2007) and others¹⁰⁹ have argued, the fragmentation or “deverticalization” of global production networks suggest that there are multiple entry points for firms in emerging industrial countries. In the electronics industry, for example, there has been a major transformation in the way products are designed, manufactured and sold. Leading multinationals Cisco and Hewlett-Packard concentrate on R&D, sales, and marketing, but outsource production, assembly, and testing to low-cost manufacturing hubs like China. The ability to outsource

¹⁰⁸ These are the largest independent producers of passenger cars. There are a number of other independent automakers successfully producing light commercial vehicles, such as Jianghuai Automobile Corporation (JAC) in Anhui Province, Wuling Motors in Guangxi Province, and Beiqi Foton in Beijing.

¹⁰⁹ Many scholars have written about the expansion and fragmentation of global production networks. For examples, see Arndt and Kierzkowski (2001); Sturgeon (2002); Gereffi (1996); Gereffi and Korzeniewicz (1994).

production was facilitated by the standardization of interfaces between different components. Although that level of standardization has not occurred in the automobile industry, car platforms are increasingly modular by design, with the leading automakers outsourcing most components and subsystems to specialized suppliers. The push toward greater modularization was in large part driven by the increasing complexity of the modern car.

The modern automobile is composed of somewhere between 8 and 10 thousand individual parts, each of which must be individually designed and produced.¹¹⁰ Cars are costly to design precisely because so many parts and functions must be incorporated into a single safe and reliable system. Organizing this enormous task is the greatest challenge in automobile manufacturing. This section highlights three key developments in the global auto industry that would have far-reaching consequences not only for the business models of the world's leading automakers, but those of China's independent automakers. The first is the specific Japanese innovation of lean production; the second is the broader evolution of the modern car from one that is mostly controlled mechanically to one that is increasingly controlled electronically; the third is the stagnation of car markets in the industrialized countries. In order to demonstrate how dramatic these three changes were for the organization of the global auto industry, it is important to first go back to the days of mass production.

In the early days, Henry Ford bought his engines and chassis from the Dodge Brothers, along with other parts he needed to make a complete vehicle. But over time, in an effort to control tolerances, interoperability, and the schedule of parts delivery, Ford eventually took every aspect of automobile production in-house, including steel and glass. And in order to get the greatest efficiency from an army of immigrant workers with little education that barely spoke English, Ford also took the division of labor to an extreme. He designed the assembly line such that each worker had a very limited and defined task – to put two nuts on two bolts or perhaps to attach one wheel to each car. Ford's innovation of the interchangeable part and interchangeable worker, along with Alfred Sloan's innovations in marketing and corporate management, comprised what would become known around the world as mass production (Womack et al. 1990:38-39). By the 1950s, mass production techniques had spread to Europe's leading automakers, including Volkswagen, Renault, and Fiat.

At the same, a different method of organizing production was emerging in Japan. Due to severe capital constraints, Taiichi Ohno, the production genius at Toyota, re-designed the production process to reduce the need for expensive equipment by putting more responsibility in the hands of Japanese workers. For example, rather than relying a specialized piece of stamping equipment to produce each steel part, Ohno taught his factory workers to change the dies – which determine the shape and size of the part – such that a single machine could produce several different parts. And rather than producing all of the parts in-house, Ohno and other managers at Toyota formed a tiered network of outside suppliers that worked closely with Toyota's own engineers throughout the design and production process.

¹¹⁰ Womack et al. (1990:141) suggest that a typical model has more than 10 thousand parts. Maxton and Wormald (2004:3) put this figure at 8 thousand parts.

These suppliers, in which Toyota would often take an equity stake, were incentivized to devise ways to improve not only the design of each part, but the assembly and overall performance of the entire vehicle. Ohno also developed a new way to coordinate the flow of parts within the supply chain on a daily basis, the famous just-in-time system, called *kanban* at Toyota. The culmination of Ohno and Toyota's innovations – which took more than twenty years to fully implement – resulted in what would become known around the world as the system of lean production.¹¹¹ This new production system had extraordinary consequences for productivity, product quality, and responsiveness to changing market demand.

The traditional product design and development process, exemplified by Ford and GM's system of mass production, was *sequential* and task-driven (Maxton and Wormald 2004:141). The process would start with product planning, then handed over to the design department, then passed on to other parts of the organization (e.g., engineering, purchasing and testing) until the production department received its instructions. This process was a long one and the introduction of new car models could easily take up to seven years, with intermittent revisions, and cost hundreds of millions of dollars. The constant revisions and reworking frequently further drove up costs and delayed the time to production. These problems were exacerbated by the fact there was usually no single person accountable for the whole process, making it hard to pin the blame on anyone when the schedule was delayed.

In part to overhaul this cumbersome and slow process, Toyota's lean production model was optimized to run many tasks in *parallel* with its suppliers under Toyota's coordination. When a new project is identified, it is handed over to a multidisciplinary team which divides up the tasks to be worked on by different groups, both inside and outside of the firm. Holding the process together is the constant interaction between each group and a central database from which all the groups work.

In response to the success of Toyota's lean production system, American and European automakers instituted changes to their own organizations and production processes. In order to cope with the huge costs associated with an ever growing number of new modules and systems in a modern car, the leading global automakers have become less involved all aspects of product development and production, passing more of the responsibility of developing, manufacturing, and assembling key sections of the car on to their suppliers (Kumar and Veloso 2002:8).¹¹² In the past, the leading multinational automakers were accustomed to transferring best practices to their suppliers. Now they rely on their suppliers to teach about the latest technologies and production methods.

GM and Ford Motors saw that designing and producing their own parts had become a liability rather than an asset. After all, foreign competitors were buying better quality parts from independent suppliers at lower prices. The lack of competitiveness was evident in the early 1990s when GM announced the largest ever loss in its corporate history; in fact it was the largest

¹¹¹ For a more complete discussion of the development and evolution of Toyota's lean production system, see Tyson and Zysman (1988) and Womack et al. (1990).

¹¹² See the Kumar and Veloso (2002) article for a detailed explanation of how the growing importance of suppliers in the automotive industry is affecting the structure of the industry supply chain and the individual firms within it.

in U.S. corporate history (Sutherland 2003:112). In part to regain their competitiveness, GM and Ford exited the parts-making business in 1999 and 2000 by spinning off those business units into Delphi Corporation and Visteon Corporation respectively. These firms then expanded their businesses to supply not only GM and Ford, but other global automakers. To support the China operations of their clients, including FAW-VW, SVW, SGM, Ford Chang-An, Honda, and Toyota, Delphi invested in four of its own JVs. In addition, Delphi sells parts to independent firms, Chery and Geely. According to the Managing Director of Delphi China, these local players get special pricing and extended financing terms from Delphi.¹¹³

Given the organizational legacies within each firm, and the national political economic environment in which it operates, the global auto industry has not seen a convergence on a single production method. Rather there has been more of a hybridization or even mutation of the lean production model, with each firm creating its own unique approach. Nonetheless, broadly speaking, the model of automobile production has evolved to one in which suppliers rather than assemblers control more of the technology and value in today's cars. Maxton and Wormald (2004:140) estimate that vehicle manufacturers such as GM and Ford control about 25 percent of the value of the cars they produce, while their suppliers control the other 75 percent.¹¹⁴ This is a dramatic change from 1955, when vehicle manufacturers and suppliers controlled 75 percent and 25 percent of the value respectively.

This trend towards increasing modularity and vertical disintegration was further accelerated by the second key development in the global auto industry: the transformation of the automobile from a mostly mechanical system to one that is increasingly electronically controlled. A myriad of electrical systems, electronic sensors, and actuators have taken over control and monitoring of car performance (Veloso and Kumar 2002). The popular figure is that roughly 40 percent of a new car's value in 2010 will consist of electronics, compared to 22 percent in 2000 and 10 percent in 1990 (Maxton and Wormald 2004:139).¹¹⁵ This trend has, in turn, been driven by the even greater acceleration of modularization in the electronics industry.

Automakers increasingly rely on their suppliers for sophisticated electronic control systems and other advanced features like onboard global positioning systems to differentiate their products from competitors. As a result, revenues of component suppliers have grown exponentially. The global sales value of the components sector rose from US\$450 billion in the 1980s to more than US\$950 billion in 2000 (Sutherland 2003:118). Many supplier firms are now some of the largest firms in the world. In 2009, Bosch had revenues of US\$54 billion. Japan's largest supplier, Denso Corporation, which also supplies multiple automakers, had sales of US\$32 billion that year.¹¹⁶ The general view is that a widespread trend toward component

¹¹³ Interview 32 with Managing Director of Delphi China, 3 September 2008.

¹¹⁴ Maxton and Wormald's (2004) figures are corroborated by those of Klier and Rubenstein (2008:47), who write that suppliers' share of a vehicle's value-added rose from approximately 40 percent in 1990 to approximately 60 percent in 2000, and would hit 80 percent by 2010.

¹¹⁵ These figures refer to the value of the electronic systems rather than the actual electronic parts, which are actually worth much less than that. Much of the value lies in the software that integrates and manages the individual parts. Maxton and Wormald's (2004) figures are supported by those of Kumar and Veloso (2002:5), who write that as much as 35 percent of the overall cost of a new vehicle is in the electronics.

¹¹⁶ Revenue figure is from Yahoo Finance. <http://biz.yahoo.com/ic/41/41437.html>. Accessed on 1 January 2010.

outsourcing in the auto sector has resulted in a “deverticalized landscape” (Sturgeon 2002; Sutherland 2003).

The third key development was the stagnation of car markets in the industrialized countries, or what is often referred to in the auto industry as the “triad countries” of the United States, Western Europe, and Japan. Worldwide vehicle production was stagnating in the 1980s and 1990s, growing at about 1.0 percent per year compared to about 5.9 percent per year in previous decades (Maxton and Wormald 2004:4). Between 1999 and 2003, growth in production almost came to a halt. The demand for cars in the leading markets decreased for a number of reasons. Slowing population growth in developed countries, especially Europe and Japan¹¹⁷, not only reduced the number of new car buyers, but cut disposable incomes and changed spending priorities. Plus, the major car markets were saturated, meaning there were already enough cars to satisfy most people’s transportation needs.¹¹⁸ Finally, not only was the cost of car ownership – driven primarily by unpredictable petroleum prices – increasing in the advanced countries, but so was the pressure to reduce traffic congestion.

With the maturation of car markets in the developed countries, the leading multinational automakers began to look for new growth markets in yet untapped car markets in developing countries, including China. In the 1990s, as European and American demand was slowing down, the Chinese passenger car market was just starting to take off and personal car ownership was very low. In 1998, vehicle penetration in China was only 9 units per 1,000 people.¹¹⁹ Then in 2001, China joined the WTO, which assuaged some of the fears of foreign investors, including firms in the global auto industry.

The combination of the sea changes in the global auto industry and deep reform of China’s trade and investment regime drove nearly all the world’s leading automakers and their global suppliers to China in large numbers. Their investments, especially those of global suppliers, opened numerous new technological frontiers for independent automakers. Chinese automotive start-ups with little in-house technical expertise could purchase domestically-produced parts and form technology partnerships with global suppliers that had set up operations in China. By 1997, there were more than 500 component suppliers with operations in China. Delphi alone had 15 Chinese JVs by 2000, with total investment totaling US\$500 million (Sutherland 2003:128). Similarly, as of 2003, TRW had 5 JVs, Denso had 6 JVs, and Valeo (France’s largest component supplier) had 11 operating units in China. The list goes on and on, with more suppliers making investments each year. The expansion of China’s automotive component supply chain was a huge boon to the domestic auto industry, particularly the independent automakers that needed to source readily available parts.

¹¹⁷ As Maxton and Wormald (2004:7) point out, the population of Japan and Western Europe is actually set to start declining in the coming years.

¹¹⁸ According to the U.S. Department of Energy website, in 2008, there were 841 vehicles per 1,000 people in the U.S., compared to 593 per 1,000 people in Western Europe, and 35 per 1,000 people in China. http://www1.eere.energy.gov/vehiclesandfuels/facts/2010_fotw617.html. Accessed 18 May 2011.

¹¹⁹ Ibid.

While technology transfer between independent automakers and foreign suppliers today largely occurs through official contracts and cooperative relationships, much of the knowledge transfer at first occurred through intellectual property (IP) infringement at all levels from component design to auto body styling. Because all of the world's leading automakers and their suppliers had manufacturing operations in China, it was not difficult for resourceful and eager Chinese automakers to buy and reverse engineer foreign-designed but domestically-produced vehicles and parts. As several interviewees for this study expressed, knocking off a car is not "rocket science."¹²⁰

Equally important, independent automakers could hire talented Chinese engineers trained by foreign firms. As they grew in size, independent automakers also lured away foreign engineers and managers who brought with them in some cases decades of design and production experience. Specific examples of IP infringement and talent poaching will be discussed in the mini-case studies in Chapter Four. (See Appendix C for pictographic comparisons between original models and Chinese copycat models.)

As Alexander Gerschenkron (1962) once famously pointed out, backward countries are fortunate to have a backlog of technologies to draw upon. Independent automakers did not have to reinvent the wheel, literally. The ability to access to foreign technology and knowhow through formal and informal channels has allowed independent automakers with limited budgets to cobble together factories and build inexpensive cars to sell to the segment of the market underserved by the joint ventures. Moreover, unlike their state-owned counterparts, independent automakers are unburdened by the legacy of large bureaucratic corporate organizations discussed in Chapter Two. Independent firms started off leaner and were thus more able to adapt to new production techniques, innovations in component design, and untapped market opportunities.

It is still too early to tell whether the organization of production in China's independent automakers constitute an altogether new production model akin to Japan's lean production model. Nonetheless, as the following section will show, scholars are beginning to identify aspects of what could eventually become a new China-specific model of production.

3.3. THE LOW-COST PRODUCTION MODEL OF INDEPENDENT AUTOMAKER: ARCHITECTURAL INNOVATION OR SIMPLE IMITATION?

The competitive advantage of independent automakers lies in their ultra low-cost business model and ability to sell cars below RMB70K (~US\$10K), the segment of the market underserved by the joint ventures. As discussed in the previous chapter, the production costs of the joint ventures remained high for a number of reasons. For one, rather than share their core technology with their Chinese partners, foreign automakers prefer to charge high royalties to their joint ventures for technologies which are developed in their home countries. At the same time, the Chinese partner charges high production costs to the joint ventures because of their high overhead costs.

¹²⁰ Interview 35 with Operations General Manager at Johnson Controls, 5 September 2008; Interview 34 with Technology Manager at Ford China, 5 September 2008.

As a result, the average price of most vehicles in 1997 was above RMB 130K (~US \$15K)¹²¹, which was 20 times more than the GDP per capita that year (Li 2009).

In stark contrast to the joint ventures, independent automakers have created a very low-cost production model due to two main factors. The first source of cost savings comes from the low price of labor in the second tier cities where independent automakers have built their factories. My research suggests that the average factory wages at the independent automakers is less than those at the largest joint ventures, though location does matter. Independent automakers are largely located in second and third tier cities where wages are lower than in the first tier cities where many of the traditional SOEs are located. Table 3.2 below compares the average monthly salaries of factory workers at SGM and the four leading independent automakers.

Table 3.2: Factory Wage Differential between Joint Ventures and Independent Automakers

Automaker	Type of Automaker	Average Monthly Wage ¹²²
Shanghai GM	Joint venture	RMB 3,000 (USD 460)
Chang'An Ford	Joint venture	RMB 2,000 (USD 307)
Great Wall	Independent automaker	RMB 1,500-2000 (USD 230 - USD 307)
Chery	Independent automaker	RMB 1,000 (USD 153)

Source: Author interviews.¹²³

As the table shows, the wages at Chang-An Ford, which is located in Chongqing City in western China, are one-third less than those at Shanghai GM's factory, which is located in the more expensive city of Shanghai. More importantly, average monthly wages do not reflect the other overhead costs traditionally faced by traditional SOEs, such as housing, health insurance, pensions, and other employee benefits.

The second major source of cost savings lies in low R&D costs, especially compared to leading multinational automakers. There have been several avenues for automotive start-ups to inexpensively access existing foreign technologies, and in some cases outsource technology development. Independent automakers have accessed foreign technology through IP infringement, especially for their first models. The early products of all independent automakers were imitations of foreign cars. Chery's best-selling model, the QQ, is a copy of the Chevrolet Spark. As noted in Table 3.4, the Chery QQ was about 25 percent less expensive than the Chevrolet Spark, which in large part explains why QQ sales were nearly three times higher than those of the Spark in 2009. Toyota models have been particularly "popular" among China's eager imitators, especially BYD and Great Wall. Great Wall's first SUV, the Safe, was a copy of the Toyota 4Runner and was for many years the best-selling SUV in China. Many of Great Wall's

¹²¹ The conversion to US dollars was based on the exchange rate in 1997: US\$1 = RMB 8.20.

¹²² The conversion to US dollars was based on the exchange rate on 18 May 2011: US\$1 = RMB 6.50.

¹²³ Interview 63 with Founder and CEO of SICAR; (6 January 2009); Interview 62 with BYD manager (29 December 2008); Interview 56 with Great Wall manager (3 December 2008); Interview 34 with Technology Manager at Ford China (5 September 2008); Interview 2 with SGM manager (26 December 2007). Because industry-wide wages are not publicly available, interviews were my only source of data. It should also be noted that wages may have changed since the interviews were conducted.

other models also “borrow” a lot of styling of Toyota models. Similarly, BYD’s F3 compact is uncannily similar to the Toyota Corolla. As seen in Table 3.4 below, the F3 was less than half the price of the Corolla. To the shock of many industry executives and observers, the F3 was the best-selling passenger car in any category by any manufacturer in 2009. That year, BYD sold over 251K units of the F3, while Guangzhou Toyota sold just over 96K units.

Table 3.3 below compares the prices and sales of the best-selling independent model and comparable JV-produced model in the mini-car, sub-compact, compact, and SUV segments. The independent firms are very price competitive in each segment, though, as the table indicates, the independent model is not always the best-selling model in that segment. As was discussed in Chapter One, JV-produced models still outsell independently-produced models by about 2-to-1. Nonetheless, the purpose of Table 3.4 is to show that because of their ability to keep costs and hence prices low, independent automakers are able to carve out a significant part of the domestic market.

Table 3.3 Price Comparison of Best-Selling Independent Models and Joint Venture Models (2009)

Company (Brand)	Type of Automaker	Model Name	Model Type ¹²⁴	Starting Price in RMB	Equivalent Price in USD	Units Sold in 2009
Chery	Independent	QQ311	Mini-car	¥ 31,000	\$4,247	150,342
GM (Chevrolet)	Joint Venture	Spark	Mini-car	¥ 40,000	\$5,479	56,955
Geely	Independent	Freedom Ship	Sub-compact	¥ 44,000	\$6,027	100,988
Dongfeng Nissan	Joint Venture	Tiida	Sub-compact	¥ 107,000	\$14,658	144,079
BYD	Independent	F3	Compact	¥ 56,000	\$7,671	251,863
Guangzhou Toyota	Joint Venture	Corolla	Compact	¥ 128,000	\$17,534	140,939
Great Wall	Independent	Hover	SUV	¥ 103,000	\$14,110	54,759
Guangzhou Toyota	Joint Venture	RAV4	SUV	¥ 190,000	\$26,027	96,269

Source: *Automotive Resources Asia* (2009)¹²⁵

Independent automakers and their domestic suppliers also save on operational costs by “borrowing” automotive design software. Product lifecycle management (PLM) software is used by car companies and their supplier network to manage a car from concept to after-market service. Dassault, a French firm, provides PLM software to most of the world’s automakers, except for GM which uses software provided by Siemens. According to a Chinese sales manager of Dassault, most Chinese carmakers and suppliers use pirated copies of Dassault’s software.¹²⁶ Nonetheless, some firms are beginning to see the value of legitimately paying for Dassault’s

¹²⁴ These are the segment definitions used by Automotive Resources Asia. A mini-car is defined as a car whose length is less than 3,300 mm. A sub-compact is between 3,300 mm and 4,200 mm. A compact is between 4,200mm and 4,500 mm.

¹²⁵ Automotive Resources Asia, *China Automotive Monthly Market Trends*, December 2009.

¹²⁶ Interview 27 with Sales Manager at Dassault, 14 August 2008.

software. As of mid-2008, Geely had purchased one seat, while Chery had purchased around a dozen seats.

Because the Chinese government inconsistently enforces IP laws, independent automakers have been able to get away with serious IP violations. A more detailed discussion of the IP violations of each independent firm, which in some cases resulted in court disputes, will follow in the next chapter. The important point to be made here is that nascent independent automakers were not tied into a particular vehicle platform and viewed IP infringement as the solution to their lack of R&D experience and very limited budgets.¹²⁷ As Hua Wang (2008:517) writes, “Facing technology constraints, imitation of a small number of popular models produced by foreign competitors has become the most viable solution.”

Another source of R&D savings comes from outsourcing product development to recently established domestic automotive design firms. One such firm, IAT, was started in 2003 by Wu Xuan Qi, an engineer who had worked in FAW’s R&D department for five years and received a doctorate in engine design from a Japanese university. IAT offers a wide range of design services to number of Chinese companies including FAW, Dongfeng, SAIC, Brilliance, Great Wall, and Chery. According to the founder and CEO, Xuan Qiwu, IAT’s services include platform development and prototyping, body development, body remodeling, reverse engineering, chassis tuning, parts development and testing, powertrain integration and styling.¹²⁸ It would appear from Xuan’s description of his company’s services that IAT may actually facilitate the IP infringement of Chinese automakers, perhaps even helping them cover their tracks. The company, which has more than six hundred engineers including thirty to forty engineers from Italy, Japan, and Korea, charges about one-quarter to one-fifth of the price of European design firms per project.¹²⁹ IAT was the largest Chinese auto design firm in 2008. Access to this type of domestic outsourcing is an incredibly powerful resource for independent firms with little in-house R&D capabilities.

Wang (2008) and others have argued that within this “outsourced” model of product development model lies an architectural innovation. Using Geely as a case study, Wang contends that Geely has moved beyond a *closed integral architecture* to a *quasi-open modular architecture*. Cars traditionally exemplified a closed integral architecture, when the automakers controlled most aspects of product design. In the integral architecture, functions are shared by different components, where a single change in one part necessitates changes in the other parts. In this set-up, changes to the overall architecture are costly and time-consuming.

As discussed in the previous section, once the automakers began to outsource component and subsystem design, there was a push toward greater standardization of interfaces so that parts could be interchangeable. In a more modular architecture then, one part delivers one function, and the mixing and matching of a range of components becomes possible due to

¹²⁷ As Hua Wang (2008:517) writes, “Facing technology constraints, imitation of a small number of popular models produced by foreign competitors has become the most viable solution.”

¹²⁸ Interview 30 with Founder and President of IAT, 28 August 2008.

¹²⁹ Interview 14 with Investor and Board Member of IAT, 3 July 2008.

interchangeability of parts. According to Takahiro Fujimoto (2006), this push toward modularity is more common in the U.S. than in Europe or Japan.¹³⁰

Like the United States, Chinese automakers are following along the trajectory of greater modularity. In a quasi-open modular architecture, imitation-turned versatile parts are being gathered and assembled by numerous companies. In other words, auto components have become *de facto* generic and standardized components through repetitive imitation and remodeling. These generic components were then mass produced and sold to different automakers, reducing the barrier to entry for both Chinese assemblers and component manufacturers. Yet, to be sure, this quasi-open architecture is still markedly different from a full-fledged open architecture like that found in the global electronics industry.

Wang (2008) cites Geely as a concrete example of this trend toward greater modularity. Geely's first model, the Haoqing, was an imitation of the FAW Xiali Charade, which was itself developed using a technology license from Toyota affiliate Daihatsu. Without little of its own design capability, Geely combined original components, copied components of the Charade, and components of other vehicles to build the Haoqing. In total, 70 percent of the components were interchangeable with that of the original Charade.

This quasi-open architecture emerged out of the need to assemble a car quickly and cheaply without much design or engineering. Rather than competing with joint ventures on the basis of better performance or more advanced features, independent Chinese automakers leveraged their low-cost production model to compete on price. As the example of Geely demonstrates, the quasi-open architectural approach would not have been possible had it not been for the investment of foreign automakers and component suppliers. While Wang considers this quasi-open product architecture an important innovation, others consider the production model of independent automakers unsustainable because of the lack of real R&D and the broader consequences of IP violations, especially in markets outside of China (Thun 2006; Guo and Zhang 2008).¹³¹

Today, independent automakers have moved beyond wholesale IP infringement toward legitimate technology partnerships with foreign suppliers as they attempt to move up the value chain. Geely, for one, announced a new car codenamed EC718 in 2009 which is composed of an engine designed by Geely's own engineers, a braking system from Bosch, a lighting system from Valeo, seats from Lear Corporation, and an instrumental panel from Visteon. By sourcing from the world's leading suppliers, Geely hopes to upgrade its image from a maker of

¹³⁰ Fujimoto hypothesizes that product architecture (including the development process of new products) is conditioned by the organizational capability of the firm in question, which itself is strongly influenced by prevailing economic and cultural conditions, as well as the historical trajectory of the country of origin. For example, the dominance of integral product architecture in Japan is due to the integrative organizational capability of the Japanese which facilitates teamwork in a multi-skilled workforce, long-term employment and long-term transactions.

¹³¹ In the conclusion of his book, Thun (2008:269) writes, "Firms such as Geely and Great Wall have been very successful in capitalizing on the capabilities of the supply networks that have been developed by the JV projects...But while these firms are highly skilled at copying and undercutting on the basis of price, they are likely to find it difficult to compete with the resources and design skills of the global firms in more advanced models."

affordable cars to a company known for building the safest and most fuel efficient cars.¹³² Although the details of this new platform are unknown, it is very likely that this new platform was built upon the concept of a quasi-open modular architecture. The four case studies in Chapter Four present more examples of technology partnerships that are forming between independent automakers and foreign suppliers.

Whether the production model of independent automakers indeed represents a new production model on the level of lean production or mass production is beyond the scope of this study. Nonetheless, it is clear that key changes in China's political economic environment and trends in the global auto industry have indelibly shaped the low-cost product development and production process within independent automakers. Future research on the potential emergence of a comprehensive Chinese production model will require a deeper analysis of China's labor laws, the organization of work within Chinese companies, as well as the joint-development and purchasing contracts between independent automakers and their suppliers.

3.4. CONCLUSION

Independent automakers have benefitted tremendously from relaxed trade and investment rules and China's accession to the WTO. China's gradual integration into the global economy allowed domestic firms, especially domestic automakers to access foreign capital and technology as well as to do business with foreign firms. China's accession to the WTO reassured foreign component suppliers that China was willing to play by international trade and investment norms, which accelerated foreign direct investment into the country's rapidly growing domestic auto sector.

At the same time, the global auto industry itself was changing in fundamental ways. Not only were car markets in the industrialized countries stagnating, but the industry's traditionally closed and highly integrated production model was morphing into a more open and increasingly modularized production model. The result was that suppliers controlled more of the technology and value of new cars. Along with their customers to China, these suppliers were lured into the vast and untapped Chinese market. Once their operations were set up, these suppliers were more than willing to form relationships with China's budding independent automakers. Though there was at first rampant IP infringement by independent automakers, these firms are now cultivating legitimate technology partnerships with global suppliers. The powerful combination of foreign technology partnerships, China's increasingly sophisticated automotive supply base, and low labor and manufacturing costs at home have together enabled China's independent automakers to develop an ultra low-cost production model. Some scholars argue that the quasi-open modular architecture used by independent automakers represents an important architectural innovation.

Yet even if the jury is out on whether the production model of China's independent automakers constitutes a break-through innovation, it is clear that their low-cost business models are positioning them to become serious contenders in the global auto industry. Geely's 2010 acquisition of Volvo for USD 1.5 billion, perhaps the boldest move yet by a Chinese automaker—private or state-owned—has ignited considerable international interest in the Chinese auto

¹³² *Automotive News China*, 2009. "Leveraging global supply base, Chinese OEMs are striving to move upscale." September 2.

industry. What is little advertised about this deal is the fact that two local governments in China put up more than one-third of the financing for the acquisition. The government of Daqing, an oil city in northeast China, supplied RMB 3 billion (USD 461 million), while the government of Jiading, a district of Shanghai, pledged RMB 1 billion (USD 153 million).¹³³

Why would local officials far from Geely's headquarters in Zhejiang Province put up money for Geely's pricey acquisition of Volvo? The following chapter will explain why these local governments and others have been so eager to support local automakers, as well as present case studies of China's four leading independent firms: Geely, but Chery, BYD, and Great Wall.

¹³³ *Automotive News China*, 2011. "For Volvo owner Li Shufu, government generosity carries a price," 12 November. <http://www.autonewschina.com/en/article.asp?id=6108>. Accessed on 18 May 2011. The conversion from RMB into USD was based on the exchange rate on 18 May 2011: US\$1 = RMB 6.50.

CHAPTER 4

HARNESSING THE ECONOMIC ASPIRATIONS OF THE LOCAL STATE: CASE STUDIES OF CHINA'S FOUR LEADING INDEPENDENT AUTOMAKERS

State entrepreneurialism has emerged in the process of reform for a combination of reasons. Officials say that it helps them ease their departments' financial problems and cut their staff. But the entrepreneurial option has been available to those officials because of wider structural factors in the reform process. In particular, pre-reform bureaucratic control of the economy and ill-defined boundaries on bureaucratic behavior in the reform era have meant that officials are well-placed to go into business.

Jane Duckett, *The Entrepreneurial State in China* (1998)¹³⁴

The story of late industrialization is often narrated from the perspective of the nation-state, for the web of institutions at the national level often provide the broad regulatory and policy framework for economic development. In the Chinese case, there are significant variations in developmental outcomes at the local level, not only because of the Center's inconsistent industrial policies, but because of the economic initiative of local governments. As a result of fiscal decentralization in the reform era, local officials became increasingly motivated to promote local development and maximize local revenues. Indeed, many scholars have argued that officials at the local level—rather than those at the national level—have been the true agents of industrial change in China, particularly at the level of the firm (Thun 2006). However, as this chapter will show, ambitious local governments have also been known to defy national developmental objectives in their pursuit of economic growth, which has had both positive and negative consequences for auto sector development.

Chapter One argued that the emergence of the independent auto industry was the unlikely outcome of three sets of policies interacting with a changing business environment. Chapters Two and Three focused on the first and second sets of policies, both of which were implemented at the national level. Chapter Two discussed how the limitations of the JV model created room in the domestic market for aspiring low-cost competitors, while Chapter Three illuminated how the dismantling of China's rigid trade and investment regime and the fragmentation of automotive production networks lowered barriers to entry for nascent independent automakers. This chapter focuses on the third and final set of policies, which were implemented at the local level, as well as presents case studies of the four leading independent automakers. These case studies offer detailed firm level evidence to support each element of the argument.

There is no “one size fits all” development policy at the national level, let alone at the local level (Thun 2006). The auto sector provides an empirical lens onto the ways in which local governments have moved beyond simply adapting to market reform to becoming “entrepreneurial states” and partnering with regionally-based private firms. Whereas Eric Thun

¹³⁴ Duckett (1998:3).

(2006) focuses on the institutional capacities of local governments and their relationships with traditional SOEs, I explore the surfacing of new partnerships between local officials and new automakers, many of which are privately-held. As I will show, these partnerships are very different from those between local governments and traditional SOEs. Though other scholars have studied the relationship between local governments and private firms in China, their work has focused on other activities and sectors (Tsai 2002; Bian, Cheng, and Tsui 2006; Segal 2010).

This chapter is organized as follows. First, I discuss the role of the local state in the emergence of the independent auto industry. Second, I present a simple typology of three types of independent automakers that have emerged through different types of relationships with local governments. Finally, I present case studies of the four leading independent automakers – Chery, Great Wall, Geely and BYD – that illuminate both the new types of relationships that have emerged between firms and local governments, as well as how each firm took advantage of the fragmentation of production networks and China’s integration into global capital markets.

4.1. THE ROLE OF THE LOCAL STATE

This chapter presents the third set of policies implemented at the local level which gave independent automakers access to critical resources such as land, production licenses, and in some cases, subsidized credit from local banks. As part of its reform strategy, the Center expanded both the decision-making authority of local governments and their ability to retain the majority of the revenue generated within their jurisdictions. The result was an incentive structure which encouraged local officials to pursue and promote local development (Lieberthal and Oksenberg 1988; Blecher 1991; Oi 1992; Shirk 1993; Duckett 1998; Tsai 2002; Thun 2006).

Marc Blecher (1991) and Jane Duckett (1998) have argued that “state entrepreneurialism” – the direct participation of the state in business activities—has been an effective way in which local governments throughout China have adapted to market reforms. In what she calls “local state corporatism”, Jean Oi (1992) asserts that local officials are much more than entrepreneurs. They are the primary coordinators of all economic and social activity within their jurisdiction. As such, the “corporate good” is defined more broadly than mere economic interests and profits and includes social interests such as employment. As these scholars have noted, the adaptability of the local state in China runs contrary to assumptions about state resistance to market reform found in the neo-classical economics literature, especially the more modern public choice literature. This tradition emphasizes the state’s bureaucratic inflexibility and preferences for established working practices and rent-seeking behavior (Bauer 1971; Lal 1983; Colander 1984; Rowley 2010).

The Chinese auto industry provides a clear example of economic initiative on the part of local officials. In the absence of an established state-owned automaker, local governments have looked for other ways to establish a local auto industry. Their initiative has taken many forms. At one extreme, officials have themselves become entrepreneurs by assembling investment funds from local financial institutions to start their own regional automakers. At the other end of the spectrum, local officials have preferred to support a local private automaker.

Why are local officials in China so eager to foster a local auto industry? A thriving regional auto manufacturing hub can generate jobs and tax revenue, not to mention create spillover business opportunities in upstream like steel factories and downstream sectors like dealerships. To that end, local officials in many provinces across China have supported locally based automakers in a number of different ways, including access to local credit institutions, favorable terms on local land leases, government procurement contracts, and production licenses and equipment of bankrupt state-owned factories. The case studies at the end of the chapter provide more specific examples of local state support in the development of China's leading independent automakers.

While a burgeoning auto sector hub can be sign of local initiative, economic independence at the local level nonetheless presents a quandary for the Center. In some cases, local officials implement local policies which stimulate local development but ignore national directives. Even on specific issues controlled by the Center, a local government's interpretation of national objectives is often the more important determinant of policy implementation. Chinese leaders have long recognized that excessive centralization stifles local initiative, yet excessive decentralization can produce chaos and detract from the pursuit of national interests. The relationship between the Center and the provinces is the subject of continual reform, as Chinese leaders seek an appropriate blend of national uniformity and provincial autonomy (Lieberthal and Oksenberg 1988:139). Though the Center has periodically attempted fiscal recentralization in the 1980s and early 1990s, local governments retain considerable control over economic decision-making within their respective jurisdictions.

The evolution of the Chinese auto industry suggests that the Center has yet to find the optimal balance between uniformity and autonomy. Economic ambition at the regional level has undeniably created competitive pressure on the JVs to become more efficient, reduce costs, and thus lower the prices of their products. On the other hand, local ambition has also led to what many experts inside and outside of China view as excessive industrial fragmentation. As the former president of SGM put it, "The central government passes a lot of regulations that the provinces simply choose to ignore. For example, although the government has been promoting consolidation since the early 1990s, the local governments have not heeded. There were 120 some automakers in the early 1990s and there are about the same number now."¹³⁵

The Center favors industrial consolidation because of the increased economies of scale that it promises to bring. According to the Chief Representative of the European Automobile Manufacturers Association's Beijing office, out of the 100 or so enterprises engaged in auto production, roughly 45 enterprises are producing passenger cars. In his words, "there are too many of them, many of which are locally protected."¹³⁶ This dissertation focuses on the four leading independent automakers, but there are dozens of other independent automakers which produce less than ten thousand cars per year but manage to stay afloat with local support. (See Appendix A for names of the smaller, less well-known independent automakers.)

¹³⁵ Interview 67 with former President of SGM, 27 February 2009.

¹³⁶ Interview 75 with Chief Representative, European Automobile Manufacturers Association Beijing Office, 12 March 2009.

The phenomenal growth in Chinese auto consumption over the last decade has masked the problems inherent in China's fragmented industry. Fears of production overcapacity have not fully materialized because supply has barely been able to keep up with demand. As consumption growth begins to slow, however, there will be enormous pressure for smaller and less efficient automakers to shut down. The question is whether the local officials who support these local automakers will be willing to let them go into bankruptcy or be merged with bigger companies, or whether they will instead choose to keep them afloat through loans from local state-controlled financial institutions. To do the latter could end up being a waste of scarce local resources.

This study of the Chinese auto industry picks up where Eric Thun's study ended. In his highly regarded analysis, Thun (2006) makes a compelling argument about the way in which different local institutional arrangements in China constrain and shape industrial transformation at the level of the firm. Thun offers a useful typology of local development in the Chinese auto sector: the *local developmental state* (e.g., Shanghai), the *laissez-faire local state* (e.g., Beijing and Guangzhou), and the *firm-dominated locality* (e.g., Changchun and Wuhan). In Thun's words, "there is no one-size-fits all development approach, but a mosaic of local patterns within a national framework" (2006:9). Rather the institutional patterns that we see in China are each dominated by the industrial history and politics of that region.

This dissertation does not dispute what Thun accurately characterized as the regional dynamism of China's auto sector development. Rather, this project broadens the range of local development paradigms. Whereas Thun focused on the different types of relationships that exist between local governments and established SOEs, I focus on the new relationships that have emerged between local governments and new automotive enterprises, some of which are privately held, and nearly all of which began with no support from the Center. Whereas the local governments in Thun's analysis were acting more or less in accordance with the Center's auto policies, of which they were often the beneficiaries, my analysis focuses on local governments who have in many ways acted against the Center's policies by supporting new industry entrants.

The distance between independent automakers and the Center has been a blessing in disguise. The lack of official state support has meant that early on in their development, independent firms were ineligible for state-subsidized credit, foreign direct investment, and other forms of policy support. Yet being cut off from state support has forced independent automakers to look for support at the local level, to create a lean and cost-effective organization, and to creatively source parts and technologies from fragmented global production networks and an increasingly sophisticated domestic supply base. The more hands-off partnerships between local governments and independent automakers may be more sustainable over time than the relationships between local governments and traditional SOEs. Independent automakers have relied on local governments for access to certain local resources, but cannot use local governments as a crutch like their traditional SOE counterparts. Over time, what appeared to be disadvantages for independent automakers at the outset have proven to be important sources of their competitive strength.

4.2. TYPOLOGY OF CHINA'S INDEPENDENT AUTOMAKERS

In Chapter One, I defined an “independent” automaker as one which did not initially have financial or policy support from the Center, and hence one which was ineligible for foreign direct investment. Because of the lack of support from the Center, the development of these firms has been distinctly different from that of traditional SOEs. As discussed in Chapter Two, the JV model that was imposed upon traditional SOEs limited their capabilities by making them dependent on their foreign partners. Without the Center’s support or a JV partner, independent automakers had to be very creative in how they accessed land, capital, and technology. As we shall see, local governments have stepped in to make up for the lack of support from the Center.

At least three types of independent automakers have emerged in the Chinese auto industry. Though the business models and strategies of these firms differ in many ways, I focus here on the extent of state ownership because of its effects on access to state financing and hence on firm expansion. Typically, the bigger the ownership stake of the local state, the more state financing the firm has available to it. While unfettered access to cheap state financing can help a firm expand its operations quickly, it can also create soft budget constraints, a tendency toward overexpansion, and low overall profitability.

This finding should not all surprise economists that are skeptical of state ownership, but it does to some extent contradict those China watchers that have in recent years praised the enormous potential of China’s modernized state-owned firms and argued that the ownership structure of these firms will matter much less than the degree of openness they show in their business practices and receptiveness to new ideas.¹³⁷ To be sure, some state-owned firms have been dramatically transformed since their days as factories under the central plan. Chery, one of the independent automakers analyzed in this chapter, is in many ways a very different type of state-owned firm than those that existed five decades ago. Nonetheless, as I discuss below, there remain aspects of state-ownership that can be as much of a burden as they are a benefit.

The first type of independent automaker is the *independent regional SOE*. In this model, the local government is the primary shareholder of the firm and is actively involved in the firm’s daily operations. This model is exemplified by Chery Auto. Local officials in Wuhu City, Anhui Province, founded Chery in 1997 with funds they raised from local financial institutions, and continue to help the firm gain access to state-subsidized loans from large Chinese banks. In 2008, for example, Chery secured RMB 10 billion (US\$1.45 billion) in loans from China’s Export Import Bank to finance its domestic as well as global expansion.¹³⁸ This new type of regional SOE is distinct from the traditional regional SOE, such as SAIC or BAIC, in that the former began without the bureaucratic legacies of the central plan. The independent regional SOE was founded in the reform era and in some ways managed more like a private firm than an SOE. For example, the first and only CEO of Chery, Yin Yongyue, was an experienced engineer

¹³⁷ See for example, Woetzel, J. 2008. “Reassessing China’s State-Owned Enterprises, *The McKinsey Quarterly*, July.

¹³⁸ *Financial Times*, 2008. “Chery gets \$1.5 billion from China Exim Bank,” 8 December. <http://www.ft.com/cms/s/0/ac12daba-c511-11dd-b516-000077b07658.html#axzz1NawIN8HH>. Accessed on 26 May 2011.

hired from FAW-VW, not a local party bureaucrat. And unlike traditional SOEs, Chery was not initially supported by the Center and was ineligible for FDI. As such, it was forced to creatively look for other sources of funding, technology, and production know-how.

However, Chery's early success brought with it attention and praise from the Center, which began to hold up the firm as a model for indigenous innovation. With this praise came greater access to state-subsidized loans. The introduction of soft budget constraints caused the firm to take on a lot of –perhaps too many– overseas projects and new products and ignore profitability. Many industry observers question the long-term viability of Chery's business model and whether the firm can stand alone without state support. Chery is only one of several independent regional SOE.¹³⁹

The second type of independent automaker is the *semi-private automaker*. In this model, the local state is a minority shareholder in the enterprise. While local officials may support the firm through access to land, tax breaks, and procurement contracts, they are not actively involved in the firm's daily operations or financial decisions. The semi-private automaker is exemplified by Great Wall Auto. Although Great Wall claims to be a private firm, it has equity ownership and significant support from the Baoding government.¹⁴⁰ In addition to the forms of local support mentioned above, the local state also facilitates research cooperation between Great Wall and local universities and provides funds for the firm's local environmental projects, such as water recycling at its facilities. Why is the local state so supportive despite being a minority shareholder? According to the firm's management, Great Wall is one of the largest tax payers and employers in Baoding.

Yet there is an important distinction between an independent regional SOE and a semi-private automaker. In the latter, the state is only a minor shareholder and thus either less able or less willing to help the local automaker access state-subsidized finance. Unlike Chery, Great Wall has never taken out a loan from a Chinese bank. Instead, Great Wall has opted to finance its expansion through profits and later through public listings on the Hong Kong Stock Exchange. The company's firmer budget constraint has forced it to expand much more conservatively and to focus on profitability.¹⁴¹ In addition to Great Wall, there are other semi-private automakers.¹⁴²

The third and final type of independent automaker is the *private automaker*. This model, in which the local state is merely a partner rather than a shareholder of the independent

¹³⁹ Anhui Jianghuai is another example of an independent regional SOE. Though its ownership structure is somewhat opaque, it appears that the Anhui provincial government through one of its provincial investment vehicles is the primary shareholder of Anhui Jianghuai. More details can be found in Appendix A.

¹⁴⁰ Interview 56 with Manager of International Marketing and Planning at Great Wall, 3 December 2008.

¹⁴¹ In 2009, Great Wall sold just over 200,000 vehicles, less than half of the number of vehicles sold by Chery. However, Great Wall netted profits of RMB 627 million (USD 92 million) on RMB 11 billion (USD 1.6 billion) in sales, yielding a profit margin of 5.7 percent. These figures come from BNP Paribas automotive research, 2009. <http://www.bnppresearch.com/ResearchFiles/7576/GWM-Dec09.pdf>. Accessed on 30 May 2011.

¹⁴² Like Great Wall, Brilliance Auto, another independent automaker, a convoluted equity structure. It was founded by Yang Rong, a now exiled Chinese tycoon. After a falling out with the Liaoning provincial government, Rong was forced to flee China. The management Brilliance, which is partially listed on the Hong Kong Stock Exchange, was taken over by the Liaoning government following Rong's exit. The extent of Liaoning province's equity stake is unclear.

automaker, is exemplified by BYD and Geely. Despite the lack of equity ownership, municipal officials in Shenzhen and Hangzhou have helped BYD and Geely respectively by giving them access to many of the local resources mentioned above, including but not limited to: tax breaks, inexpensive land leases, and government procurement contracts. Whereas Great Wall likely received some start-up capital from the Baoding government, BYD and Geely’s founders initially had to rely on capital generated from its other businesses. BYD’s primary business is the production of lithium ion batteries for cell phones, which has been very profitable. Prior to entering the car business, Geely was producing motorcycles. These three firms are nonetheless similar in that they did not have unlimited access to state-subsidized finance and have had to be much more focused on their bottom lines than Chery.¹⁴³ Table 4.1 depicts these three types of independent automakers.

Table 4.1 Typology of China’ Independent Automakers

Type of Independent Automaker	Level of local state-ownership	Level of financial support from the local state	Implications for firm strategy	Examples
Independent State-Owned Automaker	High	Easy access to state-subsidized credit	Soft budget constraint leads to overexpansion and low profitability	Chery Auto, Anhui Jianghuai
Semi-Private Automaker	Low	Some access to start-up capital but not to state-subsidized credit	Firmer budget constraint leads to more conservative expansion and higher profitability	Great Wall Auto, Brilliance Auto
Private Automaker	None	Least access to state-subsidized credit	Hard budget constraint leads to creative foreign financing and higher profitability	BYD, Geely, Lifan

Note: Additional information about other independent automakers like Anhui Jianghuai, Brilliance Auto and Lifan can be found in Appendix A.

The exact form of cooperation between local governments and independent automakers varies considerably from one case to the next, with varying consequences for firm level strategy. In each of the cases presented below, local state support has been indispensable to the ability of independent automakers to gain access to local resources like land and production licenses.

4.3. CASE STUDIES OF CHINA’S FOUR LEADING INDEPENDENT AUTOMAKERS

The fact that nearly all independent automakers came into existence in the late 1990s is not a coincidence. This dissertation has argued that their emergence was made possible by a

¹⁴³ In 2009, Geely posted a net profit of RMB 1.3 billion (USD 191 million). That same year, BYD posted a net profit of RMB 3.5 billion (USD 514 million) across all of its businesses. The company does not break down its auto profits separately. Both of these figures were reported in *Caixin Online*, 2011. “Part II: Red Ink No Problem for Subsidized Chery Auto.” 13 January. <http://english.caing.com/2011-01-13/100216509.html>. Accessed 28 May 2011. The RMB to USD conversion was based on the exchange rate on December 1st, 2009 of RMB 6.80 to USD 1.00.

serendipitous confluence of factors, including: the failed transformation of traditional SOEs, the support of ambitious local governments, an expanding Chinese middle class, increased investment by global suppliers, and China's integration into global capital markets. The following sections explain how China's four leading independent automakers took advantage of these new opportunities. Each case study will show how independent automakers used access to local and foreign resources to compensate for their lack of financial support from the Center. BYD, Chery, Geely and Great Wall were selected as case studies because they are the four leading independent automakers in terms of passenger cars sold per year. Their respective market shares are presented in Table 4.2 below. These firms also exemplify each of the three types of enterprises mentioned in the typology above.

Table 4.2 China's Four Leading Independent Automakers

Independent Automaker	Type of Independent Automaker	Head Quarters	First Year of Auto Production	Passenger Car Market Share in 2009
Chery Auto	Independent Regional SOE	Wuhu, Anhui Province	1999	5.0%
Great Wall Auto	Semi-Private Enterprise	Baoding, Hebei Province	1996	1.8%
Geely Auto	Private Enterprise	Linghai, Zhejiang Province	1998	2.9%
BYD Auto	Private Enterprise	Shenzhen	2003	5.1%

Sources: Company websites, *Automotive Resources Asia* (2009)

The order of the four case studies to follow reflects the order of the firms presented in Table 4.2. Thus, we begin with Chery, the firm with the greatest regional state-ownership.

4.3.1. CHERY AUTO: AN INDEPENDENT STATE-OWNED AUTOMAKER

Chery has been held up as an example of the modern state-owned enterprise. Chery was founded by an ambitious and risk-taking local government in a rather remote and poor part of China. Without support from the Center, the founders of Chery had to make the best out of local resources, the country's growing automotive supply chain, and increased access to global sources of technology and capital.

Chery¹⁴⁴ was founded in 1997 by the Wuhu municipal government in Anhui Province. With a population of roughly 2 million, Wuhu is a small city by Chinese standards and did not have an established local automotive industry. Local officials hoped that a local automaker could prop up local economy, which had historically seen little industrial development. Because the start-up was unable to secure foreign investment, local officials looked to local state-owned investment companies for the initial capital of RMB 1.75 billion (USD 210 million)¹⁴⁵. Yin Yongyue, Chery's CEO, has said that "being independent or self-reliant" was not really what the

¹⁴⁴ In Chinese, the company is called *Qirui* (奇瑞), meaning happy or cheerful. The company's English name was supposed to be Cheery, but somewhere along the way, an "e" was accidentally dropped and the company became known as Chery, pronounced like the fruit. No one at the firm bothered to correct the mistake.

¹⁴⁵ The RMB to USD conversion was based on the exchange rate in 1997 of RMB 8.31 to USD 1.00.

firm meant to achieve. According to Yin, the firm hoped to find a “sugar daddy,” local or foreign, but did not succeed in doing so because of its small size and lack of support from the central government.¹⁴⁶ Table 4.3 below shows the equity ownership of Chery at its founding. Compared to traditional SOEs, Chery’s ownership structure is quite diversified.

Table 4.3: Ownership Structure of Chery at the Company’s Inception (1997)

Shareholder	Percentage Ownership
Wuhu Construction Investment Company, Ltd.	40.18%
Anhui Innovation Investment Company, Ltd.	33.89%
Anhui Investment Group, Ltd.	18.59%
Wuhu Economy and Technology Development Zone Company	5.56%
Anhui Guoyuan Investment Trust Company, Ltd.	1.78%

Source: Mizuho Financial Group internal document on Chery (2007)

The local government hired Yin soon after the company was established. Recognizing their own management and engineering limitations, Wuhu officials sought a manager with significant experience in the auto industry. Prior to joining Chery, Yin worked as a senior engineer at FAW-VW for twelve and a half years. He even had the opportunity to travel to Pennsylvania in the early 1990s to help oversee the disassembly of a Volkswagen plant, which was then reassembled at FAW’s headquarters in Jilin Province.¹⁴⁷ Yin later headed the plant and the engineering group in charge of the chassis for Chinese production of the Volkswagen Jetta. Yin’s success at FAW-VW caught the attention of Wuhu officials in 1995 who asked him to join the start-up as its CEO.

Given Yin’s experience at FAW-VW, it was not a coincidence that Chery’s first car, the 1999 *Fengyun* sedan, was essentially a copy of FAW-VW’s Jetta and incorporated interchangeable VW parts. Yin went to FAW-VW suppliers he had worked with in the past and asked them to produce extra Jetta parts for the production of the *Fengyun*, to the extent that some of the parts were revealed to be original Jetta parts and even carried the VW logo. Though VW eventually discovered that Chery had misappropriated its intellectual property (IP), the German firm did not pursue a lawsuit. The *Fengyun* sold well because it resembled the very popular VW Jetta, but was priced much more affordably.

Chery’s first factory incorporated machines and engine technology purchased from Ford Europe for USD 25 million in 1996. According to one Ford executive interviewed for this study, the company did not realize at the time that it was equipping a future competitor. Ford was just “happy to sell the outdated machinery for cash”.¹⁴⁸ Chery also purchased sections of an auto assembly plant from Spanish automaker SEAT and reassembled them in Wuhu.

In the traditional integrated and sequential model of production, it can take five to seven years to develop a new model from concept and bring it to mass production. In the case of Chery,

¹⁴⁶ Gao, P. 2008. “Interview with Chairman and CEO”, *The McKinsey Quarterly*, May. “Sugar daddy” were, in fact, Yin’s own words.

¹⁴⁷ Roberts, D., 2008. “The Driving Force Behind China’s Chery,” *BusinessWeek Online*, July 11.

¹⁴⁸ Interview 21 with a Ford Executive in Shanghai, (7/24/ 2008).

a nascent automaker had managed to not only set up its factory, but to produce its first model within two years of the company's inception. IP violations notwithstanding, Chery's bootstrapped model is impressive from an entrepreneurial perspective.

One of Chery's biggest challenges in the late 1990s was that it was registered as a car parts supplier rather than an assembler. At the time, the Center's policy was to rigidly limit the entry of new automakers. Under these rules, Chery was unable to obtain a license to sell their cars and was in fact illegally selling its *Fengyun* in the local market. To solve this problem, Chery negotiated a deal in 2001 with SAIC to buy a 20 percent stake in the company, an arrangement which allowed Chery to use SAIC's national passenger car production license. However, friction increased between SAIC and Chery when the latter began to see dramatic sales growth, to the frustration of SAIC's two JV partners, Volkswagen and GM.

The tension between Chery and foreign automakers intensified when Chery introduced a well-received compact model – the QQ – which triggered an intellectual property dispute with GM over the QQ's striking similarity to its own Chevrolet Spark (also known as the Daewoo Matiz). Chery vehemently denied the charge. To further add insult to injury, the cheaper QQ was outselling its Spark rival three to one in the Chinese market. Although GM complained to government officials in Beijing and tried to sue the company, Chinese authorities took no action against Chery and GM eventually dropped the lawsuit to maintain goodwill with the government.¹⁴⁹ Nonetheless, as a result of the dispute, SAIC divested itself from Chery in 2003. Soon thereafter, the Chinese government granted Chery a legal license to produce and sell passenger cars in China.

Despite Chery's early reputation as a “copycat automaker” selling poor quality cars, the firm hoped to distinguish itself as an innovative automaker. Due to its lack of in-house engineering capabilities, Chery decided to reach out to a number of foreign suppliers. AVL of Austria, one of the world's largest developers of powertrain systems, was one of Chery's early foreign partners. The powertrain includes the engine and the transmission, the most sophisticated and expensive system in a gasoline-powered car. AVL has technical centers in 17 locations around the world, including in Germany, France, Sweden, UK, USA, Korea, and Shanghai.

AVL and Chery worked closely together to design the ACTECO series of engines for Chery cars, the first of which was launched in 2005. The engines range in size from 800 cc to 4.0 L with architectures including a straight-4 and V8. These engines are compliant with Euro emission standards, which China had decided to adapt for the Chinese market. The engines use advanced technologies such as aluminum alloy cylinder blocks and heads and direct fuel injection. Without this partnership, Chery would not have been able to on its own produce cars with such sophisticated engines. Notably, the IP for the ACTECO engines is owned by Chery.

By working closely with foreign suppliers like AVL, Chery has been able to sidestep investment in extensive R&D capabilities internally. As mentioned in Chapter Three, foreign

¹⁴⁹ Tierney, C., 2005. “Chinese carmaker ambitious, controversial,” *The Detroit News*, 2 January.

suppliers were investing in China to service their global customers and increasingly willing to work with what could emerge as China's Toyota. Table 4.4 below presents a long but by no means exhaustive list of Chery's technology partnerships with foreign firms. As Table 4.4 shows, several global suppliers have set up joint ventures with Chery in Wuhu to supply the company's nearby assembly plants, a testament to their confidence in the future of Chery.

Table 4.4: Partial List of Chery's Foreign Technology Partnerships

Foreign Firm (country of origin)	Type of Partnership	Brief Description of Cooperation
ArvinMeritor (USA)	Formed joint venture	Co-built a manufacturing plant in Wuhu to produce chasses
AVL (Australia)	Hired for design services	Co-designed the ACTECO engine series released in 2005
BOGNOR (Uruguay)	Formed joint venture	Co-designed a series of bulletproof Chery models in 2007
Johnson Controls (USA)	Formed joint venture	Co-built a manufacturing plant in Wuhu to produce seats for Chery plants
Pininfarina (Italy)	Hired for design services	Co-design new Toyota Yaris-like model to be launched in 2010
PPG Industries (USA)	Formed joint venture	Produce automotive coatings for Chery plants in Wuhu
Ricardo (UK)	Hired for design services	Co-designed new hybrid A5 launched in late 2008
Torino Design (Italy)	Hired for design services	Co-designed the Chery's series of small cars released in 2008
Tower Automotive (USA)	Formed joint venture	Supply structural suspension components to Chery plants

Sources: Company websites, *Automotive News China* website.

Chery has also proven to be quite market-savvy, at least with respect to first-time car buyers in second and third tier markets. The company has employed innovative marketing tactics, such as encouraging their customers to decorate their QQ's and then asking other consumers to vote online for their favorite design. Chery's customers can choose from a bevy of bright and cheerful colors for the QQ, one of the reasons why the car attracts young Chinese female professionals. Chery's QQ series outsold the Chevrolet Spark largely because of its closer connection to young consumers in second and third tier urban markets and its lower prices.

Yet Chery's business model also has its shortcomings. As mentioned earlier, the firm's profitability is low.¹⁵⁰ Yet the firm's low profitability has not hindered its domestic and global ambitions. In addition to its two assembly plants, a transmission plant, an automotive engineering research institute, and an automotive planning and design institute, Chery has built

¹⁵⁰Several sources throughout the industry from journalists to executives at competing automakers have suggested that Chery is not profitable. A former executive for a private equity investor in Chery said that the automaker loses money on each vehicle. Caixin Online, 2011. "Part I: For Chery, Deep Pockets Stall IPO Progress." <http://english.caing.com/2011-01-13/100216484.html> . Accessed on 30 May 2011. Separately, a journalist interviewed for this study claimed that Chery only makes RMB 500 (US\$73) in profit per QQ car it sold. Interview 51 with *Automotive News China* journalist, 23 November 2008.

assembly plants in Egypt, Thailand, Uruguay, Indonesia, Iran, Russia, Ukraine, and Malaysia. It has also announced that it will expand into Brazil, Nigeria, and the Philippines. Although it is unclear whether Chery is selling cars profitably in these countries, it has for the last eight years been China's leading exporter of passenger cars. According to the firm's website, the company has exported more than 230K cars since its inception.¹⁵¹

How has Chery funded its ambitious overseas expansion? The central government has recognized Chery as an up and coming domestic automaker. Considered by many Chinese leaders to be the new state-owned darling of the auto industry, Chery has been able to tap into financing from state-owned financial institutions. Table 4.5 below lists some of the biggest loans and export credits extended to Chery, though the firm has not tapped all of the funds.

Table 4.5 Partial List of Loans to Chery by Chinese State-Owned Financial Institutions (2008-2011)

Year	State-Owned Financial Institution	Amount of Approved Financing	Type of Financing
2004	China Development Bank	RMB2.4 billion (USD 290 million) ¹⁵²	Loan
2005	China's Export and Import Bank	RMB5 billion yuan (US\$619 million) ¹⁵³	Export Credit
2006	China Development Bank	RMB5.8 billion (USD 740 million) ¹⁵⁴	Loan
2008	China's Export and Import Bank	RMB10 billion (USD 1.45 billion) ¹⁵⁵	Loan
2009	Bohai Industrial Private Equity	RMB 500 million (USD 73 million) ¹⁵⁶	Equity Investment
2011	China Development Bank	RMB 43 billion (USD 6.32 billion) ¹⁵⁷	Loan

Source: Company websites, various news websites, bank websites.

As can be seen from Table 4.5, the amount of funds Chery has been able to secure has been growing very rapidly. In 2011, the company has been able to secure nearly ten times the amount of financing it secured in 2004 from China Development Bank. According to the China Development Bank's *2006 Annual Report*, "The funding support from the Bank to help Chery build a national automobile brand not only satisfied Chery's need for funds for its rapid development, but boosted confidence of the government, Chery and other domestic financial institutions in promoting key Chinese brands."¹⁵⁸

However, there are dangers of developing a cozy relationship with state-owned banks. Chery, once a bootstrapped and cost-sensitive start-up, has in less than ten years become a large state-owned firm with ambitious domestic and international expansion plans. If Chery can

¹⁵¹ Chery website. <http://www.cheryinternational.com/node/857> . Accessed on 1 June 2011.

¹⁵² The RMB to USD conversion was based on the exchange rate in December 2004 of RMB 8.27 to USD 1.00.

¹⁵³ The RMB to USD conversion was based on the exchange rate in December 2005 of RMB 8.07 to USD 1.00.

¹⁵⁴ The RMB to USD conversion was based on the exchange rate in December 2006 of RMB 7.83 to USD 1.00.

¹⁵⁵ The RMB to USD conversion was based on the exchange rate in December 2008 of RMB 6.89 to USD 1.00.

¹⁵⁶ The RMB to USD conversion was based on the exchange rate in December 2009 of RMB 6.82 to USD 1.00.

¹⁵⁷ The RMB to USD conversion was based on the exchange rate in December 2011 of RMB 6.80 to USD 1.00.

¹⁵⁸ China Development Bank, *2006 Annual Report*, <http://www.cdb.com.cn/english/NewsInfo.asp?NewsId=1927>

effectively build up its internal R&D capabilities, move up the value chain to more expensive cars, and create higher profits, then a higher cost structure could be justified. However, so far, these goals seem elusive. Although Chery reported RMB 20.7 billion (USD 3 billion) in revenues in 2009, its net profit was only RMB 66 million (USD 9.7 million), yielding a profit margin of 0.3 percent.¹⁵⁹ Many industry experts believe that Chery spends too much on a largely ineffective R&D campaign which, in turn, has led to a product line that is too diverse. The company offered no less than 16 models in 2009, a very large number given that Chery sold only 500,300 vehicles that year. Meanwhile, the company's net asset yield has fallen, hitting a low of 1.39 percent in 2009 compared with 9 percent in 2008 and 25 percent in 2007.¹⁶⁰

Whereas the Center was at first hesitantly supportive of Chery, it now publicly praises the company as a national leader in indigenous innovation. The more praise the firm receives, the more money state-owned banks and other financial institutions are willing to lend. The danger of the Center's heightened enthusiasm and Chery's increasingly soft budget constraint may be leading to moral hazard and an overly risky investment strategy. As Rather than becoming a new and innovative state-owned automaker, Chery may risk becoming "too big to fail". It is no accident that the company's website has a page called "Leadership Care" (*lingdao guanhuai*) which showcases photos of thirty or so Politburo level or ministerial dignitaries who have visited the company. The photos are arranged by current political rank, not by the date of the visit, with President Hu Jintao coming up first.¹⁶¹ As one prominent Chinese news site has noted, "political leverage means survival for many Chinese enterprises."¹⁶²

Nonetheless, for the time being, Chery's raw sales figures remain impressive. As of November 2010, Chery was the 5th largest manufacturer in China and the largest of the four independent automakers, producing 604,169 vehicles. Its year-on-year growth rate of 37 percent is impressive, except when compared to that of Great Wall Auto. We now turn to Great Wall Auto, a firm which has state support but continues to be managed and run independently of state intervention.

4.3.2. GREAT WALL AUTO: CHINA'S SEMI-PRIVATE AND LEADING PRODUCER OF SUVs

Great Wall Auto is China's leading SUV and pickup truck maker. It is headquartered in Baoding, Hebei Province, in northern China. Although it claims to be a privately held firm, it began as a collective enterprise with close ties to the local government.¹⁶³ Great Wall is an example of the hybrid ownership enterprises that have emerged in the reform period which blend

¹⁵⁹ These figures were reported in Caixin Online, 2011. "Part II: Red Ink No Problem for Subsidized Chery Auto." 13 January. <http://english.caing.com/2011-01-13/100216509.html>. Accessed 28 May 2011. The RMB to USD conversion was based on the exchange rate on December 1st, 2009 of RMB 6.80 to USD 1.00.

¹⁶⁰ These figures were reported in Caixin Online, 2011. "Part I: For Chery, Deep Pockets Stall IPO Progress" 13 January. <http://english.caing.com/2011-01-13/100216509.html>. Accessed 28 May 2011.

¹⁶¹ Chery's Chinese website. http://www.chery.cn/web/zjqr/lcgg_jsp_catid_908.html. Accessed 1 June 2011.

¹⁶² Caixin Online, 2011. "Part III: What's under Chery's red hat?" 14 January. <http://english.caing.com/2011-01-14/100216895.html>. Accessed 1 June 2011.

¹⁶³ Collective enterprises are technically autonomous from the formal government hierarchy, though in practice important decisions must be approved by government and party officials at the township and county levels (Naughton 2007:119).

the benefits of state and private ownership. Despite several public listings on the Hong Kong Stock Exchange, the Baoding government continues to own a minority stake in the firm.

Great Wall has received little support from the Center, though it does get some support from local officials, including tax benefits and access to local land. The Baoding government also purchases some Great Wall cars for its local fleet, as well as facilitates technical cooperation between the firm and local universities. According to the firm's management, Great Wall is one of the largest tax payers in the region.¹⁶⁴ Yet the Baoding government would eventually professionalize the company's management.

Great Wall Auto's predecessor, the Great Wall Industry Corporation, was founded in 1976 as a local collective whose main business was tractor service and repair for farmers. In the late 1980s, when the collective was on the verge of bankruptcy, it hired Wei Jianjun to become its general manager. Wei came from a military background but also spent a number of years working at various state-owned enterprises. Wei has been responsible for turning around Great Wall's business and famously coined the company's famous Chinese motto, *meitian jinbu yidiandian*, meaning "a little progress every day". Under Wei's leadership, the company expanded into auto parts and eventually into auto assembly.

In 1990, the collective was restructured into Great Wall Auto Company. Wei became a major shareholder alongside the local township-level government, the original owners of the collective.¹⁶⁵ After the restructuring, Wei traveled to the U.S. and Thailand where he witnessed the great commercial success of the pickup truck.¹⁶⁶ Upon his return to China, Wei began to aggressively develop the company's first pickup truck. In 1996, the company launched the very successful Deer series pickup truck, a copy of a small Toyota pickup. The Deer created a new pickup truck market in China, a market segment which did not previously exist. In 1998, the company became the leading pickup truck maker in China and has held that title until today.

In 2002, Wei went back the U.S. and saw tremendous potential for an SUV market in China. That same year, GW launched the Safe SUV, which was a copy of the very popular Toyota 4Runner. Like Chery, Great Wall saved a lot of money on R&D costs by "borrowing" IP from foreign firms. Both the Deer pickup and the Safe SUV sold for roughly RMB 88,800 in the 1990s (~USD 10,000)¹⁶⁷, a fifth of the cost of an imported Toyota 4Runner.¹⁶⁸ For many years, Great Wall was China's largest SUV maker. But in recent years, Great Wall's status as the top SUV maker was overtaken in 2008 by the Honda CR-V produced by the Guangzhou Honda joint venture. Nonetheless, Great Wall's total SUV unit sales have continued to grow as the SUV market as a whole has surged. In 2010, sales of the Great Wall Hover SUV grew 88 percent year-on-year compared to sales of the Honda CR-V which grew 33 percent year-on-year.¹⁶⁹

¹⁶⁴ Interview 58 with Great Wall Manager, 3 December 2008.

¹⁶⁵ The exact breakdown of ownership is unclear.

¹⁶⁶ This account of Great Wall's corporate history is from Interview 56 with a Great Wall manager at the company's Baoding headquarters, (12/3/2008).

¹⁶⁷ The exchange rate in the mid-1990s was RMB 8.30 to USD 1.00.

¹⁶⁸ Great Wall's alliterative Chinese marketing slogan was *bawanbaqianba*, *SAFE kaihuijia*, meaning "for 88,800 you can drive home a SAFE SUV."

¹⁶⁹ Automotive Resources Asia, 2010. *China Automotive Monthly Market Trends*, December.

Due to the company's history of "borrowing" foreign designs, Great Wall has faced IP infringement disputes. In December 2006, Fiat claimed that Great Wall's new GW Peri mini-car was an exact copy of Fiat's popular second-generation Panda car. On July 16, 2008, a Turin court upheld Fiat's claim and banned Great Wall from importing the GW Peri into Europe. Fiat also attempted to sue Great Wall in China, though to no avail. The Shijiazhuang Intermediate People's Court dismissed Fiat's claim that Great Wall had infringed upon its patent, and instead ordered Fiat to pay the court fees of RMB 8,800 (USD 1,279) in 2008.¹⁷⁰ Since the Panda was one of Europe's best selling mini-cars, it is not surprising that Fiat put so much effort into preventing the GW Peri from entering the European market.

Yet Great Wall's problems with Fiat have not stopped the Chinese automakers from expanding aggressively in Italy and across Europe. Currently, the company sells both its Hover SUV and its Wingle pickup in Italy, and plans to begin exporting its Voleex compact car to Italy in 2011.¹⁷¹ The Voleex will be built in Bulgaria, where Great Wall has invested in an assembly plant. The company also has assembly plants in Russia, Vietnam, Indonesia, Iran, and Egypt, and has announced plans to launch similar plants in the Philippines and Malaysia in coming years. All new models are designed to European emissions standards in order to speed their approval for sale in Europe. The manager interviewed for this study indicated that Great Wall has an ambitious goal of becoming China's top exporter and to export one vehicle for every vehicle it sells in China. In 2008, Great Wall was the country's second largest exporter behind Chery.

Though it has been marred by claims of IP infringement in the past, Great Wall is rapidly developing its own platforms by partnering with a number of foreign suppliers to move beyond rote imitation and design new platforms. Great Wall buys engines from Mitsubishi, anti-locking brake systems from Bosch, and a number of electronic components from Siemens.¹⁷² All of the parts are purchased from the joint ventures and wholly-owned Chinese subsidiaries of these suppliers or developed through joint technology partnerships. For instance, Great Wall worked closely with Bosch to design a sophisticated common rail system diesel engine for its Hover SUV, which has sold very well.¹⁷³ Bosch did not charge Great Wall upfront for the design consulting, but it Great Wall does have to buy some of the core technology components from Bosch, such as those parts related to the engine's fuel injection system. According to a Great Wall manager interviewed for this study, 30 to 40 percent of the company's five hundred suppliers are foreign firms with operations in China.

Great Wall is also expanding its internal R&D capabilities by hiring global talent. Among its two thousand technical staff, about thirty to forty are foreigners, mostly from Korea and Japan. These foreigners bring with them years of experience and know-how. Great Wall

¹⁷⁰ *Reuters*, 2008. "Great Wall Says Fiat Claim Dismissed by China Court." July 28. <http://uk.reuters.com/article/idUKL863413920080728c>. Accessed on 1/3/2011. The RMB to USD conversion was based on the exchange rate in December 2008 of RMB 6.88 to USD 1.00.

¹⁷¹ *Automotive News China*, 2010. "Great Wall to Export Sedans to Italy in 2011." December 14. <http://www.autonewschina.com/en/article.asp?id=6257>. Accessed on 1/4/2011.

¹⁷² *Ibid.*

¹⁷³ A common rail system reduces engine noise and exhaust emissions.

proudly claims that its new factory in Baoding is modeled on the Toyota just-in-time supply chain management system.¹⁷⁴

Great Wall has a reputation of being one of the best managed automakers in China.¹⁷⁵ According to the company's management, Great Wall has never taken out a loan and has instead chosen to raise capital from global capital markets. The company's expansion has been completely driven by profits and its 2003 and 2007 listings on the Hong Kong Stock Exchange. The company has raised an impressive US\$427 million dollars, a testament to foreign investors' confidence in the company's future. Table 4.6 below shows the equity structure of Great Wall. Despite its public listings, the company keeps a large cash stockpile and continues to expand conservatively compared to Chery. Unlike Chery, Great Wall does not have a virtually unlimited credit limit with state-owned banks.

Table 4.6 Equity Structure of Great Wall Auto (2008)

Percentage of Ownership	Shareholder
46%	Wei Jianjun, Chairman of the board
30%	Publicly-held shares that are traded on Hong Kong Stock Exchange
34%	Baoding municipal government

Source: Author Interviews.¹⁷⁶

According to the firm's management, Great Wall is famous for its cost control and culture of anti-corruption. The company recycles a lot of metal scraps in its factories, generating about RMB 20M per year. It does not have to pay any interest payments on debt. It does not pay large salaries or pensions, nor does it offer management a lot of perks. The company's top executives famously eat in the cafeteria every day alongside assembly workers. Because of its just-in-time system, it does not need a lot of working capital to finance parts inventory. Great Wall is also known for its strict oversight of purchasing managers. In traditional SOEs, purchasing managers are famous for kickbacks from suppliers for guaranteed contracts. At Great Wall, purchasing managers are penalized and even fired if caught taking kickbacks.¹⁷⁷ Employees are forbidden to attend big banquets hosted by suppliers and to accept gifts from suppliers.

¹⁷⁴ I have visited this factory and it is very impressive. I saw the Japanese style *kanban* boards hanging from the ceiling. Not only was there modern and automated production equipment from the U.S., Japan, and Germany, the company installed a state-of-the-art crash test facility in 2008. The Great Wall manager accompanying me on the tour told me that its crash test center was the longest (215 meters) and one of the most sophisticated in China. While one might reasonably expect all carmakers to have modern crash test facilities, I have been told that many of the independent automakers do not.

¹⁷⁵ This view was corroborated by Interview 83 with ex-VW executive (4/13/2009); Interview 76 with Ex-Chrysler executive (3/14/2009); Interview 60 with Chrysler executive, (12/18/2008).

¹⁷⁶ Interview 56 with Great Wall Manager, 3 December 2008.

¹⁷⁷ During my visit, I noticed placards placed prominently on conference room tables clearly stated the company's policy on corporate graft. Any suppliers caught giving kickbacks to Great Wall employees would be fined and potentially removed from the preferred supplier list. Employees caught taking kickbacks would be severely punished and even fired.

Equally unusual is the fact that Great Wall has a young female CEO, Wang Fengying.¹⁷⁸ She became CEO in 2002 and has one of the longest tenures among the company's executives, save for Mr. Wei, who continues to be the chairman of the board. Wang has played a pivotal role alongside Wei in growing the company from one focused narrowly on pickup trucks to one that has expanded successfully into SUVs and passenger vehicles.

In 2010, Great Wall was ranked the 14th best-selling brand in China and 4th among the independent automakers. It sold 249,130 vehicles through November 2010, an increase of 90 percent from the previous year. In fact, its growth rate was the fastest of any manufacturers in the top twenty, including joint ventures.¹⁷⁹ Though its sales figures have been less than other independent automakers, it is slowly catching up. Great Wall has been relatively conservative and has opted to patiently grow its business. That strategy appears to be paying off. At an industry forum in September 2010, Wei said, "We have stressed to be focused, focused, and even more focused."¹⁸⁰

Great Wall's low-cost business model, financial conservatism, and export orientation may prove to be long-term competitive advantages. Though the Baoding government is a shareholder in the company and provides access to local resources, local officials do not appear to be as involved in the company's daily affairs and finances, especially compared to Chery.

4.3.3. BYD AUTO: CHINA'S ASPIRING PRODUCER OF ALL-ELECTRIC CARS

BYD Auto is the youngest of the four leading independent automakers, as well as one of the few truly private Chinese automakers. The following discussion will reveal how BYD went from being China's leading cell phone battery producer to one of its fastest growing automakers. Four years after BYD produced its first car in 2005, the company was producing the best-selling car in the Chinese domestic market. As we shall see, even though BYD does not have any state ownership, it benefitted greatly from close partnerships with local governments.

In 1995, Wang Chuanfu founded BYD Company in Shenzhen city in southern China. Though the company's name at first had no special meaning, Wang would joke from time to time that the acronym stood for "brings you dollars."¹⁸¹ Today, the company claims that the acronym BYD stands for "build your dreams." The company's primary business was manufacturing batteries for the world's leading cell phone manufacturers. In building this business, Wang learned a lot about manufacturing and the assembly of consumer products. By 2002, BYD had become the supplier of half the world's cell phone batteries and China's largest manufacturer of rechargeable batteries. That year, the company raised US\$200 million on the Hong Kong Stock Exchange in its first IPO. Wang has since become one of the country's wealthiest and most famous entrepreneurs.

¹⁷⁸ Wang was 39 years old in 2010.

¹⁷⁹ Automotive Resources Asia, 2010. *China Automotive Monthly Market Trends*, December.

¹⁸⁰ Yang, J. 2010. "Why Great Wall Will Outshine its Chinese Rivals." *Automotive News China*. December 24. <http://www.autonewschina.com/en/article.asp?id=6306>. Accessed on 1/4/2011.

¹⁸¹ Huckman, R. and MacCormack, A. 2007. "BYD Company, Ltd.," Harvard Business School Case, 9-606-139, Revision 23 July.

After BYD's successful IPO, Wang began to contemplate the next stage of the company's growth. Though skeptics frowned upon the idea of a battery manufacturer becoming an automaker, Wang thought it might make sense. Wang was intrigued by the potential of applying BYD's lithium ion battery technology to develop an all-electric car. Though early electric cars failed in places like the U.S. due to high prices, Wang believed the real potential of the electric car would come from using newer technology, assembling it cheaply, and then selling it to a population whose lifestyles were suited for short trips. Wang sought to apply his deep knowledge and experience in modular electronics production to automotive production. In his view, assembling a car should not be drastically different from assembling a cell phone. Nonetheless, Wang realized that in order to enter the electric car business, it would be necessary to first understand traditional automotive technologies, production processes, and the domestic marketplace.

To that end, Wang made a bold move to acquire Shaanxi Qinchuan Auto Company Limited, a failing regional SOE, in 2003. Although the Center strongly discouraged new entrants into the auto sector, provincial officials were all too eager to sell its non-performing assets to a private firm that could revamp the local auto industry. With Qinchuan's coveted production license and its factory in Xi'an, Wang was able to quickly establish BYD Auto with relatively little investment. Wang paid roughly RMB250 million (USD 30 million)¹⁸² for Qinchuan, which was a bargain for the land, the factory, and the license to produce. But the equipment and assembly lines at Qinchuan's plant were in a dilapidated state and provided little capacity for expansion. Turning this backwards plant into a world-class production facility capable of producing hundreds of thousands of vehicles per year would require significant investment. Fortunately, BYD had cash on hand from its 2002 stock offering.

In 2005, BYD Auto launched its first car, the F3 compact sedan, just two years after BYD Auto was established. Like the early models of other independent automakers, the F3 was an imitation of successful foreign car. In this case, BYD modeled its F3 on the Toyota Corolla. Most of the parts for the F3 are interchangeable with those of the domestically produced Corolla. Not only did BYD get away with stealing Toyota's IP without paying licensing or royalty fees, it bypassed having to invest hundreds of millions of dollars designing its own cars from scratch. BYD also saved on time and R&D costs by buying off-the-shelf components. The BYD F3 features a Mitsubishi-made engine and five-speed transmission, along with Bosch-produced ignition and fuel injection systems.¹⁸³

The F3 sedan is assembled at BYD's Qinchuan plant in Xi'an. As seen in Table 4.7 below, this model has done extremely well and was the top selling compact car in 2009, exceeding the compact car sales of the GM, Hyundai, and Volkswagen joint ventures. BYD's success has largely been due to its low price point. In 2009, the basic F3 was priced as low as RMB 56K (~USD 8K), while the base Toyota Corolla was priced at RMB 128K (~USD 18K).¹⁸⁴

¹⁸² The RMB to USD conversion was based on the exchange rate in December 2003 of RMB 8.27 to USD 1.00.

¹⁸³ It has recently been announced that BYD will soon start building its own engines. In any case, using off the shelf components enabled the company to get a head start on producing cars without in house engine know-how.

¹⁸⁴ Prices quoted in Automotive Resources Asia, 2009. *China Automotive Monthly Market Trends*, December.

Not only did BYD keep its production costs low by pirating Toyota's IP, but it offered the F3 in only two colors (black or grey) and with a smaller engine (i.e., 1.5L versus 1.6L). And while the BYD F3 is not as well-built or reliable as Toyota Corolla, it is very affordable for Chinese consumers that have little disposable income and are buying a car for the first time. Perhaps unsurprisingly, the F3 sales grew 110 percent in 2009 while Corolla sales fell by 5 percent.

Table 4.7 Compact Car Sales of Leading Models in China (2009)

Company	Model	Price ¹⁸⁵	Unit Sales in 2009	Year-on-Year Growth
BYD	F3	RMB 56K-87K (USD 8K-12K)	287,711	110%
Shanghai GM	Buick Excelle	RMB 100K-150K (USD 15K-22K)	241,153	37%
Beijing Hyundai	Elantra Yuedong	RMB 100K-130K (USD 15K-19K)	239,449	179%
FAW-Volkswagen	Jetta	RMB 75K-102K (USD 11K-15K)	224,857	11%
Beijing Hyundai	Elantra	RMB 90K-127K (USD 13K-18K)	171,605	46%
Tianjin FAW Toyota	Corolla	RMB 128K-173K (USD 18K-25K)	157,457	-5%

Source: Automotive Resources Asia (2009)

Besides low R&D investment, BYD has contained its operational budget by focusing on a relatively small product portfolio that contains only three main models: the F0 sub-compact, the F3 compact, and the F6 luxury sedan. This strategy has served the company well by limiting the number of parts it must source and by preventing customer confusion about its products in the marketplace. Of all the independent automakers, BYD is the only one to have achieved significant scale in a single product (i.e., 200K per year). According to industry insiders, the company has also saved money by employing more human labor in place of expensive automated production equipment in its factories.¹⁸⁶

In just a few years, BYD has expanded rapidly across China. BYD company as a whole boasts over 130K employees and over four hundred auto dealers.¹⁸⁷ BYD has set up an impressive R&D center in Shanghai that employs roughly three thousand personnel and obtains over five hundred patents every year. BYD Auto has also set up a automobile campus in Shenzhen, with total production capacity of 300K units, as well as a second R&D center. The firm is also expanding its sales network into other emerging markets such as Russia, Iran, Angola and Portugal. BYD claims to sell product to more than 70 countries.

Like Great Wall, BYD has not been privy to state-subsidized credit and has instead turned to global capital markets, including foreign stock exchanges and foreign private equity. In addition to the money it raised on the Hong Kong Stock Exchange in 2002, the company

¹⁸⁵ The RMB to USD conversion was based on the exchange rate in December 2009 of RMB 6.82 to USD 1.00.

¹⁸⁶ Interview 54 with UBS Warburg auto industry analyst, 28 November 2008; Interview 51 with Automotive News China journalist, 23 November 2008.

¹⁸⁷ Interview 62 with BYD Manager, 29 December 2008.

received a large investment and endorsement from a well-established American private equity firm in 2008. Mid American, a division of Warren Buffett's Berkshire Hathaway, announced a USD 230 million investment in BYD for 9.89 percent stake in BYD company. Many industry observers claim that Buffett is betting on the future of BYD's plug-in hybrid and all-electric cars. Shortly after the announcement of Buffett's investment, BYD announced the world's first plug-in hybrid, the F3DM. Although the F3DM garnered a lot of international media attention, it never reached mass production. A BYD manager interviewed for this study said that the company never intended to mass produce the F3DM, and that the car was only intended to be a publicity tool to boost the company's image as a technologically cutting edge carmaker.¹⁸⁸

In 2010, the company announced pilot production of its all electric car, the e6, though this car also has yet to reach mass production. Wang has publicly claimed that the five passenger e6 has a maximum speed of 140 km/h (87 mph), consumes 21.5 kWh per 100 km, and can run about 300 km (187 miles) on a single charge. Wang claimed that the e6 would roll out in the United States and Europe in late 2010, though this target date was not met. Whether the e6 can pass the rigorous testing required to sell into American and European markets remains to be seen. To date, no Chinese made car has been approved for sale in the United States.

Nonetheless, BYD continues to garner international recognition for its potential to design and produce electric vehicles. In May 2010, BYD and German automaker Daimler AG agreed to invest RMB 600 million (USD 88 million)¹⁸⁹ in a joint venture to build electric vehicles in China. The two companies have said that their jointly-developed car will follow the architecture of a Daimler vehicle, but will be sold under a new brand developed by BYD and Daimler. The joint venture will design, research and develop electric drive trains, heavy duty batteries, and other parts related to electric vehicles for the Chinese market. As one auto market analyst has said, "This gives them [BYD] credibility on the world stage today... It gives them access to technology that will help bring up their own car making capability."¹⁹⁰ Perhaps with Daimler's guidance and technology, BYD may finally fulfill its dream to bring an all-electric car to market.

Even though BYD has not received financial support from Beijing, it has received significant support from local governments in China. As mentioned earlier, Xi'an officials were willing to sell its distressed auto assets to BYD in hopes that the company could revive its local auto industry. Xi'an also supports BYD by purchasing F3 sedans for its local taxi fleet. The Shenzhen government, where BYD is headquartered, has also been very supportive of BYD. BYD Company was already one of the city's largest taxpayers when the company entered the auto sector in 2003. When Wang announced the formation of BYD Auto, Shenzhen offered large tracts of subsidized land and government contracts for its local taxi fleet. Field testing of the e6 started in Shenzhen in May 2010 when local officials purchased forty units as taxis.¹⁹¹ Fortunately for BYD, Shenzhen does not have its own state-owned automaker nor does it have

¹⁸⁸ Interview 62 with BYD Manager, 29 December, 2008.

¹⁸⁹ The RMB to USD conversion was based on the exchange rate in December 2010 of RMB 6.82 to USD 1.00.

¹⁹⁰ Reiter C. and L. Lin, 2010. "Daimler, BYD Set Up Chinese Venture to Develop Electric Cars." *Bloomberg News*. May 27. <http://www.bloomberg.com/news/2010-05-27/daimler-buffett-backed-byd-set-up-china-venture-to-develop-electric-cars.html>. Accessed on 4 January 2011.

¹⁹¹ Green Car Congress, "40 BYD e6-based Electric Taxis Enter Service in Shenzhen City," 2010 May 18. <http://www.greencarcongress.com/2010/05/byd-20100518.html#more>. Accessed on 2 January 2010.

close ties to other regional SOEs. The willingness of local officials to cooperate with BYD supports the notion that regional governments are happy to support private firms if they contribute to the local tax base and provide local jobs. However, unlike Chery, local governments are not involved in the daily affairs and management of BYD.

In 2010, BYD was the 7th largest auto manufacturer in China and the 2nd largest independent automaker behind Chery. Through November 2010, BYD had produced 473,433 vehicles. However, the company's sales slowed dramatically in 2010, increasing only 4.6 percent from the previous year.¹⁹² Much of the decline has been due to the company's lack of new products and reliance on older models. It is likely that the company is reducing the amount of resources it dedicates to internal combustion engine models and concentrating its energy and resources on its future all-electric products. Yet whether Wang's large and risky bet on electric cars will pay off remains to be seen.

We now turn to the last case study, Geely Auto. Like BYD, Geely is a private firm founded by one of China's most famous entrepreneur.

4.3.4. *GEELY AUTO: CHINA'S FIRST GLOBAL AUTOMAKER?*

Like BYD, Geely Auto did not begin as an automaker. The company began in 1986 as a manufacturer of refrigerators, then moved on to making decoration materials, motorcycles, and finally automobiles in 1998. Geely's founder, Li Shufu, is one of the most well-known entrepreneurs in China. Li's deep understanding of Chinese markets, modular production networks, and Chinese consumer tastes has guided him in his exploration of new products and industries.

Geely's foray into the auto industry began in Linghai, Zhejiang Province. The company did not have a license to manufacture passenger cars, but Li vigorously lobbied various regional authorities to help it get approval for automotive production in Beijing. Several days before China's accession to the WTO, the State Economic and Trade Commission finally approved several of Geely's models. They were listed under the less regulated bus category despite the fact that they were passenger cars. Fortunately for Geely, Wang's lobbying of local officials came at the precise moment Chinese leaders were relaxing its rules on trade and investment. Once Geely established itself as a serious automaker, the Center eventually granted the company an official production license.

Like other independent automakers, Geely began by copying existing car models. Geely's first prototype was a combination of a Mercedes Benz model and a FAW Red Flag model based on Audi technology, though the company eventually deemed the prototype unfit for mass production. Its first mass produced product was the *Haoqing* compact, a copy of the FAW Xiali Charade, itself modeled on technology licensed from Daihatsu, a Toyota affiliate. As discussed in Chapter Three, Geely's product development exemplifies a "quasi-open modular

¹⁹² Automotive Resources Asia, 2009. *China Automotive Monthly Market Trends*, December.

architecture”, where due to repetitive imitation and remodeling, many auto components have become *de facto* modularized and their interfaces standardized.

According to Wang (2008:522), Geely mixed and matched original components, copied components of the Charade, and off-the-shelf components from other vehicles to build the *Haoqing*. For instance, Geely purchased engines from Tianjin Toyota Automotive Engine Company, a joint venture between Toyota and Tianjin Automotive Industrial Group. In the late 1990s, the *Haoqing* was so successful that it began to supplant the sales of Toyota cars in China (Wang 2008:524).

Since then, however, Geely has begun to design its own engines modeled on the Toyota engine. Then, as Geely began to replace the Toyota engines with its own engines, it did not have to change the architecture of other parts. The interface between the engine and the transmission was unchanged. Table 4.8 below breaks down the composition of the first *Haoqing*.

Table 4.8: The Quasi-Open Architecture of the Geely *Haoqing*

Nature of components	Source of components	Percentage of value of the vehicle	Example of components
Original components of FAW Xiali Charade	Directly purchased from suppliers of FAW	60%	Engine, steering unit, breaking system, gasket for engine, wire harness, door lock, air filter
Copies of FAW Xiali Charade components	Produced by Geely’s suppliers	10%	Electrical control switch, roof, horn, carpet
Components from other car models	Suppliers of other car models	10%	Fuel tank
Geely in-house production	Geely engineers and workers hired from competitors	20%	Body components, transmission and clutch, chassis

Source: Reproduced from Wang (2008:523).

Like Chery and BYD, Geely’s ability to purchase off-the-shelf and imitation auto parts greatly reduced its product development costs and time to market. Overall, Geely outsources 70 percent of its components. Fortunately for Geely, it is located near the most developed auto industrial cluster in China. This cluster includes Shanghai, Jiangsu Province, and Zhejiang Province – where Geely is headquartered. According to Wang (2008), the Chinese “Big Three” purchases 50 percent of their components from suppliers located within this industrial cluster, giving Geely access to technologically superior and higher quality parts. Geely sources around 75 percent of its components from firms in the cluster. Fifty of that 75 percent is sourced from within Zhejiang, meaning that Geely’s effective transportation distance is only about 300km (187 miles). This proximity reduces transport costs and improves Geely’s ability to manage its supply chain. For those parts that Geely cannot source from Chinese suppliers, it has established commercial relationships with global suppliers like Bosch, Delphi, Valeo, Visteon and Siemens (Wang 2008:527).

Geely's low-cost model has permitted the company to sell very inexpensive cars. The first *Haoqing* 1.0 sold for RMB 38K (USD 4.5K)¹⁹³, while foreign brands in the same segment sold for around RMB 100K (USD 12K). By 2007, Geely had developed 8 different models: Haoqing, Meiri, Ulio, Beauty Leopard, Maple, Free Cruiser, King Kong and Vision. Some of the models were co-developed with the help of foreign automakers. For example, the Free Cruiser was co-developed with Korea's Daewoo (Wang 2008:521).

Geely is also using its increased international exposure to bring in global talent. In 2006, Geely hired a new product development director, Frank Zhao, who at one time worked for Chrysler. Under Zhao's guidance, the company has been making progress on new vehicle platforms that are not mere imitations of foreign cars, as well as substantially improving the engineering and quality of its vehicles. In 2007, Geely began to increase the output and sales of models priced above RMB 50K (~USD6.7K)¹⁹⁴ and de-emphasize its cheaper models. By September 2008, Geely's higher priced Freedom Ship, King Kong and Vision models accounted for more than 70 percent of its vehicle sales.¹⁹⁵ How has the company been able to finance its expansion?

As a privately-held firm, Geely could not rely on funding from the Center or foreign direct investment. Like Great Wall and BYD, Geely has instead tapped foreign IPO markets twice in 2004 and 2009. Through its stock offerings, Geely raised over USD 250 million dollars. Some of the IPO funds went toward financing Geely's 2009 purchase of Australia's Drivetrain Systems International (DSI), the world's second largest automatic transmission producer, for USD 40 million. Geely plans to build a DSI transmission manufacturing facility in China. Geely announced that the China-made DSI product will be installed in the company's new luxury cars and all other models with the engine size above 1.5 liters. Geely executives have indicated that the firm may eventually supply its automatic transmissions to other Chinese automakers.

Working with global suppliers is an integral part of Geely's ability to upgrade the quality of its cars. In 2009, for example, Geely announced its new more expensive Emgrand brand of cars. One of the first Emgrand models, codenamed EC718 is based on an engine developed by Geely, an engine control system by Delphi, a braking system by Bosch, a lighting system by Valeo, seats by Lear, and an instrument panel by Visteon. By sourcing from global suppliers, Geely hopes to build a "world quality" car to upgrade its image from a maker of "affordable cars for ordinary people" to one that pursues the development of "the safest, the most fuel efficient and the most environment-friendly cars".¹⁹⁶

Geely's global ambitions are perhaps clearest in its purchase of Ford Motor's Volvo unit. In August 2010, Geely finalized its agreement to buy the Volvo unit from Ford for USD 1.3 billion in cash and a USD 200 million note. This is a landmark agreement that the Chinese company hopes will help it sell into the luxury car market in China and launch its operations on a

¹⁹³ The RMB to USD conversion was based on the exchange rate in December 1998 of RMB 8.27 to USD 1.00.

¹⁹⁴ The RMB to USD conversion is based on the exchange rate in December 2007 of RMB 7.40 to USD 1.00.

¹⁹⁵ *China Automotive News*, 2008. "Geely successfully adds higher priced cars," 24 September.

¹⁹⁶ *Automotive News China*, 2009. "Leveraging global supply base, Chinese OEMs are striving to move upscale." 2 September.

global scale. Under the terms of the agreement, Ford will continue to supply powertrains, stampings, and some vehicle components to Volvo. Ford has also agreed to provide engineering and technology support, and access to tooling for common components.

Geely's purchase of Volvo is evidence of the broad impact of China's integration into the global economy. Not only can Geely purchase foreign technology and a globally reputable brand, but it is able to do so through sophisticated financing mechanisms. To buy Volvo, Geely secured a USD 50 million investment from American investment bank, Goldman Sachs. The Goldman Sachs fund bought convertible bonds and warrants from Geely that will give it a minority stake in the Chinese automaker.¹⁹⁷

Notably, Geely also received generous financial support from two local governments. The government of Daqing, a city in northeastern China known for its oil production, and the government of Jiading, a district of Shanghai pledged RMB 3 billion (USD 450 million) and RMB 1 billion (USD 150 million)¹⁹⁸ respectively. In return for their financial support, Geely has committed itself to build two new assembly plants in Daqing and Shanghai. Though Geely may have preferred to build one large plant to produce Volvos in southwestern China, closer to where Ford had originally built Volvos with its Chinese partner, the company is now obliged to honor the agreements it made with local officials in the other two cities. One Chinese automotive journalist has argued in an opinion piece that "three Volvo plants in three different locations will certainly lead to a waste of capital and inefficient manufacturing."¹⁹⁹

Geely was the 9th largest auto manufacturer and 3rd largest independent automaker in China in 2010. As of November 2010, Geely sold 370,587 vehicles, a net increase of 26 percent from the previous year. Whether Geely can successfully integrate Volvo and its Swedish employees into its existing corporate culture and operational norms remains to be seen. If the company can figure out how to profit from Volvo's brand and technology at home and abroad, it could be poised to become one of China's first truly global automakers. Regardless of Geely's future success, the more important point to be highlighted here is that Chinese independent automakers have overcome major financial and technological barriers to entry by taking advantage of new linkages to global capital and product markets.

4.4. CONCLUSION

This chapter has examined the evolving role of the local state in China's auto sector development and illustrated the variation in these roles through four case studies. Local states have developed regional auto manufacturing hubs in at least three different ways. First, as the case of Chery demonstrates, local officials can themselves be automotive entrepreneurs. Though the independent regional SOE has the benefit of building close ties to state financial institutions, it also runs the risk of overinvestment and moral hazard. Second, as the case of Great Wall shows,

¹⁹⁷ Carew, R. 2009 "Goldman Invests \$250 Million in Geely Auto's Expansion." *Wall Street Journal*. September 21. <http://online.wsj.com/article/SB125336135937225281.html>. Accessed on 1/4/2011.

¹⁹⁸ The RMB to USD conversion is based on the exchange rate on December 2010 of RMB 6.66 to USD 1.00.

¹⁹⁹ Yang, J. 2010. "For Volvo Owner Li Shufu, Government Generosity Carries a Price." *Automotive News China* online. November 12. <http://www.autonewschina.com/en/article.asp?id=6108>. Accessed on 1/4/2011.

local officials can be minority shareholders and leave operations and business decisions in the hands of professional managers. Though the semi-private automaker does not have the benefit of close ties to state financing institutions and hence access to subsidized credit, it forces a firmer budget constraint and greater focus on profitability. To make up for the lack of state support, Great Wall looked abroad to foreign stock exchanges for capital. Third, as the cases of BYD and Geely demonstrate, local officials can be partners in local auto sector development without any ownership stake. Like semi-private automakers, private automakers have looked abroad for funding.

In each case, the specific form of government-business relations has shaped the financing options available to each firm, with long-term consequences for firm strategy in other areas from product development to overseas expansion. While the pattern of government-business relations and financing has differed from one independent automaker to the next, the patterns of technology acquisition and product development have shared important similarities. All of the independent automakers began by imitating and reverse engineering existing foreign models, which saved them tens of millions of R&D dollars. Yet imitation has only been a stepping stone to proprietary platform development enabled through intimate technology partnerships with foreign suppliers.

These technology relationships are becoming even more important as China's independent automakers prepare to enter the global market for electric vehicles. With growing international concern over the impact of conventional automobiles on energy security and the environment, governments around the world – including leaders in China – are looking to vehicle electrification as a solution to the woes of auto consumption. The next chapter will address both the opportunities and challenges China faces as it strives to become a leader in EV production and adoption.

CHAPTER 5

MANAGING THE CONSEQUENCES OF CHINA'S AUTO CONSUMPTION: THE PROMISE AND CHALLENGE OF VEHICLE ELECTRIFICATION

“China’s great hunger for energy, in particular its strong oil imports, contrasts with the recent fall in demand exhibited by major industrialized countries, which were harder hit by the recession. According to IEA research, almost half of global oil demand growth in the next five years will come from China.”

International Energy Agency, 2011²⁰⁰

Vehicle electrification is expected to be strategically important to China’s future in the following four areas: global climate change; energy security, urban air quality; and China’s auto industry growth.

World Bank and PRTM Consultants, 2011²⁰¹

The previous chapters have focused on the story of how the Chinese auto industry, now the largest in the world, benefited from China’s deep integration into the global economy. China’s accession to the WTO attracted billions of dollars in investment from the leading global automakers and component suppliers, which allowed nascent Chinese automakers to piggyback on an increasingly sophisticated domestic supply base. China’s economic opening policies, combined with the lure of its large domestic market and the economic initiative of local governments, have in many ways made up for inconsistent national auto policies. In a sense, the independent automakers emerged *in spite* of the government’s industrial policies, not *because* of them. However, as this chapter will show, the very lack of policy coherence at the national level that unexpectedly created an opening for independent automakers today handicaps China’s ability to put forth the common standards necessary for mass market adoption of electric vehicles.

This chapter begins by developing two aspects of the Chinese auto story that stem from the consequences of the country’s rapidly rising auto consumption. First, cars require a significant amount of energy and emit a significant amount of pollutants such as carbon dioxide. Increased auto consumption forces a reconsideration of how energy and emissions are governed. As we shall see, the same center-periphery tensions discussed in the auto case in fact reappear in the energy case, often with negative consequences for energy governance.

Second, the build out of China’s energy system presents opportunities for industrial leadership. China will use more and more energy, but in the process, it will develop and deploy new “green” technologies. The broader implication is that although China may remain a “dirty”

²⁰⁰ International Energy Agency, 2011. “Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts.” http://www.iea.org/papers/2011/overseas_china.pdf. Accessed on 10 April 2011.

²⁰¹ World Bank and PRTM (2011). The full title of their report is “The China New Energy Vehicles Program: Challenges and Opportunities.”

economy, a voracious consumer of scarce energy resources, and the world's largest emitter of carbon, it may nonetheless emerge as a green technology leader.

The electric vehicle (EV) is one type of green technology that emerges from the intersection of these various issues. In theory, widespread adoption of EVs could significantly mitigate the current growth of China's oil imports and carbon emissions, not to mention become a source of worldwide automotive technology leadership. In 2008, McKinsey & Co. published a scenario in which EVs could generate as much as 30 percent of China's passenger vehicle sales by 2030.²⁰² A year later, A.T. Kearny released a "most likely base case scenario" in which alternative energy cars –EVs plus hybrids– would grab 39 percent of China's new vehicle sales by 2020.²⁰³

But how realistic are these predictions? Upon closer examination of China's national energy policy framework, as well as the roles of bureaucratic agencies, local governments, and firms within that framework, this chapter finds that while such predictions may overstate China's prospects for widespread vehicle electrification, the Chinese auto industry is nonetheless becoming a learning laboratory and potential export base for the global electric vehicle industry.

Why is rapid adoption of EVs in China unlikely, despite the government's financial commitment to deploying them? The mass adoption of EVs in China will require a consistent national energy policy, including an overhaul of China's electricity infrastructure and the implementation of national EV standards. This chapter will explain how China's fragmented policy-making process at the national and local levels complicates and may even preclude the emergence of a national energy policy. Instead, specific policy initiatives emerge from different levels of government with different backers, and tend to be tacked onto existing policy in an ad hoc fashion.

The rest of this chapter is organized as follows. First, I present historical data on the relationship between auto sector growth and Chinese oil imports and greenhouse gas emissions, thus setting up the case for vehicle electrification. Second, I explore the problematic aspects of China's fragmented policy apparatus, particularly those pertaining to the upgrading of the national electricity grid and the implementation of national EV standards. Without such policies, the adoption of EVs in China may be slow. Third, I explore the possibility that even though China may not become the world's leading adopter of EVs, its vast electronics and auto supply bases is providing a fertile environment for EV technology development and production.

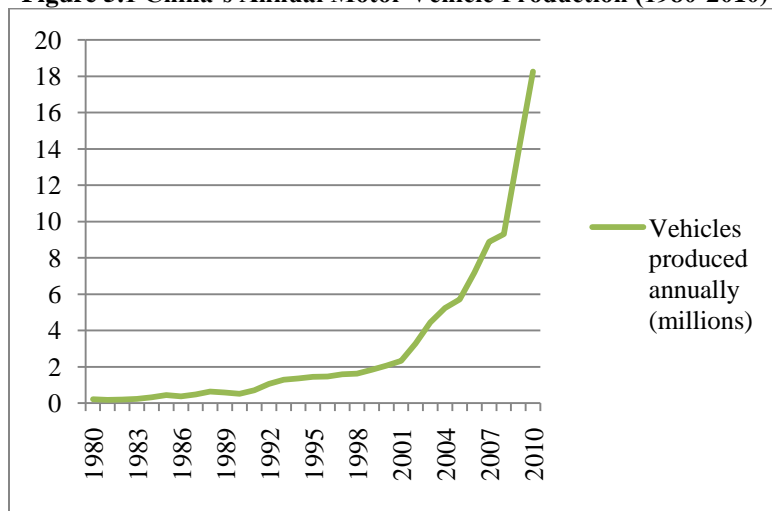
²⁰² McKinsey & Company, 2008. "China Charges Up: The Electric Vehicle Opportunity." http://www.mckinsey.com/locations/greaterchina/mckonchina/reports/china_charges_electric.aspx. Accessed 11 June 2011.

²⁰³ AT Kearny, 2009. "Great Leap Forward or Déjà vu? The Alternative Energy Car Landscape for China in 2020." http://www.atkearney.at/content/misc/wrapper.php/id/50177/name/pdf_great_leap_forward_1246455912cf2f.pdf. Accessed 11 June 2011.

5.1. IMPACT ON CHINA'S OIL CONSUMPTION AND GREENHOUSE GAS EMISSIONS

The auto industry has presented China with both enormous opportunities and daunting challenges. The rapid development of the Chinese auto industry has had a positive impact on economic growth, employment creation, and social mobility – literally. Independent automakers in particular played an important part in stimulating fierce domestic competition and lowering car prices, thus creating greater consumer choice and making car ownership available to a burgeoning Chinese middle class. As Figure 5.1 below shows, Chinese motor vehicle production – including heavy and light commercial vehicles as well as passenger cars – increased gradually from the beginning of China's economic reform period through the early 1990s, and then skyrocketed in the early 2000s following China's WTO accession.

Figure 5.1 China's Annual Motor Vehicle Production (1980-2010)



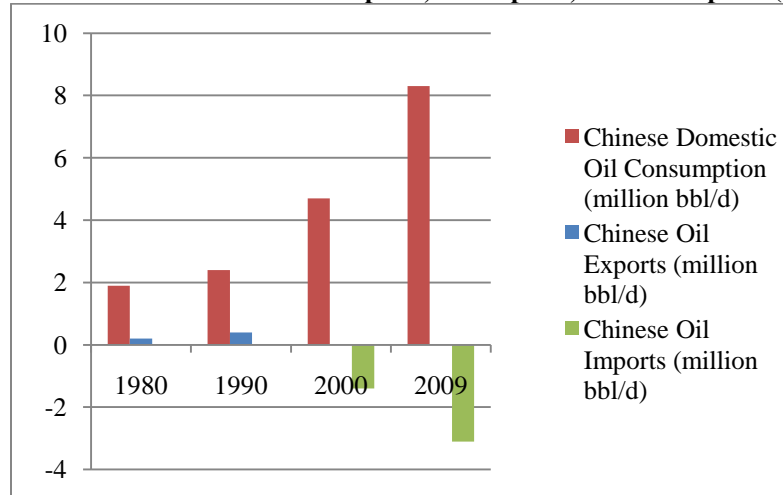
Sources: Noble et al. (2005) for 1980-1999 data; www.oica.net for 2000-2010 data.

Over the last decade, vehicle production on average increased 24 percent annually, reaching more than 18 million units in 2010. Many of the reasons for this phenomenal growth in automotive production – such as increased FDI into the sector, growing Chinese incomes, and the emergence of new entrants – were discussed in the previous chapters. Given that China's car penetration is still only 47 vehicles per 1000 people as of 2009 (National Bureau of Statistics 2010), a fraction of the 842 vehicles per 1000 in the US (DOE 2010), the domestic market still has plenty of room to grow. The China Energy Group at Lawrence Berkeley Livermore Laboratory predicts that private car ownership will grow from 6.4 million in 2005 to 169 million in 2030 and 355 million by 2050 (Zhou et al. 2011).

While it is not hard to imagine why increasing demand for vehicles has had a negative effect on Chinese energy security and the environment, the *rate* at which oil imports, CO₂ emissions, and air pollution have increased has been astonishing to Chinese leaders. In 2009, China consumed an estimated 8.3 million barrels per day (bbl/d) of oil, with oil imports reaching 4.3 million bbl/d, or more than half of total consumption (EIA 2010). That year, China overtook Japan to become the second largest oil importer behind the United States, which in 2009 consumed 18.8 million bbl/d and imported 11.7 bbl/d.

Throughout the 1980s, China was actually a net exporter of oil. Oil demand exceeded domestic supply for the first time in 1993 – around the time that annual vehicle production began to consistently top 1 million – and turned China into a net oil importer for the first time. Figure 5.2 below shows the rise in oil demand from 1980 to 2009, noting China’s transformation from a net oil exporter to a net oil importer. Based on data collected from China’s National Bureau of Statistics, Haibo Wang (2010) calculates that the proportion of transport-related oil consumption has increased from 10.4 percent of total oil consumption in 1980 to 33.6 percent in 2007.

Figure 5.2 China’s Domestic Oil Consumption, Oil Exports, and Oil Imports (1980-2009)



Sources: IEA (2007) for 1980-2007 data; EIA (2010) for 2009 data

China’s energy security concerns over rapidly growing oil demand are exacerbated by the fact that the country’s largest oil fields are aging, their reserves-to-production ratios are low, and domestic oil production is nearing its peak. As a result, China is almost entirely dependent on international oil markets to meet incremental demand. In its *2010 International Energy Outlook*, the U.S. Energy Information Administration (EIA) predicted that China’s oil demand would increase to 17 million bbl/d by 2035, double the amount that was consumed in 2009.²⁰⁴ British Petroleum (BP) has predicted that China’s oil demand would rise even faster, reaching 17.5 million bbl/day by 2030.²⁰⁵ BP’s higher estimates in 2011 were likely influenced by the fact that China’s auto production unexpectedly surged from 13.79 million vehicles in 2009 to over 18.26 million units in 2010. If we use the more aggressive BP prediction of 17.5 million bbl/day, and assume that Chinese domestic production will stay flat at 4 million bbl/d, then China could end up importing 76 percent of its oil supply by 2035.²⁰⁶ That would equate to a more than 20 percent increase in oil imports between 2009 and 2035. (See Appendix E for a more detailed

²⁰⁴ Energy Information Administration. *International Energy Outlook 2010*. July 2010. <http://www.eia.doe.gov/oiaf/ieo/pdf/0484%282010%29.pdf>. Accessed on 11 April 2011.

²⁰⁵ British Petroleum. *BP Energy Outlook 2030*. January 2011. http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2010_downloads/2030_energy_outlook_booklet.pdf. Accessed on 11 April 2011.

²⁰⁶ The IEA’s *World Energy Outlook 2007* echoes the prediction that China will have to import 80 percent of its oil by 2030, a prediction based on their estimation that transport-related oil consumption will reach 43 percent.

discussion of what the Chinese government and Chinese oil companies are doing to secure more oil supply at home and abroad.)

The increase in auto consumption and hence oil consumption has been accompanied by an increase in China’s greenhouse gas emissions, particularly carbon dioxide (CO₂) emissions. Most discussions around CO₂ emissions revolve around China’s coal consumption and ignore China’s transport-related CO₂ emissions. While it is true that coal-fired electricity production accounts for the majority of the country’s emissions, internal combustion engines are nonetheless a significant contributor. According to the IEA’s *2009 World Energy Outlook*, China’s total CO₂ emissions from the Chinese transport sector amounted to 427 million tons in 2007, accounting for 7 percent of China’s total energy-related CO₂ emissions and 6 percent of the world’s transport-related CO₂ emissions (IEA 2009: 350).²⁰⁷

Table 5.1 Transport-related Carbon Dioxide Emissions in the U.S., China, and the E.U. (1990-2030)

Year	World Transport-related CO ₂ Emissions (Gigatons)	U.S. Transport-related CO ₂ Emissions (Gigatons)	U.S. as a % of World Transport-related Emissions	China Transport-related CO ₂ Emissions (Gigatons)	China as a % of World Transport-related Emissions	E.U. Transport-related CO ₂ Emissions (Gigatons)	E.U. as a % of World Transport-related Emissions
1990	4.6	1.4	30%	0.1	2%	0.7	15%
2007	6.6	1.7	26%	0.4	6%	0.9	14%
2020 IEA Reference Scenario	7.0	1.7	22%	0.8	11%	0.9	12%
2030 IEA Reference Scenario	7.6	1.7	18%	1.4	15%	0.9	10%

Source: IEA *World Energy Outlook* (2009)

In the IEA’s Reference Scenario, akin to a business-as-usual scenario, transport-related CO₂ emissions could grow to 1.4 gigatons in 2030, amounting to 12 percent of China’s total energy-related CO₂ emissions and 18 percent of world transport-related CO₂ emissions. In this business-as-usual scenario, China’s transport-related CO₂ emissions in absolute terms will more than triple from 2007 levels.²⁰⁸ Table 5.1 above compares Chinese transport-related CO₂ emissions against those of the United States and the European Union. It is notable that under the IEA’s Reference Scenario, China’s transport-related CO₂ emissions will not exceed those of the United States in 2030 because China’s total vehicle fleet will still be smaller than the U.S. fleet.²⁰⁹

²⁰⁷ As a point of comparison, the IEA puts 2007 U.S. CO₂ emissions from the transport sector at 31 percent of total energy-related CO₂ emissions, or 1.7 gigatons. In other words, U.S. transport-related CO₂ emissions were roughly four times those of China in 2007.

²⁰⁸ Separate from the Reference Scenario, the IEA also offers what it calls the “450 Scenario”, in which countries including China coordinate the adoption of policies to the ultimate effect of stabilizing greenhouse gas emissions at 450 parts per million of CO₂-equivalent. Under the so-called 450 Scenario and policy framework, the IEA estimates China’s transport-related CO₂ emissions could be as low as 1.2 gigatons.

²⁰⁹ This prediction is backed up by the China Energy Group’s 2050 scenario (Zhou et al. 2011).

Although the specific links between CO₂ emissions and climate change are complex, it is nonetheless clear that the rapid growth of greenhouse gases emissions – particularly CO₂ emissions – would lead to a substantial long-term increase in the concentration of greenhouse gases in the atmosphere and a significant increase in global temperatures (IEA 2009:112). Against this backdrop, new energy vehicles and electric vehicles in particular have been proposed as a way to combat China’s growing oil dependence and carbon emissions, and at the same time, improve urban air quality and create a new source of Chinese technology leadership. Although EVs appear to hold great promise, the following section will discuss why their widespread adoption in China is complicated by China’s inability to put forth a consistent national energy policy.

5.2. CHINA’S FRAGMENTED ENERGY GOVERNANCE: WHY WIDESPREAD ADOPTION OF EVS IS UNLIKELY

Increased auto consumption is forcing a reconsideration of how energy and emissions are governed. On the surface, it would appear as though the Chinese government is tackling energy and environmental issues head on by committing generous funds to a number of proposed solutions, including electric cars. In the recently announced 12th Five Year Guideline (FYG), the Chinese government designated “new energy vehicles”, a category which includes all-electric and plug-in electric cars, as one of China’s “strategic emerging industries” (NDRC 2011, Chapter 10 Section 1). To that end, the government has pledged more than RMB 100 billion (USD 15 billion) of state funding to the development of new energy vehicles (World Bank 2011).

However, money alone cannot solve China’s energy and environmental problems. As the following sections will show, the fragmented policymaking apparatus in Beijing and the propensity of local governments to pursue their own energy policies make it very difficult for China to put forth a coherent national energy strategy or handle the infrastructural issues that stand in the way of widespread adoption of electric cars.

5.2.1. CHINA’S FRAGMENTED POLICYMAKING APPARATUS

The government’s emphasis on the need to develop new energy vehicles is clear, but the 12th FYG does not present a long-term plan for how to promote the development of new energy vehicles beyond state subsidies for purchases of EVs, which are not yet widely available in China. Much of the problem lies in China’s fragmented bureaucratic apparatus and lack of a national energy strategy that is accepted by all stakeholders.

Table 5.2: Energy Bureaucracy Re-Shuffling in China (1980-2010)

Name of Agency	Year Formed	Year Abolished	Notes
State Energy Commission (SEC)	1980	1982	<ul style="list-style-type: none"> Created to formulate energy policy, undertake long-term planning, and research new energy technologies Abolished due to unclear objectives and insufficient authority
Ministry of Energy (MoE)	1988	1993	<ul style="list-style-type: none"> Established through merger of Ministry of Coal Industry, Ministry of Hydroelectricity, Ministry of Oil Industry, and Ministry of Nuclear Industry Abolished due to opposition from the former ministers of merged ministries and from then Vice Premier Zhu Rongji who advocated for more market forces in the energy sector
National Energy Bureau (NEB)	2003	2008	<ul style="list-style-type: none"> Initially formed within the NDRC to manage energy policy Folded into the NEA in 2008.
National Energy Leading Group (NELG)	2005	2008	<ul style="list-style-type: none"> Formed as an advisory and coordination body under the authority of the State Council. Folded into the NEA in 2008.
National Energy Administration (NEA)	2008	Still in existence	<ul style="list-style-type: none"> Established to replace the NEB within the NDRC and merged with the Office of the NELG. Formed to handle the NEC's daily affairs. Technically reports to both the NEC and the NDRC.
National Energy Commission (NEC)	Approved in 2008 but not instated until 2010	Still in existence	<ul style="list-style-type: none"> Created to formulate national energy development strategy. Reports directly to State Council. Headed by Premier Wen Jiabao and includes 22 high ranking officials from a variety of ministries and agencies. No major policies have been released yet.

Sources: Lieberthal and Oksenberg (1988); Downs (2006, 2008); Meidan, Andrews-Speed and Xin (2009).

There are a number of agencies which have control over different aspects of energy policy, including but not limited to the NDRC, the Ministry of Science and Technology (MOST), Ministry of Commerce, and the Ministry of Land and Resources. Currently, there is no single entity with sufficient power to persuade the other agencies to embrace its proposed strategy. Though there have been calls for years for an energy superministry, such a ministry has not emerged. Instead, a number of energy agencies and committees have come and gone.²¹⁰ As Erica Downs (2008:42) puts it, “China’s fragmented energy bureaucracy has impeded energy governance because there is no single institution, such as a ministry of energy, with the authority to coordinate the interests of the various stakeholders. Turf battles among various energy institutions have often resulted in energy laws that fail to specify agencies responsible for the

²¹⁰ For a detailed discussion of how China’s energy agencies have been shuffled and reshuffled, please see Lieberthal and Oksenberg (1988); Downs (2006; 2008), and Meidan, Andrews-Speed and Xin (2009).

content of those laws, delaying or preventing implementation.” Table 5.2 above presents a list of the energy agency reorganizations that have occurred since 1980.

The most recent attempt to come up with a national energy agency is the National Energy Commission (NEC) and its subservient organization, the National Energy Administration (NEA), which is supposed to carry out the NEC’s daily affairs. Though the NEC is under the purview of the State Council, and technically at the same level as the NDRC, it may still suffer from many of the problems faced by its predecessors, namely the amount of autonomy it has from the NDRC. For example, it lacks the authority to set energy prices, which remain the purview of the NDRC’s Pricing Department. Though the NEA and NEC can suggest energy price adjustments, the NDRC and ultimately the State Council must approve any price changes. The problem of energy prices will be discussed further below. It is also unclear how much power the NEC will wield over China’s very powerful national oil companies or over energy management at the local level (Downs 2008).

China’s current energy structure is unlikely to improve energy governance substantially, as its limited capacities remain largely unchanged. To date, neither the NEC nor the NEA have announced a national energy policy. Instead, different government agencies and levels of government are in many instances implementing their own energy policies, some of which fall in line with national directives, while others run in the face of such directives.

There are many reasons why the widespread adoption of electric cars requires a coherent national energy policy. First, there must be a major overhaul of China’s electricity infrastructure. Not only will the already stressed electrical grid need to meet the increased electricity demand posed by electric cars, but it will need to accommodate the intermittency of EV charging. Put simply, the grid will need to be “smarter.” Second, and more importantly, there needs to be national standards for EV charging. Without a single set of national standard for EV charging, potential customers will likely feel insecure about the range limitations of a particular EV. As we shall see in the sections below, China is making little progress in either of these areas.

5.2.2. CHINA’S NOT-SO-SMART GRID: GROWING ENERGY DEMAND, STALLED PRICE REFORMS, AND UNINTENDED LOCAL CONSEQUENCES

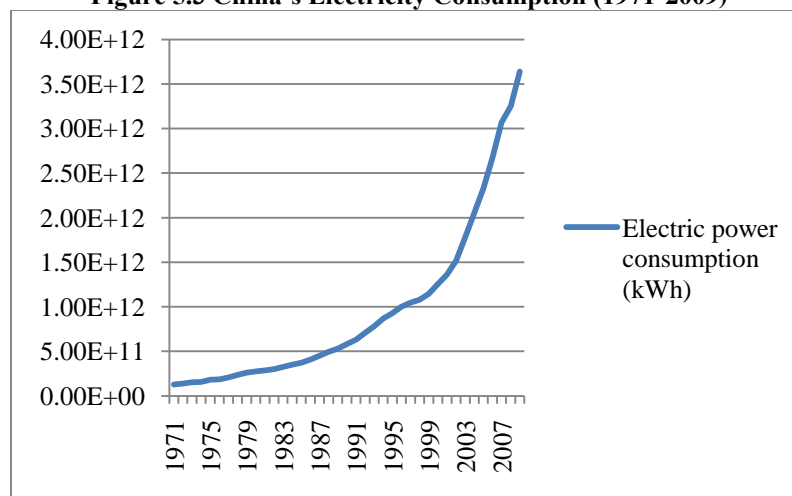
It has been well-established that the widespread adoption of plug-in hybrids and all-electric vehicles will require a “smarter” electricity grid. Generally speaking, the smart grid will require the addition of advanced communications to the current electrical infrastructure. Intelligence within the grid is required not only to better manage the load of the grid and facilitate the connection and operation of generators of all sizes and technologies, especially intermittent renewable sources like wind and solar, but to allow energy consumers to play a part in the optimization of the electricity system.

For instance, dynamic time-of-day pricing could encourage owners of plug-in hybrids and EVs to charge their batteries during off-peak hours when electricity demand is the lowest. If millions of EV owners instead choose to charge their cars during peak periods, the existing grid

infrastructure could be overwhelmed. In China, the problem is that the existing grid is very fragile, not least because electricity usage is skyrocketing.

In 2002, China consumed less than half of the energy than the U.S. Just seven years later, China had surpassed the U.S. to become the world's largest energy consumer, according to estimates provided by the International Energy Agency (IEA).²¹¹ The IEA chief economist, Fatih Birol, said in an interview that “the fact that China overtook the U.S. as the world's largest energy consumer symbolizes the start of a new age in the history of energy”.²¹² According to the IEA's analysis, China consumed 2.2 billion tons of oil equivalent in 2009, about 4 percent more than the U.S.²¹³ Figure 5.2 illuminated one aspect of China's growing energy demand, oil consumption. Figure 5.3 below looks at another aspect of China's energy demand, electricity consumption. By 2009, Chinese electricity consumption had more than tripled from 1999 levels.

Figure 5.3 China's Electricity Consumption (1971-2009)



Source: World Bank Indicators (1971-2008)²¹⁴; China NEA (2009)²¹⁵

Given China's economic growth rate over the last decade of 10 percent per annum, it is not surprising that China's electricity consumption has also grown. What is alarming, however, is the rate at which China's *per capita* electricity consumption has increased. Urbanization and a desire for modern conveniences like air conditioners, refrigerators, and TVs are pushing up per capita electricity consumption. As Figure 5.4 below shows, China's per capita electricity consumption has tripled between 1999 and 2009. Electricity usage is not rising as a result of population growth (i.e., 0.6 percent per year)²¹⁶, but rather as a result of rising incomes.

²¹¹ IEA website. http://www.iea.org/index_info.asp?id=1479. Accessed on 10 June 2011.

²¹² Quinn, J. 2010. “China knocks US off top energy use spot,” *The Telegraph*, 20 July. <http://www.telegraph.co.uk/finance/newsbysector/energy/7899033/China-knocks-US-off-top-energy-use-spot.html>. Accessed 10 June 2011.

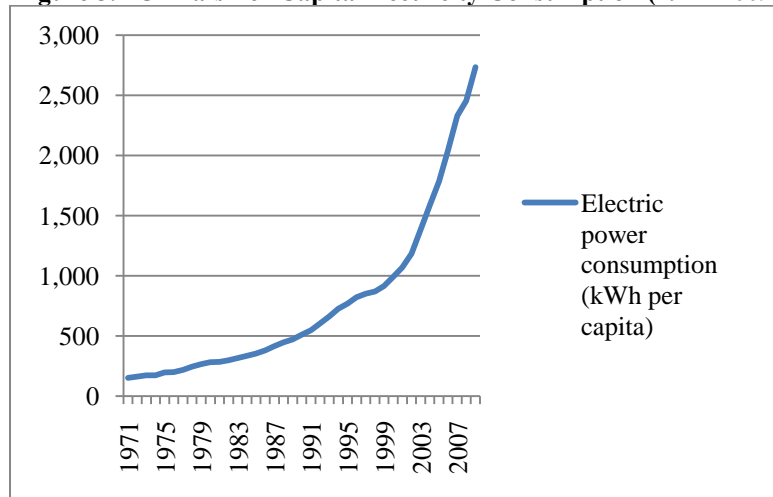
²¹³ The oil equivalent metric represents all forms of energy consumed, including crude oil, nuclear power, coal, natural gas and renewable sources such as hydropower.

²¹⁴ World Bank Indicators website. <http://data.worldbank.org/indicator> , Accessed 10 June 2011.

²¹⁵ *Xinhua News Agency*, 2010. “China's power consumption grows 6% in 2009”, 6 January. http://news.xinhuanet.com/english/2010-01/06/content_12763227.htm. Accessed on 10 June 2011.

²¹⁶ World Bank Indicators website. <http://data.worldbank.org/indicator> , Accessed 10 June 2011.

Figure 5.4 China's Per Capita Electricity Consumption (1971-2009)



Source: World Bank Indicators (1971-2008)²¹⁷; China NEA (2009)²¹⁸

As one might imagine, the Chinese government has been under tremendous pressure to continually add electricity capacity. Although China has passed the U.S. in the average efficiency of its coal-fired power plants, demand for electricity is so voracious that in 2009 China built new coal-fired plants with a total capacity greater than all existing power plants in New York State, not to mention the billions it has invested in new renewable energy sources.²¹⁹ To overcome the electricity transmission bottleneck, China is building a new ultra high voltage (UHV) transmission grid that is scheduled to be completed by 2020. In January 2011, the State Grid Corporation –which is in charge of the power supply for 26 provinces, autonomous regions and municipalities in China– announced that it will invest RMB 500 billion (USD 75.4 billion) in the next five years to extend its UHV electricity transmission system.²²⁰

Yet despite the billions of dollars of invested in electricity capacity and building transmission lines each year, China continues to suffer from chronic power outages and electricity rationing. Recently, Xue Jing of the China Electricity Council, an industry body that reports to state regulators, told state media that China in 2011 would “face its most severe electricity shortage since 2004”.²²¹ In her comments to the media, Xue suggested that there could be a national shortage of 30 million kWh in the summer of 2011, which is equal to the consumption of three Chongqing’s, referring to the southern city of 31 million. As a result, many provinces, including Hunan, Zhejiang, Jiangsu and Anhui, have begun rationing electricity early.

²¹⁷ World Bank Indicators website. <http://data.worldbank.org/indicator> , Accessed on 10 June 2011.

²¹⁸ Xinhua News Agency, 2010. “China’s power consumption grows 6% in 2009”, 6 January. http://news.xinhuanet.com/english/2010-01/06/content_12763227.htm. Accessed on 10 June 2011.

²¹⁹ New York Times, China Fears Consumer Impact on Global Warming, July 4, 2010, http://www.nytimes.com/2010/07/05/business/global/05warm.html?_r=1 . Accessed on 10 June 2011.

²²⁰ Xinhua News, 2011. “State Grid to invest 500 bln yuan in China’s UHV transmission system,” 6 January. http://news.xinhuanet.com/english2010/china/2011-01/06/c_13679425.htm. Accessed 10 June 2011.

²²¹ Hoo, L. 2011. “China forced to ration electricity,” *Financial Times*, 17 May. <http://www.ft.com/cms/s/0/42c0f7f8-809a-11e0-85a4-00144feabdc0.html#ixzz1MkqRUeYB> . Accessed on 10 June 2011.

Yet it turns out that the need to ration has less to do with insufficient electricity production capacity but and more to do with the rising cost of coal and the Center's stalled electricity pricing reforms. In 2010, the price of thermal coal – which fuels 70 per cent of China's power plants – rose by nearly 20 percent, yet the Center raised retail electricity tariffs by just 2 percent that year.²²² The price gap between coal inputs and retail electricity prices has prompted some stations to shut down or reduce generation.

As mentioned earlier, energy prices are set by the NDRC, the main agency in charge of national macroeconomic policy, including inflation. The NDRC has been reluctant to raise utility rates, despite the fact that market-based coal prices have climbed precipitously due to China's exploding energy demand. Rather than allowing electricity prices to rise in step with coal prices, the NDRC has opted to support state-owned utilities and grid companies by helping them negotiate for lower coal prices, or in some cases, by offering government hand-outs to compensate for losses. Yet such hand-outs have not been able to compensate for rising coal prices. The China Electricity Council reported that Chinese power producers lost RMB18.3 billion (USD 2.8 billion) during the first quarter of 2011.²²³

Though the NDRC has at times expressed intent to adjust electricity prices, fears of inflation make increasing energy prices socially and thus politically unpalatable. In May 2011, the NDRC ordered a rate hike of RMB 20 (~USD 3) per 1,000 kWh for some industrial users, but exempted residential users.²²⁴ Why has the NDRC been so hesitant to raise prices, especially residential users? With the winding down of communist ideology in China's reform era, many scholars argue that the ability to create jobs and continuously improve living standards has become the new source of legitimacy for the Chinese government.²²⁵ Providing cheap energy, integral to better living standards, has become part of the implicit bargain between Chinese leaders and Chinese society. Given the specter of public protest over rising energy and food prices, it is not hard to understand why the Chinese leadership is skittish about keeping the lid inflation.²²⁶ The perverse irony of subsidized electricity prices is that they end up squeezing the profits of Chinese utilities, and hence their funds for future infrastructure investment. Subsidized

²²² Hoo, L. 2011. "China forced to ration electricity," *Financial Times*, 17 May. <http://www.ft.com/cms/s/0/42c0f7f8-809a-11e0-85a4-00144feabdc0.html#ixzz1MkqRUeYB> . Accessed 10 June 2011.

²²³ *New York Times*, China fears consumer impact on global warming, July 4, 2010, http://www.nytimes.com/2010/07/05/business/global/05warm.html?_r=1 . Accessed on 10 June 2011.

²²⁴ Kurtenbach, E., 2011. "China hikes electricity rates to counter shortages," *The Boston Globe*, 31 May. http://www.boston.com/business/articles/2011/05/31/china_hikes_electricity_rates_to_counter_shortages/, Accessed 11 June 2011.

²²⁵ In his investigation of the Chinese political system, Guo (2003) suggests that this form of 'utilitarian legitimacy' is a powerful legacy from China's imperial era. Perry (2010) argues that this concept of utilitarian legitimacy justifies anti-government sentiments stemming from food, housing and other material necessities, which may in part explain why the CCP is more tolerant of protests over land and energy prices than those over religious and political freedoms. Utilitarian legitimacy also explains why the CCP places so much emphasis on sustaining high levels of economic growth, enhancing energy security, creating jobs, and controlling inflation.

²²⁶ Most recently, hundreds of angry truck drivers blocked a dock in the Pudong district of Shanghai in protest of rising fees and fuel prices. *Associated Press*, 2011. "Chinese truck drivers protest rising fees and fuel prices," *New York Times*, 21 April. <http://www.nytimes.com/2011/04/22/world/asia/22shanghai.html>. Accessed on 11 June 2011.

prices also encourage residential and industrial users to consume more energy than they otherwise would under market-driven prices.

To make matters worse, the NDRC's call for electricity conservation have often had unfortunate consequences at the local level. Struggling to meet national energy intensity reduction targets, some local officials have scheduled brownouts which caused temporary shutdown of factories, schools, and hospitals. When the lights were turned off, manufacturers fired up diesel generators to compensate for the loss of electricity from the grid. Such actions had the effect of driving up diesel prices and ultimately food prices, not to mention promoting an uncontrolled source of energy and emissions in the form of off-grid diesel generation.²²⁷

Though the State Council gave no specific reason for lowering the energy intensity reduction target in the 12th FYG to 16% from the 20% target in the 11th FYG, it likely did so to limit these types of unintended consequences at the local level. Neither the NDRC nor the other energy agencies have provided local governments the tools required to further increase energy efficiency and suppress peak demand. Some effort has been made to improve the efficiency of electricity production and distribution, such as the shutting down of small coal plants and the expansion of the UHV transmission grid. But there has been no concerted and coordinated effort to promote demand side initiatives to reduce electricity usage, such as real-time pricing. Real-time pricing is needed to incentivize EV owners to plug in at night, when electricity rates and usage are low, rather than plug-in cars during the day, when rates and usage are high.

The billions of dollars being invested in expanding in electricity generation and transmission is important, but without a commitment to more market-driven electricity pricing, the prospect of a stable and reliable electricity system, let alone a smarter Chinese grid, will be grim. Without a smarter grid, it will be very difficult to incorporate millions of plug-in hybrids and EVs without overwhelming the existing system.

The next section explores another problematic aspect of China's fragmented energy governance that has immediate implications for the adoption of EVs: the battle over national EV charging standards. As we shall see, the MOST's hasty disbursement of subsidies to promote EVs at the local level in the absence of national standards may end up doing more harm than good.

5.2.3. CHINA'S DOMESTIC BATTLE OVER ELECTRIC VEHICLE CHARGING STANDARDS

A number of common national standards are required for the smooth adoption of EVs. The most important standards include the plug interface between the EV and the charging station, vehicle charging methods (alternating current versus direct current), charging network communications and billing protocols, and the range of acceptable temperatures for charging. Some in the industry are also calling for a standard size and interface for EV battery packs, which could

²²⁷ Xinhua News Agency, 2010. "Energy reduction policies cause unexpected Diesel shortage in China," *Global Times*, 7 November 7. <http://business.globaltimes.cn/industries/2010-11/590017.html> . Accessed on 10 June 2011.

enable EV owners to swap out a battery pack at a designated EV service station rather than take the time to fully charge their EV battery, which can take hours.²²⁸

Without these standards, it will be difficult for both the central government and the EV industry to create a national interoperable charging infrastructure that will convince potential consumers that EVs won't be limited by battery range. Nissan executives have publicly said that they have no schedule to launch their all-electric Leaf in China because Chinese charging stations and charging systems have not yet been standardized. As Yasuaki Hashimoto, the president of Nissan (China) Investment Company, puts it, "It's inevitably important to have these standards, otherwise we cannot start the mass market."²²⁹ Unfortunately, the lack of such standards has not stopped coalitions of Chinese utilities, carmakers, and local governments from investing in local EV charging stations based on the coalition's preferences.

For example, two competing industry alliances have formed to set EV charging standards. The first alliance, the Union of Electric Vehicle Manufacturers, is made up of the top ten Chinese automakers and led by the China Association of Automobile Manufacturers, the main industry association. The second, the Electric Vehicle Industry Association, is a somewhat odd alliance of sixteen large SOEs, including the three large national oil companies, the two grid operators, and three state-owned automakers (FAW, Chang-An, and Dongfeng), under the guidance of the State-owned Assets Supervision and Administration Commission (SASAC).²³⁰ Oddly missing from the latter organization is SAIC, the largest of the Chinese "Big Three".²³¹ As an SOE-driven alliance, the Electric Vehicle Industry Association also conspicuously excludes the independent automakers arguably at the forefront of China's EV industry.

The Electric Vehicle Industry Association, formed in August of 2010, might be too little too late. China's two state-owned grid operator monopolies, which control all of the country's electricity transmission and distribution, have been independently writing up their own standards building out EV charging station pilots. According to its website, State Grid Corporation of China had already finished writing several industrial standards for EV charging infrastructure as

²²⁸ The amount of charging time depends on whether the car is "slow" or "fast" charged. Slow charging can be done through an upgraded standard electric outlet in one's home (i.e., 240V outlet in the U.S.), but can take 8 to 10 hours. Fast charging (via a level 3 charger of 480V) has the potential to charge 80 percent of the EV battery in around 30 minutes, but there are not yet any standards for fast charging interfaces. Moreover, fast charging stations can cost USD 50,000 to install, versus USD 2,000 to install a 240V charger in one's home.

²²⁹ *Reuters*, 2010. "Nissan has no timetable for sell Leaf in China," 15 November.

<http://www.reuters.com/article/2010/11/15/us-nissan-idUSTRE6AC0QV20101115>. Accessed 11 June 2011.

²³⁰ The full list of sixteen SOEs involved in the Electric Vehicle Industry Association are: China FAW Group, Dongfeng Motor Corporation, Chang-An Automobile Group, Dongfang Electric Corporation, China South Locomotive and Rolling Stock Corporation, China National Offshore Oil Corporation, General Research Institute for Nonferrous Metals, Aviation Industry Corporation of China, China Aerospace Science and Technology Corporation, China Aerospace Science and Industry Corporation, State Grid Corporation of China, China Potevio Company, China National Petroleum Corporation, China Petroleum and Chemical Corporation, China Southern Power Grid Company and China Poly Group.

²³¹ The Electric Vehicle Industry Association may exclude SAIC because SAIC holds the chairmanship of the Chinese Association of Automobile Manufacturers, the organization behind the Union of Electric Vehicle Manufacturers, though this has not confirmed.

of March 2010, months before the Electric Vehicle Industry Association was formed.²³² Furthermore, State Grid has publicly said that it will build 173 electric charging stations, with 9,211 charging poles, in 26 provincial regions in 2011.²³³

Separately, China Southern Power Grid Company has been building its own charging stations in cities within its geographic jurisdiction, including Shenzhen, Guangzhou, Nanning, and Kunming. Southern Grid has announced it will invest more than RMB 1 billion (USD 155 million) to build 89 charging stations and 29,500 charging posts in Shenzhen alone.²³⁴ Why the focus on Shenzhen? Southern Grid has a close relationship with aspiring EV maker BYD.²³⁵ Hence the charging stations to be built in Shenzhen are likely to be fitted with the charging interfaces and requirements of BYD's electric cars.

In 2009, the Ministry of Science and Technology (MOST) announced the “Ten Cities, Thousand Vehicles Program” (*shichengshi qianliang*), in which ten cities – Beijing, Shenzhen, Shanghai, Jinan, Chongqing, Wuhan, Changchun, Hefei, Dalian, and Hangzhou – were chosen to roll out at local pilots of at least 1,000 EVs. The MOST's Ten Cities program, which included funding for the construction of local charging stations, was hastily rolled out *before* national standards were adopted.

In cooperation with Southern Grid, Shenzhen put into service China's first EV charging stations in 2009.²³⁶ In August 2010, Beijing independently announced its own list of standards for EV charging stations to be built in four districts within the city's jurisdiction – Hangtianqiao, Majialou, Xiaoying, and Sihui.²³⁷ Likewise, Hefei announced its own standards in November 2010.²³⁸ As of 2010, 76 charging stations had purportedly been built in 41 cities in China. As discussed in Chapter 4, the Chinese auto industry is very fragmented, with regional governments striving to promote their own regional auto manufacturing hub.

As might be expected, this fragmentation –or “balkanization” – of the industry is contributing to the battle over EV standards. If deals are struck between local officials, local utilities, and local automakers to adopt region-specific standards that exclude other competitors,

²³² The State Grid standards include the Electric Vehicle Charging Station General Technical Requirements, Electric Vehicle Charging Station Design Guidance, Electric Vehicle Charging Station Power Supply System Standards, Electric Vehicle Charging Station Key Technology Research and Operation Assessment, and Electric Vehicle Charging and Discharging Facilities Construction Guidance.

²³³ Du, J., 2011. “State Grid plans to expand power network in 2011,” *China Daily*, 25 March.

http://www.chinadaily.com.cn/bizchina/2011-03/25/content_12227592.htm. Accessed on 11 June 2011.

²³⁴ *Global Times*, 2011. “China Southern Power Grid to lay out charging stations with 1 billion yuan in Shenzhen,” 15 February. <http://auto.globaltimes.cn/auto-china/new-energy/2011-02/623199.html>. Accessed on 11 June 2011.

²³⁵ Southern Grid signed a contract with BYD for a large-scale, grid-connected, energy storage station based on BYD's iron phosphate battery technology. More details can be found on the BYD website. www.byd.com.

²³⁶ *Electric Vehicle News China*, 2010. “China Moves Toward Creating Unified EV Charging Station Standards.” 10 November. <http://www.evchina.com/2010/11/china-moves-towards-creating-unified-ev.html>. Accessed on 6 June 2011.

²³⁷ *China Automotive Review*, 2010. “Beijing Issues EV Charging Station Standards”, 3 September.

<http://www.chinaautoreview.com/pub/CARArticle.aspx?ID=4749>. Accessed on 6 June 2011.

²³⁸ *Electric Vehicle News China*, 2010. “Hefei Announces Extensive EV Infrastructure Plan,” 28 November.

<http://www.evchina.com/2010/11/hefei-announces-extensive-ev.html>. Accessed on 6 June 2011.

then China's vehicle electrification project at the national level will suffer. When a national standard is finally announced, many existing charging facilities will either go through an expensive process of equipment upgrading or be left to rust in disuse.

In November 2010, the Ministry of Industry and Information Technology (MIIT) released a document outlining steps toward a unified charging station standard. But rather than outlining the standards, the MIIT document instead called for the formation of a committee composed of representatives from the China Electric Vehicle Research Center, the China Association of Electricity Producers, and the China Scientific Electrical Appliance Research Institution, as well as industry leaders to create a bill proposing common standards.²³⁹ It is unclear how or whether this committee will cooperate with the two industry alliances mentioned earlier or other agencies with an interest in shaping the future of China's EV industry. For example, the NEA is also said to be reviewing national EV charging standards.²⁴⁰

Meanwhile, MOST has announced that it is working with both the General Administration of Quality Supervision Inspection and Quarantine and the Standards Administration "to set up a [e-car] standardization system in accordance with the characteristics of domestically innovated products and technology."²⁴¹ The national standard setting process is a classic example of what Lieberthal and Oksenberg famously call China's "fragmentation of authority", which leads to a "policy process that is protracted, disjointed and incremental" (1988: 22). Since there is no energy superministry with full authority, it is unclear which agency has the authority or jurisdiction to set national EV standards.

To be sure, China is not alone in the fight over standards. In the U.S., the J1772 charging plug designed by the Society of Automotive Engineers is the leading standard for 120V and 240V charging, and is compatible with the leading alternative energy vehicles available today.²⁴² In Europe, manufacturers led by Daimler have chosen a different plug that is often referred to as the Mennekes plug, which can support 240V and 360V charging, though French and Italian automakers object to the German specifications.²⁴³ Tokyo Electric Power Company has

²³⁹ *Ifeng.com*, 2010. "MIIT solicits opinions about electric vehicle recharging interface standard," 26 November. <http://auto.ifeng.com/roll/20101126/475331.shtml>. Accessed on 11 June 2011.

²⁴⁰ The National Energy Administration was supposed to announce the new national standards in October of 2010, but that deadline has passed without any additional news at the time of this writing. For news related to the October 2010 deadline, see <http://www.automotiveworld.com/news/emerging-markets/83431-china-ev-charging-standards-expected-in-october>. Accessed 10 June 2011.

²⁴¹ Lan, X.Z., 2010, "Shifting into a new gear," *Beijing Review*, 14 October. http://www.bjreview.com/quotes/txt/2010-10/14/content_303508.htm. Accessed on 15 June 2011.

²⁴² This list includes the Nissan Leaf, the Chevrolet Volt, the Toyota Prius Plug-In Hybrid, the Mitsubishi MiEV, the Honda Fit EV, the Ford Focus BEV, and the Tesla Roadster (using the J1772 adapter).

²⁴³ The European Commission is working on a EU standard for EV charging plugs to be used on EVs built in Europe. To that end, the Commission has launched a "Green eMotion" initiative with 42 partners from the auto industry, utilities, municipalities, universities and research institutions, and large industrials like Bosch, IGM, Siemens, EDF, Endesa and Enel. The initiative is designed to promote the adoption of EVs in Europe and is tasked with coming up with a standard plug, though such an effort has been stalled due to disagreement between European carmakers. As of April 2011, there is still no agreement in sight as to what kind of plug will be used at European EV charging stations. For more, see *Euroactiv*, 2011. "Electric car makers fight over plug standard," 7 April. <http://www.euractiv.com/en/innovation-enterprise/electric-car-makers-fight-plug-standard-news-503854>. Accessed 19 June 2011.

developed a specification solely for high voltage fast charging in conjunction with Mitsubishi, Nissan and Subaru, which can support fast charging up to 500V. These three plugs have different numbers of connectors and vary in size. The fact that all of the global automakers have JVs and influential political partners in China will further complicate the country's efforts to settle on EV standards.

There is one more wild card worth mentioning. The Chinese government has a history of espousing technology standards which it believes will reduce China's dependence on foreign technology and at the same time give Chinese firms an advantage over foreign firms. In the 1990s, for example, the Chinese government pushed for the adoption of Super Video CD, which it hoped would be an alternative to the DVD format that would not be restricted by expensive technology royalties that had to be paid to foreign companies. In 2004, the Chinese government attempted to mandate its own wireless local area network (LAN) standard called WAPI (Wireless LAN Authentication and Privacy Infrastructure). In 2006, the government announced that its homegrown TD-SCDMA technology would be the country's standard for 3G mobile telecommunication. These examples are just to name a few.

The good news is that the Chinese government's has had an overwhelming record of failure in developing China-specific standards to compete with well-established international standards.²⁴⁴ The bad news is that if the government should again try to leverage its large domestic market to benefit Chinese automakers and to promote China-specific EV standards, the adoption of EVs in China will be excruciatingly slow as EV prices are likely to remain high because of small production volumes and little to no export potential. Given what many see as a "more assertive" Chinese government, it is not difficult to imagine the government once again making this mistake.²⁴⁵

Yet even if China will not lead the world in the adoption of EVs, the Chinese auto industry is becoming the world's leading laboratory for EV technology collaboration and experimentation. One of these experiments could lead to a breakthrough in battery technology and EV production. The following section looks closely at some of the most promising collaborations.

5.3. CHINA AS A LABORATORY FOR GLOBAL EV COLLABORATION

China is proving to be an exceptionally fertile environment for EV technology collaboration and development. Electric propulsion introduces a value chain shift that could favor the Chinese auto industry from both a technological and supply chain perspective. This is largely due to China's broad electronics manufacturing base and its specific strength in batteries and motors. China is the world's largest manufacturer of lithium batteries. Next generation plug-in hybrids and EVs are likely to be built with lithium battery technology.

²⁴⁴ For a comprehensive discussion of why China's standard setting efforts have failed, see Kennedy (2006).

²⁴⁵ Many media articles and opinion pieces in recent years have referred to a "more assertive" China. Christensen, T., 2011, "The World Needs an Assertive China," *New York Times*, 21 February. *Japan Today*, 2011. "As China grows more assertive, U.S., Japan push back," 1 February. Small, A., 2010 "Dealing with a more assertive China," *Forbes*, 18 February; McGregor, R., 2007. "China more assertive in climate talks," *Financial Times*, 4 May;

Furthermore, China possesses an advantage in the production of rare earth materials, specifically neodymium, which contributes approximately 30 percent of the material cost of permanent magnet motors, one of the key motor types used in electric propulsion systems. According to the World Bank's recent study of China's new energy vehicles program, "the result of these advantages in batteries and motors could provide an overall advantage for Chinese companies in electric drive train components and may position Chinese automakers to assume global leadership in electric vehicles (2011:12). The following sections look at the different types of companies and collaborations in China that could lead to incremental breakthroughs in key technologies and manufacturing processes.

5.3.1. CHINA'S PROMISING INDEPENDENT AUTOMAKERS, GOLF CART PRODUCERS, AND ELECTRIC BICYCLE MANUFACTURERS

As Chapter 3 argued, the Chinese auto industry –particularly independent firms– have benefitted tremendously from China's integration into the global production networks and global product markets. The decomposition of automotive production along with the trend toward more electronics has put more of the value of new cars into the hands of global suppliers, which have been increasingly willing to work with independent Chinese automakers. These collaborations have obviated the need for independent firms to reinvent the wheel.

Even if the Chinese domestic market will be slow to adopt EVs, independent automakers could sell their products to other regional markets, especially developed markets which have national policies in place to stimulate rapid EV adoption. Table 5.3 below offers a partial list of hybrid and all-electric cars that have been announced by independent automakers and leading global manufacturers. Though none of these cars are in mass production yet, the comparison is nonetheless useful in that it demonstrates just how active Chinese automakers are in the global EV industry. The following sections will illustrate how Chinese firms are executing on their global product development and international product sales strategy.

Table 5.3 Partial List of Announced Plug-In Hybrids and All-Electric Vehicles²⁴⁶

Company	Model Name	Type of Power Train	Country of Production	Range (miles)	Max Speed (mph)	Estimated Price (USD)	Status of Availability (as of 6/2011)
BYD	F3DM	Plug-In Hybrid	China	40-60 w/ electric, plus 300 w/ gas	93	\$25,000-29,000	Not yet in mass production.
BYD	e6	All-electric	China	205	87	\$35,000-\$40,000	Not yet in mass production.
Chery	S18	All-electric	China	93	75	\$19,200	Not yet in mass production
Chevrolet	Volt	Plug-In Hybrid	U.S.	35 w/ electric, plus 344 w/ gas	100	\$ 43,568	Limited quantities in the U.S.
CODA	the CODA	All-electric	China (U.S. assembly)	90-120	N/A	\$40,000-\$45,000	Limited quantities in U.S. in 2011.
Geely	Nanoq	All-electric	China	124	80	\$ 45,530	Not yet in mass production.
Lifan	520	All-electric	China	62.5-218.7 (depends on battery pack)	87.5	N/A	Still in the development phase.
Nissan	Leaf	All-electric	Japan (U.S. in 2012)	73-100	93	\$ 32,780	Limited quantities in the U.S., Japan, Ireland, U.K.
Shanghai GM	Sail (electric)	All-electric	China	93	91	N/A	Still in the development phase.
Wheego	LiFe	All-electric	China (U.S. assembly)	100	70	\$32,995	Limited quantities in U.S. in 2011.

Source: Company websites; news websites.²⁴⁷

²⁴⁶ This is only a partial list. Many more all-electric and plug-in hybrid cars are being developed by other leading automakers, including but not limited to: Mitsubishi iMiEV, Subaru Plug-In Stella, General Motors e-Spark, BMW Mini-E, Daimler Electric Smart for Two, Tesla Roadster, Tesla Model S, and Volkswagen E-Up!

²⁴⁷ Most of the specifications are those given by the companies themselves and have not in all cases been verified by third parties.

Of the independent automakers, BYD has been the most aggressive when it comes to EV development. As discussed in Chapter 4, BYD is a battery maker with automotive ambitions. Though it had no particularly technological advantage in the production of internal combustion vehicles, BYD derives distinct advantage from its expertise and manufacturing experience in cell phone batteries. BYD is currently the world's largest producer of lithium-based batteries. The company is currently on an IPO road show to raise money to build a new lithium ion battery plant, invest in R&D manufacturing facilities in Shenzhen, and expand parts production.²⁴⁸

Wang Chuanfu, BYD's founder and CEO, hopes to leverage the company's strength in battery technology to become a leading exporter of EVs to developed markets. To that end, Wang is actively building relationships with foreign firms and foreign governments. BYD's most widely publicized relationship is the JV it announced with Germany's Daimler in 2010. The goal of the 50-50 partnership is to design and produce an electric car for sale in 2012. The firms have committed USD 90 million to the JV partnership. As one Beijing-based American auto analyst puts it, "This gives them [BYD] credibility on the world stage today. It gives them access to technology that will help bring up their own car making capability."²⁴⁹

One of the key advantages BYD purports to have is its lower cost lithium iron phosphate battery, which is different from the more expensive lithium ion battery used by other EV makers. Though there are questions over whether BYD's lithium iron phosphate technology infringes upon existing patents, BYD is forging ahead with EVs built on this technology.

At the same time, BYD is actively reaching out to governments with a clear interest in vehicle electrification as a way to reduce their carbon footprints. To that end, BYD has been very aggressive in expanding into California, the state at the forefront of environmental policy in the United States. In 2010, BYD opened an office in Los Angeles with much fanfare. Los Angeles Mayor Antonio Villaraigosa and California Governor Arnold Schwarzenegger joined BYD Chairman Wang on the steps of Los Angeles city hall as the company announced that Los Angeles would be the company's North American headquarters.²⁵⁰ The company has hired an American, Micheal Austin, to be its Vice President of BYD America and chief evangelist in the U.S. market. Austin, who previously had a distinguished career at Motorola, is the highest ranking Caucasian working at BYD.

After setting up its American headquarters, BYD finalized a deal with the Housing Authority of the City of Los Angeles (HACLA) in which the HACLA would test a fleet of BYD's F3DM plug-in hybrids. According to the HACLA, the appeal of the F3DM is that comes with an onboard charger which requires 7 hours to charge using a standard 220V AC outlet, the same outlet that is used for a clothing dryer. The F3DM does not require special charging

²⁴⁸ *Automotive News China*, 2011. "BYD cleared to issue stock on Shenzhen exchange," 10 May. <http://www.autonewschina.com/en/article.asp?id=6985>. Accessed 11 June 2011.

²⁴⁹ *Bloomberg News*, 2010. "Daimler, BYD set up Chinese venture to develop electric cars," 27 May. <http://www.bloomberg.com/news/2010-05-27/daimler-buffett-backed-byd-set-up-china-venture-to-develop-electric-cars.html>. Accessed 11 June 2011.

²⁵⁰ *Edmunds Auto Observer*, 2010. "China's BYD selects Los Angeles as Automaker's North American Headquarters," 30 April. <http://www.autoobserver.com/2010/04/chinas-byd-selects-los-angeles-as-automakers-north-american-headquarters.html>. Accessed 12 June 2011.

infrastructure. BYD is also in discussions with HACLA to integrate solar power to charge an energy storage solution during the day that could then be used in the evening to charge the F3DM fleet.²⁵¹ As part of its effort to ramp up its energy storage solutions, BYD also announced that it was forming a collaborative partnership with Los Angeles Department of Water and Power, the largest municipal water and power utility in the U.S. Together they will develop a 5 to 10 megawatt power storage unit to be housed at the Pine Tree Wind Farm.²⁵²

In Europe, BYD has signed an agreement with Trafikselskabet Movia, Denmark's largest public transport operator, in which the company will sell electric buses to the Danish agency. If BYD's K9 electric buses, which are purported to have a range of 250 km and a maximum speed of 70 km per hour, pass Danish tests, they will be integrated into Denmark's 2012 bus fleet.²⁵³ BYD has also signed a deal with the city of Rotterdam in the Netherlands, in which the company is to deliver several EVs for the city's test fleet of 75 vehicles.²⁵⁴

BYD also plans to bring its energy storage solutions to Europe. To that end, BYD formed a partnership with the German utility company, RWE Effizienz GmbH. Under their agreement, BYD will supply its F3DM plug-in hybrid and all-electric e6, while RWE will provide quick charge stations. Though the two sides have not publicly named which markets they will target with their products, they have confirmed their plans to produce an EV fleet for a trial program in Germany. The trial, if successful, could be extended to other markets in which RWE has a presence, including Austria, the Netherlands, the United Kingdom, and twelve other European countries.²⁵⁵

To be sure, BYD is not the only independent automaker trying to take the lead in EVs. Geely is working closely with two Danish companies to develop an electric version of its Panda small car. The electric motor system for the electric Panda is supplied by the Danish electric car developer, Lynx Cars, while the lithium polymer battery pack is supplied by Lynx Car's sister company, Positive Batteries. The batteries for the electric Panda are reported to be the same as those used in the Lynx GT, a record-breaking pure electric sports car with 1,072 horsepower. According to the founder of Positive Batteries, Brian Hoehl, the five-seat electric Panda can reach a top speed of 130 km/hr (81 mph) and has a range of 200km (125) per charge.²⁵⁶ The car will be marketed as the Geely Panda in China, while in the U.S. and Europe it will be branded as

²⁵¹ HACLA website. <http://www.hacla.org/byd-and-the-hacla-launch-electric-vehicle-testing-program/>. Accessed 11 June 2011.

²⁵² BYD website. <http://www.byd.com/buzz/company-news/los-angeles-department-of-water-and-power-and-byd-partner-for-grid-energy-storage-solution/>. Accessed 11 June 2011.

²⁵³ *Automotive News China*, 2011. "BYD sends its electric bus for tests in Denmark," 25 March.

<http://www.autonewschina.com/en/article.asp?id=6727>. Accessed 11 June 2011.

²⁵⁴ *Automotive News China*, 2011. "BYD ships EV test fleet to Rotterdam," 7 June.

<http://www.autonewschina.com/en/article.asp?id=7111>. Accessed on 11 June 2011.

²⁵⁵ *Automotive News China*, 2011. "BYD expects to sell plug-in and EV in Europe in 2012," 28 September.

<http://www.autonewschina.com/en/article.asp?id=5881>. Accessed 11 June 2011.

²⁵⁶ *Automotive News China*, 2011. "Danish company works with Geely to develop electric car," 6 January.

<http://www.autonewschina.com/en/article.asp?id=4084>. Accessed 12 June 2011.

the Geely Nanoq.²⁵⁷ The car was demonstrated in Copenhagen during the 2009 United Nations Climate Change Conference, and reportedly test driven by Premier Wen Jiabao and Prince Frederik of Denmark.²⁵⁸ Though the Nanoq is not yet in mass production, it is yet another example of the synergies that can be created between cutting-edge foreign automotive technology and low-cost Chinese manufacturing.

Like BYD and Geely, Chery is actively designing and promoting its own electric car. Its first EV is the S18, which is a small electric version of its popular QQ model. The specifications, such as the range and the top speed are similar to those claimed by other Chinese carmakers, though Chery has announced that its EV will be priced much lower at RMB 130,000 (USD 19,200). Chery has continually delayed the car's official launch for unclear reasons, though many within the industry have speculated that Chery's S18 announcements have been designed more to placate the Chinese government and to better its image as an industry leader than to sell EVs. Nonetheless, Chery did sign a memorandum of understanding with California-based technology company, Better Place, to jointly develop switchable-battery EV prototypes in hopes of securing regional Chinese government pilot projects.

Better Place, which raised USD 250 million investment in 2010 (for a valuation of USD 1.2 billion) aims to build a network of charging stations for EVs in China and then lease batteries to Chinese EV owners.²⁵⁹ To that end, Better Place has also announced a strategic agreement with China Southern Power Grid to establish a battery swapping station and joint education center in Guangzhou city by the end of 2011.²⁶⁰ At the *2011 International Forum on Electric Vehicle Pilot City and Industry Development* held in Shanghai, China Southern Power Grid announced that China could have more than 2,300 battery swapping stations installed by the end of 2015.²⁶¹

However, without common standards for battery pack dimensions, connector interfaces between the car, the battery and the communications network, and the battery cooling system, and safety standards, it will be difficult to reach economies of scale. Better Place is working with European car and battery makers and the European Commission on a set of European standards

²⁵⁷ Nanoq means polar bear in the Greenland language. According to Hoel, the reason for choosing Nanoq is to use the story of the polar bear in the countries outside Asia to make a direct link with the benefit of driving and electric car.

²⁵⁸ Presswire, 2009. "Geely made huge impact at COP15 with electric car," 31 December. http://www.presswire.com/releases/Geely_made_huge_impact_at_COP15_with_electric_car/450. Accessed 12 June 2011.

²⁵⁹ Reuters, 2010., "Better Place to work with Chery on electric cars," 24 April. <http://www.reuters.com/article/2010/04/24/us-betterplace-chery-idUSTRE63N1GQ20100424> . Accessed 15 June 2011.

²⁶⁰ *Autoblog Green*, 2011, "Better Place signs deal in China; State Grid wants 2,300 swap stations installed by 2015," 2 May. <http://green.autoblog.com/2011/05/02/better-place-signs-deal-in-china-state-grid-wants-2-300-swap-st/> . Accessed 15 June 2011.

²⁶¹ This was the inaugural year for this forum, which was co-hosted by the MOST, the Shanghai municipal government, and the IEA. More on the forum (in Chinese) can be found at <http://auto.sohu.com/s2011/evcity/index.shtml> . Accessed 15 June 2011.

via the “EASYBAT” Consortium.²⁶² Though EASYBAT is a 2.5 year project which is expected to run until June 2013, many in Europe and elsewhere see great promise in the idea of switchable batteries to solve EV range issues.²⁶³ With an internationally known and active EV technology company like Better Place as a partner, Chery may have an edge in China if more local governments get behind switchable battery stations.

Another lesser known independent automaker, Lifan, is also muscling its way into the EV market through technology partnerships with foreign firms. Though Lifan’s annual production is much smaller than Chery, Geely, BYD or Great Wall, its ambitions are not. Lifan, based in Chongqing City in western China, is partnering with French tire maker, Michelin, and Chinese battery material supplier and manufacturer, Mengguli Corporation (MGL), to produce an electric version of its Lifan 520. The electric powertrain system for the electric Lifan will integrate Michelin’s “Active Wheel” technology with MGL’s lithium batteries. Michelin’s proprietary Active Wheel technology houses a pair of electric motors and suspensions inside a standard wheel. One of the motors spins the wheel and transmits power to the ground, while the other acts as an active suspension system to improve handling and stability. The technology is such that a vehicle equipped with Active Wheel will no longer need a gearbox, clutch, transmission shaft, universal joint, or anti-roll bar. The EV will reportedly have a maximum speed of 140 km (87.5 mph) and a range of 100 to 350 km (62.5 to 187.5 miles) with a full recharge, depending on the capacity of the battery pack.²⁶⁴ This car has still not been tested, but Michelin has said that its Active Wheel technology has been proven.

In addition to carmakers, Chinese golf cart producers and electric bike companies are also jumping in the EV fray. China is currently the world’s largest producer of golf carts, which are small plug-in electric vehicles. Shandong Fangneng Electric Vehicle Company, for one, produces tiny plug-in EVs that closely resemble the Daimler Smart ForTwo and the Chevrolet Spark. The problem is that these cars can only run 62.5 miles on a single charge and can only reach a max speed of 40 mph. Yet what these two EVs lose in performance, they make up in price. The two-seat Smart ForTwo lookalike sells for RMB 26,800 (USD 3,905) while the four-seat Spark lookalike sells for RMB 27,800 USD (4,050). Fangneng claims it sold 1,000 units of its electric cars in 2007, a majority of which were exported to Sri Lanka, Thailand and Canada.²⁶⁵ Other Chinese golf cart companies with EV ambitions include Cestar Electric Vehicle Company,

²⁶² *Green Car Congress*, 2011. “EC backs project for EV battery switching: EASYBAT,” 2 March. <http://www.greencarcongress.com/2011/03/ec-backs-project-for-ev-battery-switching-easybateasybat-20110302.html> . Accessed 15 June 2011.

²⁶³ The UC Berkeley Center for Entrepreneurship and Technology released “Electric Cars in the United States: A New Model with Forecaset to 2030”, which examines the market size for electric cars with switchable batteries. The study predicts rapid adoption of EVs assuming the ownership of the battery is separated from the vehicle. The press release for this report can be found at <http://cet.berkeley.edu/news/uc-berkeley-study-finds-separate-battery-ownership-accelerates-mass-market-adoption-of-electric-cars> . Accessed 15 June 2011.

²⁶⁴ Weber, J., 2008. “Michelin partners with China’s MGL to produce Active Wheel powertrains,” *Motor Authority*, 1 December. http://www.motorauthority.com/news/1031048_michelin-partners-with-chinas-mgl-to-produce-active-wheel-powertrains . Accessed on 12 June 2011.

²⁶⁵ Huang, K., 2008. “Tiny Chinese companies make electric lookalikes,” *Automotive News China*, 9 July. <http://www.autonewschina.com/en/article.asp?id=1624> . Accessed 15 June 2011.

Huoyun Electric Car Company, Aolong Electric Car Company, and Chuangyida Electric Car Company.²⁶⁶

Like golf cart companies, electric bike companies are also adeptly leveraging China's deep and vast electronics and automotive supply chain. In 2010, Chinese consumers bought about 97 percent of the 25 million electric bikes sold worldwide, while the rest were exported. Today, there are already 140 million electric bikes and scooters in China.²⁶⁷ Though electric bikes are today run on lead acid batteries, Chinese manufacturers are developing ones with lithium-ion batteries, which could help bring down prices for lithium-ion battery cells across vehicle platforms. China's Giant, the world's largest producer of conventional bicycles, is already selling electric bikes that use lithium-ion batteries in northern Europe. Some electric bicycle companies are already showcasing their EV prototypes. For example, Shandong Bidewen Power Technology Company and Shandong Baoya New Energy Vehicle Company, which make electric bicycles, showcased two-seat mini electric cars with lead acid batteries along with other electric bicycle producers at the 25th *World Battery, Hybrid and Fuel Cell Electric Vehicle Exhibition* in Shenzhen City in November 2010.²⁶⁸ Bvin, another company at the Shenzhen exhibition, claims it has already started selling a low-speed, mini electric car for RMB 29,800 (USD 4,500).

According to an ex-VW executive interviewed for this study, the fact that Chinese consumers are already used to short ranges and the hassle of charging batteries for their electric bikes suggests that switching to electric cars will not require a massive cultural change. In his words, the issue is the right price, which he puts at around USD 5,000. If that is the case, then golf cart and electric bicycle companies just might have an edge.²⁶⁹ The leading Chinese golf cart and electric bicycle companies are not small companies and arguably have more experience producing battery-based vehicles than their automotive counterparts, which could give them a cost and scale advantage. Nonetheless, the technology and safety standards of low-speed EVs based on golf cart and electric bicycle technology are unlikely to match that of automakers, which will likely limit the adoption of these types of products in developed markets with strict vehicle standards. These small and inexpensive EVs could, however, serve special niche markets, such as small government vehicle fleets or urban commuter cars, both in China and in other emerging markets.

5.3.2. CHINA AS A GLOBAL EV DEVELOPMENT AND PRODUCTION BASE FOR MULTINATIONAL AUTOMAKERS

Until recently, the global manufacturers with JVs in China focused their energies on producing cars to be sold in the Chinese market. For various reasons, very few of the JV-produced cars are

²⁶⁶ Cestar plans to launch a new electric car that also looks like the Daimler Smart ForTwo, which it will call "Si-Ma-Te" in Chinese, which sounds like "smart".

²⁶⁷ Burns, S., 2011. "Massive demand for electric bikes in China impacting lead and lithium prices," *Oil Price website*, 14 May. <http://oilprice.com/Metals/Commodities/Massive-Demand-for-Electric-Bikes-in-China-Impacting-Lead-and-Lithium-Prices.html>. Accessed 15 June 2011.

²⁶⁸ More on this event can be found on the exhibition website: <http://www.huiyee.com/event/2009ddc-en/index.html>. Accessed 16 June 2011.

²⁶⁹ Interview 83 with ex-VW executive, 13 April 2009.

exported from China.²⁷⁰ However, this could change with the advent of the electric car. As mentioned earlier, China –with its deep and broad electronics and automotive supply networks– is in many ways an ideal location for the development and production of electric cars. Many multinational automakers, established and new, are learning to leverage their China operations as a global EV production hub.

Shanghai GM, for example, showcased an electric version of its popular Sail sedan at the 2010 Guangzhou Auto Show. The Sail electric concept vehicle, like its gasoline-powered predecessor, was developed by GM and its Chinese partner SAIC through their PATAC research and development joint venture. The Sail electric concept is powered by a lithium-ion battery and uses a technology which is called regenerative braking, which recovers and converts the energy produced by braking and then stores it until needed. If the electric Sail goes into production in 2011, as the joint venture has said, then GM will be the first global automaker to build EVs in China. Although there are not yet many details about the electric Sail, such as its pricing, some information can be inferred from the original gasoline-powered Sail.

The Sail was the first car completely developed from scratch by GM and SAIC through their joint venture, as well as the first car built by Shanghai GM to be exported in significant quantities. General Motors' commitment to design and build the Sail in China marked the first time a global automaker had truly brought its Chinese partner into the product development process. Because the R&D for the Sail occurred entirely in China, with little royalty payments to GM headquarters, the development costs were low. As a result, the basic Sail model could be sold for the very low price of RMB 57,000 (USD 8,500) in China, making it the most affordable JV-produced car in subcompact segment of the market.²⁷¹

The low development cost of the Sail makes it a viable export. Not only did the Sail do very well in China, selling 125K units in 2010, but Shanghai GM shipped over 5,000 Sail units that same year, mostly to Chile. According to a GM executive, the annual export volume of the Sail could jump fourfold in 2011 and is set to be sold as CKD kits to new regional markets including India.²⁷² The Chinese-designed and Chinese-built electric Sail is likely to follow in the footsteps of its gasoline-powered predecessor. If the price is right, Americans could find Chinese-made electric Sails in their local dealerships.

General Motors is not the only foreign automaker that sees the potential of using China as a production base and export hub for EVs. CODA Automotive is a privately held company headquartered in Santa Monica, California, with ambitions to become a global leader in EVs. To keep its development and production costs manageable, CODA looked to China for partners in

²⁷⁰ For one, shipping cars from China to other regional markets is expensive. Furthermore, many countries still place high tariffs on imported cars. As a result, many carmakers prefer to ship CKDs to be assembled in each market rather than shipping fully assembled cars.

²⁷¹ As a point of comparison, the other two leading JV-produced cars in that segment, the Guangzhou Honda City and the Shanghai VW Polo, started at RMB 97,000 (USD 14,500) and RMB 86,000 (USD 12,800) respectively. Though the City and Polo models are built in China, they were largely designed in Japan and Germany and then adapted for the Chinese market, which keeps overall costs high.

²⁷² *International Business Times*, 2011. "GM blazes trail of small car exports from China," 1 March. <http://www.ibtimes.com/articles/117278/20110301/general-motors-chevy.htm> . Accessed 13 June 2011.

technology development and production. Its first electric car, the CODA, is loosely modeled on the body of a Chinese-built gasoline powered vehicle, the Hafei Saibao²⁷³, with engineering help by Italian design firm, Pininfarina. The lithium iron phosphate battery system is co-developed and produced with Chinese battery company, Lishen Power Battery.²⁷⁴ Though CODA has raised USD 200 million from investors, it has also applied for a USD 500 million dollar loan from the U.S. Department of Energy to build a battery plant in Columbus, Ohio with its Chinese partner, Lishen.²⁷⁵ Though many parts, including the body and chassis, will be built in China, these parts will be assembled along with the electric motor and battery pack in the United States. In an effort to shore up its Chinese operations, CODA named long time industry veteran, Phil Murtaugh as their CEO in early 2011. Murtaugh, former CEO and Chairman of GM China, is largely credited with the success of Shanghai GM.²⁷⁶ CODA debuted the CODA electric car at the 2010 Los Angeles Auto Show.²⁷⁷

Similarly, another EV start-up, Atlanta-based Wheego is also leveraging China's electronics and automotive supply base. Wheego's first EV is a small, two-seat electric car called the Wheego LiFe, a play on the elemental symbols of its battery technology, lithium (li) and iron (fe). For the chassis and body of the LiFe, Wheego is partnered with Shijiazhuang Shuanghuan Automobile Company. Of course, what Wheego does not like to publicize is that the LiFe body is loosely based on the body of the Shuanghuan Noble minicar, which bears an uncanny resemblance to the body of the Daimler Smart ForTwo minicar.²⁷⁸ Separately, Shuanghuan's SUV, called the CEO, is also considered a blatant imitation of the BMW X5.²⁷⁹ In any case, the ability to source the body and chassis from China, rather than design it from

²⁷³ Hafei is a brand owned by traditional SOE, Chang-An. The base Hafei Saibao chassis is licensed from Mitsubishi.

²⁷⁴ The joint venture between CODA and Lishen is called LIO Energy Systems, is based in Tianjin City, and aims to sell their battery systems to other companies. Interestingly, Lishen's primary shareholder is China National Offshore Oil Company.

²⁷⁵ There have been some concerns raised by American lawmakers over the fact that CODA plans to build the plant with Lishen, fearing that federal dollars will go to a Chinese company. Gearino, D., 2010. "Ties to China pose hurdle for proposed battery plant," *The Columbus Dispatch*, 28 October.

http://www.dispatchpolitics.com/live/content/local_news/stories/2010/10/28/copy/u-s-aid-for-local-battery-operation-hits-snap.html?adsec=politics&sid=101 . Accessed 16 June 2011.

²⁷⁶ Under Murtaugh's stewardship, GM China grew from fifteen employees in its Shanghai operations to 15,000 employees throughout the country, with revenues growing from USD 300 million to more than USD 7 billion. The press release can be found at <http://www.codautomotive.com/news-press-release/2011/coda-appoints-phil-murtaugh-ceo.html>. Accessed 13 June 2011.

²⁷⁷ For news on the CODA display at the LA Auto Show, see *Road & Track* website.

<http://www.roadandtrack.com/auto-shows/los-angeles/2012-coda-electric-sedan> . Accessed 13 June 2011.

²⁷⁸ Daimler took Shuanghuan to court in Europe in 2007 over what it viewed as IP infringement. Though Daimler managed to successfully block the Shuanghuan Bubble (the European version of the Noble) from being showcased at the Bologna Auto Show in 2007, it has all but given up on blocking sales of the car. Martin Motors, Shuanghuan's European distributor, has pointed out that the Bubble is substantially different from the Smart ForTwo. The Smart has rear-engine and rear-wheel drive, while the Bubble is front-engine and front-wheel drive. The Smart has two seats while the Bubble has four seats. Martin Motors has turned around and sued Daimler for lost Bubble sales. For more on these lawsuits, see <http://search.autonews.com/dealers-and-dealer-companies/martin-motors.htm> . Accessed on 13 June 2011.

²⁷⁹ BMW took Shuanghuan to court in Milan and in China, and lost in both cases. For more on the Milan court case, see <http://www.autonews.com/apps/pbcs.dll/article?AID=/20081218/ANE02/812189978> . Accessed on 13 June 2011.

scratch, has saved Wheego tens of millions of R&D dollars. The LiFe is assembled in Ontario, California, and will be sold throughout the United States.²⁸⁰ Several LiFe cars were delivered to customers in the early 2011, with greater availability slated for the latter half of 2011.²⁸¹

With the advent of the electric car, the Chinese auto industry is finally becoming global. Whether independent automakers or global automakers will lead the charge in EV exports from China is still unclear, as the EV market is just beginning to ramp up. To be sure, there could be enough room in the international marketplace for both. In either case, many Chinese companies located along the electronics and automotive value chains are poised to benefit from the world's embrace of electric transportation.

5.4. CONCLUSION

The first part of this dissertation argued that China's independent automakers emerged, rather unexpectedly, out of the failure of China's joint venture policy combined with the new opportunities afforded by China's integration into global production networks. In a sense, the Chinese government's incoherent industrial policy and inability to prevent market entry opened the door to new domestic competition. However, policy incoherence does not always have positive unintended consequences. This chapter has argued that the government's failure to produce a consistent national energy policy and its inability to put forth clear electric vehicle charging standards does not bode well for China's energy governance, especially when it comes to large scale adoption of electric vehicles.

Policy decentralization and local experimentation have played crucial roles in China's economic development over the last few decades, but they may hamper China's economic growth going forward. In many ways, the Center's limited capacity to reign in the economic ambitions and policy initiatives of local governments has turned into a liability. Not only have hasty actions by local governments led to undesirable outcomes such as off-grid diesel-powered electricity generation, but to the proliferation of local EV charging solutions based on local interface preferences.

The battle over EV charging standards is further complicated by conflicting interests and alliances between domestic Chinese automakers, not to mention the conflicts between China's grid operators, or those between global automakers with a presence in China. Though every stakeholder has an interest in influencing EV standards, no single stakeholder or government agency has the authority or will to make a final decision. At this time, it is not clear which firms and whose preferences will emerge as the "winners" of the standards war. As one industry insider puts it, "Five years from now, China's zealous drive for electrics is bound to produce some effect. But what will that effect be? Based on the challenges that electric vehicles face

²⁸⁰ Though it is not entirely clear why the LiFe is assembled in California, it is likely because the body and chassis are shipped from China, and because California is likely to be the car's largest market.

²⁸¹ Cunningham, W., 2011. "Watch out Leaf, Wheego LiFe EV hits the streets," *CNET News*, 24 April. http://reviews.cnet.com/8301-13746_7-20057238-48.html . Accessed on 13 June 2011.

today, will we compare the EV campaign with the formidable Great Wall, or the start-crossed Great Leap Forward?”²⁸²

That being said, this chapter has also demonstrated the ways in which China is uniquely positioned as a laboratory for EV technology and product development and a potential base for EV exports.²⁸³ China not only has an increasingly sophisticated automotive supply network, but also boasts an extensive electronics supply chain. As the World Bank and others have pointed out, China could possess particular advantages in EVs that it never possessed in conventional vehicles.²⁸⁴ Various forms of Sino-foreign technology collaborations are taking shape, many of which are likely to lead to incremental breakthroughs in either core EV technologies, especially batteries and motors, or low cost EV design and production methods. As a result of the symbiotic relationship between Chinese and foreign firms, we may see the importation of largely Chinese-made electric cars into the U.S. and Europe long before we see the importation of gasoline-powered cars from China.

²⁸² Dunne, M., 2011. “Commentary: The great Chinese electric vehicle campaign,” *Automotive News China*, 24 May. <http://www.autonewschina.com/en/article.asp?id=7038> . Accessed in 13 June 2011. Dunne is the author of the upcoming book, *American Wheels, Chinese Roads: The Story of General Motors in China* (Wiley & Sons).

²⁸³ I have also co-authored a paper about China’s renewable energy sector which tells a similar story (Chang and Gao forthcoming). In our paper, we argue that China is a learning laboratory for renewable energy development. Even though renewables will continue to comprise a small fraction of China’s overall energy needs, Chinese “green industries” – especially those firms engaged in wind turbine and solar panel production – are becoming global industry leaders by leveraging the country’s deep and broad electronics supply base.

²⁸⁴ Wan Gang, the Minister of Science and Technology, also believes that China has a unique advantage in the development of fuel cell technology for cars. Wan not only spearheaded fuel cell research at Tongji University in Shanghai, but has said publicly that battery-powered cars are seen as the medium to long-term solution, with fuel cells being the ultimate solution. To that end, the MOST commits over 60 percent of its energy research funding to electric and fuel cell vehicle projects. Ribet, S., 2008, “Chinese central government cools to clean diesel,” *Automotive News China*, 12 November. <http://www.autonewschina.com/en/article.asp?id=1991> . Accessed 15 June 2011. At the time of writing, fuel cell-based cars have been tested but are not yet close to being commercially available.

CHAPTER 6

CONCLUSION: STUMBLING TOWARD CAPITALISM

China's current alternative energy vehicle strategy is like a shotgun. China scatters a little effort in many directions, hoping one bullet will hit the target. What China needs is a rifle strategy. One focused and detailed plan and one silver bullet.

-Former Shanghai Volkswagen Executive, 2009²⁸⁵

Without a blue print for reform, Chinese leaders have often employed a “shotgun strategy.” They allow regional policy experiments as a way to test the viability of different reforms. In the auto sector, for example, the first joint ventures were experiments performed on regional SOEs – SAIC, BAIC and GAIC. Rather than concentrating scarce R&D dollars on a few select firms and technologies, the Chinese government prefers to parcel out limited funds across many automakers, local governments, and state-run research institutes, hoping that one of those companies, cities, or technologies will emerge above the fray. Yet what China needs now to solve meet auto and energy-related challenges is a concentrated “rifle strategy”. The question is whether that likely given China's fragmented institutions and decentralized economic policymaking.

This last chapter will consider the broader implications of the argument presented in this dissertation, including the limitations of China's shotgun approach to policymaking. I will also address the following questions: What are the future prospects of China's independent automakers? How might these firms shape the dynamics of the global auto industry? What do the findings presented in this dissertation suggest about China's political economic model?

The rest of this chapter is organized as follows. First, I summarize the key findings and arguments presented in the dissertation. Second, I explore the future prospects of China's burgeoning independent automakers, as well as how they might shape the competitive dynamics of the global auto industry. Third, I present the challenges China will face in electrifying its transport system. Fourth, I discuss why it is difficult to come up with an accurate characterization of China's political economic model and what some of the limitations are with respect to China's experimental and decentralized approach to policymaking. Finally, I present final thoughts and areas of future research.

6.1. ARGUMENT REVISITED

This dissertation was motivated by the following research puzzle: what factors explain the emergence of China's independent automakers? The emergence of these new domestic entrants was surprising given the central government's staunch support of traditional SOEs and their foreign partners and industrial consolidation efforts, not to mention the historically high capital and technological barriers to entry in the auto industry. If Chinese industrial policy could not directly account for the emergence of these firms, then what could explain this rather unexpected outcome?

²⁸⁵ Interview 83 with former Shanghai Volkswagen executive (from Germany), 13 April 2009.

The central contention of this dissertation is that the emergence of China's independent auto industry is not a narrow story about industrial policy, but rather a broader and more nuanced story of three sets of policies interacting with a shifting global business environment. The first set of policies concerns China's sector-specific industrial policies, especially foreign direct investment. China's embrace of FDI and the resultant JV model left state-owned automakers technologically reliant on their foreign partners and precluded them from developing their own brands and becoming national automotive champions. This failure of industrial policy left the low-end of the market open to low-cost domestic competitors. But these initial background conditions were only part of the story.

The second set of policies concerns China's economic liberalization policies, which culminated in China's accession to the WTO. The opening of China's trade and investment regime allowed domestic firms, particularly non-state firms, to form new linkages to global capital markets and to global production networks. Not only were independent automakers able to raise capital on foreign stock exchanges, but they were able to use that capital to buy equipment and parts from the global marketplace at reduced tariff rates and without the need to go through state-controlled trading companies. Rather than putting the domestic auto industry out of business, as some Chinese leaders had feared, WTO-related reforms instead increased the competitiveness of the industry by enabling the local-global business models of independent automakers.

The third and final set of policies concerns local level policies, which gave nascent domestic automakers access to critical resources such as inexpensive land leases to build factories. The Chinese auto industry exemplifies the various forms of economic initiative at the level. In the case of Chery, local officials became entrepreneurs by starting and running their own local automakers. In the case of Great Wall, local officials took a minority share in the company and access to subsidized land leases, but refrained from interfering in the operations of the firm. In the cases of Geely and BYD, local officials took no equity stake but were still motivated to support the development of what they hoped would become local automotive champions. The support of local governments has in many ways supplanted the lack of financial and policy support from the Center.

These three sets of policies interacted with a shifting global business environment, which enabled nascent Chinese automakers to form technology partnerships with the world's leading suppliers to co-develop engines and other subsystems rather reinvent the wheel on their own. As auto markets in the developed countries saturated and the leading global automakers searched for new growth markets like China, their suppliers followed. And because the auto industry's closed and vertically integrated production model had morphed into a more open and increasingly modularized one, more of the value creation had been put in the hands of global suppliers. After following their multinational automaker clients to China, these suppliers saw independent automakers as potentially high growth customers and saw enormous business potential in forming technology partnerships with them. These technology partnerships enabled independent automakers to keep research and development (R&D) costs low, speed up the product

development process, and produce cars that could compete with those produced by the JVs in the competitive Chinese marketplace.

We now turn to the implications of the argument for the Chinese auto industry specifically, and for our understanding of the Chinese political economy more broadly.

6.2. CHINA'S AUTO INDUSTRY: PROSPECTS AND IMPLICATIONS FOR THE GLOBAL AUTO INDUSTRY

This dissertation has demonstrated that the many ways in which Chinese independent automakers have benefited from deep organizational changes within the global auto industry, namely the fragmentation of global automotive production networks. Unlike Japanese and Korean automakers, the product development and business models of China's independent automakers have from the beginning been intimately linked to foreign firms and foreign capital markets. This section explores how China's independent automakers could change the competitive dynamics of the global auto industry, as well as discuss some of the limits of their business model.

Though foreign automakers and traditional SOEs at first did not take independent Chinese automakers seriously, they now consider them to be formidable competitors. Unlike their large foreign and state-owned counterparts, independent firms are much more nimble and unencumbered by large bureaucratic organizations, political and social obligations, and the limitations of the JV model. Their leaner organizations and lower cost structures enable them to compete more effectively in the low-end of the Chinese market, as well as in other developing countries with a burgeoning but price-conscious middle class. Chinese independent automakers are today the leading exporters of cars from China.

Though export volumes are still relatively speaking low (i.e., roughly 500K units in 2010), they are growing rapidly (i.e., 59 percent Y-o-Y growth from 2009 to 2010). In 2010, the leading destinations of Chinese car exports were, in the order of importance: Algeria, Syria, Vietnam, Russia, Egypt, Bangladesh, Iran, Chile, Brazil and Iraq (Automotive Resources Asia 2010). Most of these countries are not the target markets of the established global automakers, not least because of perceived political risk and relatively small volumes.

Developing countries will be the leading centers of personal consumption growth for the coming decades. What will matter most to consumers in these countries is price and fuel efficiency. The cars produced by independent automakers are strong on both of these fronts. Technological gadgetry, like global positioning systems and on-board internet access, as well as engine performance, are likely to be secondary concerns.

Independent automakers are, however, facing enormous difficulties penetrating the markets of developed countries, where safety and reliability standards and consumer expectations are much higher. Each year, at least one Chinese automaker claims it will be exporting cars to the U.S. soon, but so far, none have done so. To their credit, the quality of the

cars they produce is improving. A senior research from J.D. Power Asia Pacific, which closely tracks consumer satisfaction in China's auto market, has recently said that he believes "China's domestic automakers are building better vehicles and will match the quality of foreign brands within five years."²⁸⁶ Chinese auto exports could take a dramatic turn with respect to the electric car market. When the price of core EV technologies and components like batteries and motors come down considerably, independent Chinese firms could have several advantages over foreign automakers. China has a broad automotive *and* electronics manufacturing base, especially in batteries and electric motors. China is also a leading producer of rare earth minerals which are necessary for the production of both lithium batteries and for magnet--based motors. Furthermore, foreign component suppliers are eager to provide independent automakers with their products and services.

This brings us to the one of the biggest disadvantages of the independent automakers. Because they are dependent on foreign suppliers for many aspects of their product development, independent automakers may capture very little of the value-added, and hence very little of the profits. The big profit takers are likely to be global component suppliers that control the core automotive and electronic technologies, as is true in the personal computer industry. In the best case scenario, independent automakers could benefit from scale, but they may continue to suffer from low margins unless they bring more of the R&D in-house.

Their business model is very different from that of Japanese and Korean automakers which have preferred to work with suppliers in their own countries. With the support of their respective governments, Japanese and Korean automakers have helped to upgrade the capabilities of their suppliers, and in some cases, even take equity stakes in their suppliers. Chinese independent automakers ramped up their operations much faster than their Japanese and Korean counterparts, but they may have done by sacrificing self-sufficiency.

It is still too early to know when or if any of China's independent automakers discussed thus far will ultimately be worthy of the title "national champion", but nor was it the intention of this dissertation to make such predictions. Rather, what I have attempted to do is show how deep changes within the Chinese political economy and the global auto industry created new opportunities for Chinese automakers. As long as China remains a leading market and manufacturing powerhouse, new possibilities and business model configurations will continue to emerge. After all, less than ten years ago, no one would have believed that a cell phone battery company could become one of China's leading car companies. Yet one did. As the former head of Shanghai GM puts it, "China's auto industry is still in its infancy."²⁸⁷

Whether or not the Chinese auto industry produces the world's next Toyota, China is likely to remain a hub for EV technology development and an integral part of the global EV supply chain. As discussed in Chapter Five, American EV start-ups CODA and Wheego are partnering with Chinese car and battery companies to keep development and production costs down. General Motors could one day import into the United States a low-cost EV designed and

²⁸⁶ Stein, J., 2011. "Chinese automakers improve quality, says J.D. Power," *Automotive News China*, 26 April. <http://www.autonewschina.com/en/article.asp?id=6902>. Accessed 21 June 2011.

²⁸⁷ Interview 67 with ex-President of Shanghai GM, 27 February 2009.

built in China. After all, the electric version of the Chevrolet Sail, which is being designed and built in China, will likely cost much less to bring to market than the GM's "billion dollar baby", the Chevrolet Volt.²⁸⁸

The next section will re-iterate why even though China will remain a hotbed for global EV development, widespread adoption of EVs inside China will be slow.

6.3. CHINA'S ENERGY POLICY AND VEHICLE ELECTRIFICATION: PROBLEMS AHEAD

China's growing vehicle fleet is putting even enormous pressure on the country's already fragile energy infrastructure and environment. Not only are oil imports surging, but so too are the country's greenhouse gas emissions. Energy and climate policy are complicated by competing bureaucratic interests and the difficulties the Center faces in reigning local governments. Efforts to coordinate energy policy by creating a superministry have been thwarted by resistance from the NDRC and energy-related state-owned enterprises.

Had a new ministry been formed, it probably would have deprived the NDRC of a large piece of its portfolio and tools of macroeconomic policy, such as price setting, while SOEs feared such a ministry would limit their direct access to China's top leaders (Downs 2008; Garrison 2011). This is evidenced by the continual shuffling and reshuffling of energy agencies since the beginning of the reform era. The recent formation of the NEA and the NEC were a compromise between among the other ministries and the NDRC, yet this new arrangement will struggle to fulfill its mandate of coordinating energy policy because it does not have the authority to address the challenges. In this environment, a clear and focused national energy policy – in which vehicle electrification is but one piece – appears unlikely.

The politics of energy policy are further complicated by China's devolution of power to regional governments. When the Center attempts to shut down energy-intensive industries or force consolidation to increase efficiency, the affected enterprises are often sheltered by provincial and local governments. In other instances, when local officials try to meet national energy conservation requirements, they lack the resources and tools to increase energy efficiency and instead have no choice but to turn off the lights of factories. This in turn drives local firms to produce their own electricity off the grid through diesel-powered generators, which then drive up fuel prices and ultimately food prices.

Given China's fragmented institutions and proliferation of locally-driven solutions, prospects for a national energy policy, let alone widespread vehicle electrification, appear dim. There are multiple industry alliances competing to set national EV charging standards. Meanwhile, despite the lack of common standards and the paucity of commercially available EVs, local governments are actively building out EV charging stations through the hastily-executed "Ten Cities, Thousand Vehicles" campaign. To use a popular colloquialism, ambitious local officials are "putting the horse before the cart." If and when national standards are adopted, existing stations across the country may have to undergo expensive retrofitting. A national

²⁸⁸ Squatriglia, C. 2009. "Billion-Dollar Baby: We Drive the Chevrolet Volt," *Wired Magazine*, 28 April. <http://www.wired.com/autopia/2009/04/billion-dollar-baby-we-drive-the-chevrolet-volt/>. Accessed 21 June 2011.

infrastructure of charging stations is even more imperative in China than in the U.S. because most Chinese consumers do not have garages where they can plug-in and charge their EVs.

6.4. CHINA'S VARIETY OF CAPITALISM: LIMITS OF THE DECENTRALIZED APPROACH TO POLICYMAKING

China's economic success has puzzled many scholars over the years, especially many economists, because its sequencing of reforms seems to defy much of the conventional wisdom. Though China has adopted many policies that have been long been advocated by economists, such as being open to trade and foreign investment and providing macroeconomic stability, its reforms have proceeded until now without complete market liberalization, full scale privatization of the state-owned sector, consistent protection of private property rights, or democratization.

Over the years, there have been many attempts in the west to characterize China's peculiar political economic model, including "fragmented authoritarianism" (Lieberthal 1992), "authoritarian capitalism" (Gat 2007), "capitalism with Chinese characteristics" (Huang 2008), and "state capitalism" (Bremmer 2010), to name a few. The Chinese government prefers to call their model "socialism with Chinese characteristics," as the word "capitalism" remains unpalatable in official circles. Yet none of these concepts fully captures the dynamism of the Chinese model or the complexity of the mechanisms at work. As Lieberthal's concept of "fragmented authoritarianism" conveys, China is full of paradoxes. It is hard to nail down an accurate conceptualization of a Chinese model, not only because China is so vast and diverse, but also because China's political economic institutions and marketplace are still evolving. China is stumbling toward some form of capitalism, but the parameters of its unique variety of capitalism are still works in progress.

In both the auto and energy sectors, the Chinese government continues to experiment with a basket of state controls and market-enhancing policies. One moment, the government is encouraging foreign investment and private sector growth; the next moment, it seems almost hostile to foreign investors and private firms. Recently, the Chinese government put considerable pressure on foreign automakers to launch new models under new Chinese brands, rather than only selling cars under foreign brands. To that end, GM has already launched its new Baojun line of cars in conjunction with its Chinese partners. Volkswagen, Honda and Toyota have also announced they are working on Chinese branded cars.²⁸⁹ The Chinese business environment remains unpredictable, with growing concern over the government increasingly adoption of "indigenous innovation" policies that disproportionately privilege domestic firms over foreign firms.²⁹⁰

²⁸⁹ More on this new push by the government for Chinese brands can be found at <http://auto.globaltimes.cn/auto-china/industry/2011-04/614793.html>. Accessed 21 June 2011.

²⁹⁰ For more on the frictions being caused by China's indigenous innovation policies, see Ahrens, N. 2010. "Innovation and the Visible Hand: China, Indigenous Innovation, and the Role of Government Procurement." *Carnegie Paper Number 114*, July. Washington, DC: Carnegie Endowment for International Peace. Paper can be downloaded at <http://www.carnegieendowment.org/publications/?fa=view&id=41125>. Accessed 21 June 2011.

While there is still no agreed upon definition of Chinese capitalism, scholars have at least reached some consensus over how to characterize the process of economic reform. China's reforms have been gradual, incremental, and often experimental, with much of the responsibility of economic development handed off to local governments. Sebastian Heilmann (2008) argues that China's decentralized policy experimentation is not equivalent to "freewheeling trial and error", but rather is "a purposeful and coordinated activity" geared to produce novel policy options that are later injected into official policymaking and replicated on a larger scale. My findings suggest that "purposeful" and "coordinated" may somewhat overstate China's reform strategy. Nonetheless, China's decentralized and experimental approach to policymaking has thus far been extraordinarily effective at unleashing the power of incentives and stimulating rapid economic growth, all the while preserving existing political institutions.

Yet some scholars are now asking whether China is approaching the limits inherent in its decentralized and experimental policymaking approach. Ran Tao and Zhigang Xu (2006:178) argue that China now faces "serious challenges in its yet-to-be-finished economic reform." These include a highly inefficient banking system, a widening urban-rural and interregional disparity, and the lack of a social safety net for its rapidly aging population. These challenges have created a host of uncertainties for China's further transition, though these fragilities may not become breaking points until China's economic growth slows to rates seen in the industrialized world.

The findings presented in this dissertation also indicate that there are limitations to China's decentralized and experimental policymaking approach. For one, the Chinese industry is likely to remain highly fragmented, with bureaucrats and local officials shielding central and regional SOEs from bankruptcy and consolidation. If the rate of auto industry growth slows considerably, as it has in the first half of 2011, there is the possibility that Chinese leaders at the national and local levels will use policy to protect traditional SOEs to the disadvantage of more efficient and innovative private and semi-private independent automakers. Moreover, the inability to coordinate energy policy and EV charging standards at the national level will make broad based vehicle electrification difficult.

Without a well-coordinated set of policies and the ability to reign in ministerial infighting and rogue local officials, it is difficult to see how China will manage its impending energy and climate crisis. Forging consensus in China is exceedingly difficult and very time-consuming, especially when even policymakers are themselves fighting for a slice of China's growing but still limited economic pie. Rather than implementing a policy of crisis prevention, the Chinese government is likely to continue fighting fires by employing ad hoc measures as problems emerge.

6.5. DIRECTIONS FOR FUTURE RESEARCH

There are at least two directions this research could take. First, it would be interesting to understand whether the story told here has any relevance in India, another large and diverse late industrializing nation with a burgeoning domestic auto industry. How have Indian automakers benefited from the fragmentation of global automotive production networks? How has India's FDI policy shaped the development and business models of India's automakers? What are the

strengths and weaknesses of India's up and coming automakers compared to China's independent automakers? How are those firm level similarities and differences rooted in the similarities and differences between the national institutional environments in which they operate? Those are just some of the questions a detailed India-China comparison could answer.

Second, it would be interesting to compare the difficulties China faces in resolving its energy and climate problems to those the United States faces. My hunch is that there may be more similarities than differences. Like China, the U.S. lacks a unified national energy policy, with regional governments having considerable autonomy over energy policy. A greater understanding and specification of the common challenges the world's two largest carbon emitters share will make future international cooperation more fruitful. Analyses which focus narrowly on the differences between the two countries will tend to overlook areas of potential collaboration.

REFERENCES

Amsden, A.H. 1989. *Asia's Next Giant: South Korea and Late Industrialization*. New York, NY: Oxford University Press.

Andrews-Speed, P. 2004. *Energy Policy and Regulation in the People's Republic of China*. New York, NY: Kluwer Law International.

Andrews-Speed, P. 2004. "China's Oil Import Strategies." Conference paper for Center for Global Energy Studies, 24th Executive Retreat, June 30-July 1.

<http://www.dundee.ac.uk/cepmlp/gateway/index.php?news=26129> . Accessed on 11 April 2011.

Automotive News, Automotive Resources Asia, and JATO Dynamics. 2009. *2009 Guide to China's Auto Market*. 27 April.

Automotive Resources Asia. 2007-2010. *China Automotive Monthly*. McGraw Hill Companies.

Baek, S.W. 2005. "Does China follow 'the East Asian Development Model'?" *Journal of Contemporary Asia*, 35(4).

Bauer, P.T. 1971. *Dissent on Development: Studies and Debates in Development Economics*. London, UK: Weidenfeld & Nicholson.

Bennett, D.C. and K.E. Sharpe. 1985. *Transnational Corporations versus the State: The Political Economy of the Mexican Auto Industry*. Princeton, NJ: Princeton University Press.

Bian, Y.J., Cheng, L., and Tsui (eds.). A. 2006. *China's Private Domestic Private Firms: Multidisciplinary Perspectives on Management and Performance*. Armonk, NY: M.E. Sharpe.

Blecher, M. 1991. "Developmental State, Entrepreneurial State: The Political Economy of Socialist Reform in Xinji Municipality and Guanghan County." In White, G. (ed.), *In The Road to Crisis: The Chinese State in the Era of Economic Reform*. p.265-291. London, United Kingdom: Macmillan.

Bremmer, I. 2010. *The End of the Free Market: Who Wins the War Between States and Corporations*. New York, NY: Portfolio.

Breznitz, D. 2008. *Innovation and the State: Political Choice and Strategies for Growth in Israel, Taiwan, and Ireland*. New Haven, CT: Yale University Press.

Breznitz, D. and Murphree, M. 2011. *Run of the Red Queen: Government, Innovation, Globalization, and Economic Growth in China*. New Haven, CT: Yale University Press.

British Petroleum. *BP Energy Outlook 2030*. January 2011.

http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2010_downloads/2030_energy_outlook_booklet.pdf. Accessed on 11 April 2011.

Burt, T. and Jacob. R. 2000. "China's Walls Will Crumble but Only One Brick at a Time," *Financial Times*, 30 May, p.8.

Chang, C. and Gao, H.J. (forthcoming). "China: A Country Case Analysis," *The Green Growth Economies Project*, Berkeley, CA: Berkeley Roundtable on the International Economy.

Chang, C. and Saez, L., 2011. "China and South Asia: Strategic Implications and Economic Imperatives." In Dittmer, L. and G. Yu (ed.), *China, the Developing World, and the New Global Dynamic*. Boulder, CO: Lynne Rienner Publishers.

China Automotive Technology and Research Center. 2004-2008. *China Automotive Industry Yearbooks 2004, 2005, 2006, 2007, 2008*. Tianjin, China.

Chin, G. 2010. *China's Automotive Modernization: The Party-State and Multinational Corporations*. New York, NY: Palgrave MacMillan.

Clifford, M. 1994. *Troubled Tiger: Businessmen, Bureaucrats, and Generals in South Korea*. New York, NY: M.E. Sharpe.

Colander, D. 1984. *Neo-Classical Political Economy: An Analysis of Rent-seeking and DUP*. Cambridge, MA: Ballinger.

Cornelius, W. 2001. "Death at the Border: Efficacy and Unintended Consequences of US Immigration Control Policy." *Population and Development Review*. 27(4): 661-685.

Dargay, J., Gatley D. and Sommer M. 2007. "Vehicle Ownership and Income Growth, Worldwide: 1960-2030," *The Energy Journal*, 28(4): 143-170.

Department of Energy, 2010. "Changes in Vehicles Per Capita Around the World."

Department of Energy website. 5 April.

http://www1.eere.energy.gov/vehiclesandfuels/facts/2010_fotw617.html . Accessed 5 June 2011.

Doner, R., Noble G., and Ravenhill J. 2005. "Executioner or Disciplinarian: WTO Accession and the Chinese Auto Industry", *Business and Politics*, 7(2):1-33.

- Downs, E. 2004. "The Chinese Energy Security Debate." *The China Quarterly*, 177: 21-41.
- Downs, E. 2006. *The Brookings Foreign Policy Studies Energy Security Series: China*, Washington, D.C.: The Brookings Institution. Paper can be downloaded at <http://www.brookings.edu/reports/2006/12china.aspx> . Accessed 19 June 2011.
- Downs, E. 2008. "Commentary: China's 'New' Energy Administration," *China Business Review*, November-December. Article can be downloaded at http://www.brookings.edu/articles/2008/11_china_energy_downs.aspx . Accessed 19 June 2011.
- Duckett, J. 1998. *The Entrepreneurial State in China*. New York, NY: Routledge.
- Energy Information Administration, 2010. "China." *Country Analysis Briefs*. Last updated November. <http://www.eia.doe.gov/cabs/china/pdf.pdf> . Accessed 10 April 2011.
- Energy Information Administration, 2009. "Emissions of Greenhouse Gases Report." Last updated December. <http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html>. Accessed on 19 April 2011.
- Energy Information Administration, 2008. "East China Sea." *Country Analysis Briefs*. Last updated March. http://www.eia.doe.gov/cabs/East_China_Sea/pdf.pdf. Accessed on 11 April 2011.
- Evans, P. 1995. *Embedded Autonomy: States and Industrial Transformation*. Princeton, NJ: Princeton University Press.
- Eisinger, P.K. 1973. "The Conditions of Protest Behavior in American Cities." *The American Political Science Review*, 67(1), March.
- Finamore, B., Hu, Z.G., Li, W.Z., Lei, T.J., Dai, Y.D., Zhou, F.Q. and Yang, Z.R. 2003. "Demand-Side Management in China: Benefits, Barriers, and Policy Recommendations." National Resources Defense Council. <http://www.nrdc.org/air/energy/chinadocs/dsm.pdf>. Accessed on 24 April 2011.
- Frieden, J.A. 1991. *Debt, Development, and Democracy: Modern Political Economy and Latin America, 1965-1985*. Princeton, NJ: Princeton University Press.
- Fujimoto, T. 2006. "Architecture-based comparative advantage in Japan and Asia". Discussion Paper Series, 2006-MMRC-94. Tokyo, Japan: Manufacturing Management Research Center, Department of Economics, University of Tokyo. http://merc.e.u-tokyo.ac.jp/mmrc/e_dp/index.html. Accessed on 2 January 2010.

- Fujimoto, T. and J. Oh. 2004. "Electronic technology and parts procurement: A case of the automobile industry." Discussion Paper Series, 2004-MMRC-17. Tokyo, Japan: Manufacturing
- Gallagher, K. S. 2006. *China Shifts Gears: Automakers, Oil, Pollution, and Development*. Cambridge, MA: The MIT Press.
- Gallagher, M. 2002. "'Reform and Openness': Why China's Economic Reforms Have Delayed Democracy," *World Politics*, 54(3): 338-372.
- Garrison, J. 2011. "The Domestic Political Context for China's Quest for Energy Security," in Currier, C.L. and Dorraj, M. (eds), *China's Energy Relations with the Developing World*, New York, NY: The Continuum International Publishing Group.
- Gat, A. 2007. "The return of Authoritarian Capitalists," *The New York Times*, 14 June. <http://www.nytimes.com/2007/06/14/opinion/14iht-edgat.1.6137311.html> . Accessed 21 June 2011.
- Gereffi, G. 1996. "Global Commodity Chains: New Forms of Coordination and Control Among Nations and Firms in International Industries." *Competition & Change*, 1(4): 427-439.
- Gerffi, G. and Korzeniewicz, M. 1994. *Commodity Chains and Global Capitalism*. Westport, CN: Praeger.
- Gerschenkron, A. 1962. *Economic Backwardness in Historical Perspective*. Cambridge, MA: Belknap.
- Gilpin, R. 1987. *The Political Economy of International Relations*. Princeton, NJ: Princeton University Press.
- Guo, W.Q. and Zhang S.J. 2008. "Analysis of Technology Spillover Effect of Multinational Company's Technology Transfer to the Investment of Chinese Car Industry. *Journal of Zhengzhou Institute of Aeronautical Industry Management*. 26(2): 51-64.
- Guth, J. and M. Ginsberg, 2004. "Energy Use in China: Trends in Oil Demand and Imports/;, *International Economic Review*, November/December. Paper can be found at: <http://web.rollins.edu/~tlairson/asiabus/chinaenergy.pdf>. Accessed 11 April 2011.
- Hale, C. 2001. "Indonesia's National Car Project Revisited," *Asian Survey*, 4(4): 629-645, July-August.
- Halper, S. 2010. *The Beijing Consensus: How China's Authoritarian Model Will Dominate the Twenty-First Century*. New York, NY: Basic Books.

- Harwit, E. 1995. *China's Automobile Industry: Policies, Problems, and Prospects*. Armonk, New York: M.E. Sharpe.
- Harwit, E. 2001. "The Impact of WTO Membership on the Automobile Industry in China", *The China Quarterly*, 167: 655-670.
- Heilman, S. 2008. "Policy Experimentation in China's Economic Rise." *Studies in Comparative International Development*, 43(1) March.
- Hirschman, A. 1958. *The Strategy of Economic Development*. New Haven, CT: Yale University Press.
- Hollingsworth, J.R., Schmitter C., and W. Streeck. 1994. *Governing Capitalist Economies: Performance and Control of Economic Sectors*. New York, NY: Oxford University Press.
- Huang, Y.S. 2002. "Between Two Policy Coordination Failures: Automotive Industrial Policy in China with a Comparison to Korea." *Review of International Political Economy*, 9(3): 538-573.
- Huang, Y.S. 2003. *Selling China: Foreign Direct Investment during the Reform Era*. Cambridge, Massachusetts: Cambridge University Press.
- Huang, Y.S. 2008. *Capitalism with Chinese Characteristics: Entrepreneurship and the State*. Cambridge, Massachusetts: Cambridge University Press.
- Hui, F. 2006. *The Politics of China's Accession to the World Trade Organization: The Dragon Goes Global*. New York, New York: Routledge.
- International Energy Agency, 2011. *Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts*. http://www.iea.org/papers/2011/overseas_china.pdf . Accessed on 10 April 2011.
- International Energy Agency. 2007-2010. *World Energy Outlook*. Paris, France.
- Jenkins, R. 1977. *Dependent Industrialization in Latin America: The Automotive Industry in Argentina, Chile and Mexico*. New York, NY: Praeger.
- Jiang, J. and J. Sinton. 2010. "Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts." *International Energy Agency Information Paper*. September. http://www.iea.org/papers/2011/overseas_china.pdf. Accessed on 19 April 2011.
- Jin, H.H., Qian, Y.Y. and Weingast, B. 2005. "Regional decentralization and fiscal incentives: Federalism, Chinese style." *Journal of Public Economics* 89 (2005): 1719-1742.

- Johnson, C. 1982. *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-1975*. Stanford, CA: Stanford University Press.
- Johnson, C., L.D. Tyson, J. Zysman. 1989. *Politics and Productivity: How Japan's Development Strategy Works*. Cambridge, Massachusetts: Ballinger.
- Jomo, K.S., ed. 2007. *Malaysian Industrial Policy*. Singapore: National University of Singapore Press.
- Kambara, T. and C. Howe. *China and the Global Energy Crisis: Development and Prospects for China's Oil and Natural Gas*. Northampton, MA: Edward Elgar Publishing.
- Kampfner, J. 2010. *Freedom for Sale: Why the World is Trading Democracy for Security*. New York, NY: Basic Books.
- Kennedy, S. 2006. "The Political Economy of Standards Coalitions: Explaining China's Involvement in High-Tech Standards Wars," *Asia Policy*, Number 2 (July 2006): 41-62.
- Kitschelt, H. 1991. "Industrial governance structures, innovation strategies, and the Case of Japan: Sectoral or Cross-national Comparative Analysis?" *International Organization*, 44(4), Autumn.
- Klier, T. and J. Rubenstein. 2008. *Who Really Made Your Car? Restructuring and Geographic Change in the Auto Industry*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.
- Kumar, R. and Veloso, F. 2002. "The Automotive Supply Chain: Global Trends and Asian Perspectives," Economics and Research Department Working Paper Series No. 3, Asian Development Bank. (January).
- Lai, H.H. 2007. "China's Oil Diplomacy: Is it a Global Security Threat?" *Third World Quarterly*, (28)3: 519-537.
- Lal, D. 1983. *The Poverty of Development Economics*. London, United Kingdom: Institute of Economic Affairs.
- Lardy, N. 2002. *Integrating China into the Global Economy*. Washington, D.C.: Brookings Institution Press.
- Li., S and Z. Wang. 1998. *The Global and Domestic Impact of China Joining the World Trade Organization*. Washington, D.C.: Development Research Center of the China State Council, Project of China Economic Research Program, Washington Center for China Studies, and The Ford Foundation.

- Li, Z.J. 2009. "The Role of International Technology Transfer in the Chinese Automotive Industry." Manufacturing Management Research Center Discussion Paper Series, No. 269. Tokyo, Japan: The University of Toyko.
- Li, X. 2010. "The Development of China's Automotive Industry and Measures to Counter the Global Financial Crisis." Tsinghua University, Department of Automotive Engineering, Working Paper. Beijing, China.
- Li., X. and Xie, N. 2010. "Measurement of R&D Capabilities in Chinese Self-Brand Automotive Firms," *International Journal of Automotive Technology and Management*, 10(4):414-429.
- Li, Z. 2009. The Role of International Technology Transfer in the Chinese Automotive Industry. Discussion Paper Series, 2009-MMRC-269. Tokyo, Japan: Manufacturing Management Research Center, Department of Economics, University of Tokyo. http://merc.e.u-tokyo.ac.jp/mmrc/e_dp/index.html. Accessed on 2 January 2010.
- Lieberthal, K. 1991."Introduction: The 'Fragmented Authoritarianism' Model and Its Limitations," in Lampton, K. and Berkeley, D. (eds), *Bureaucracy, Politics and Decision-Making in Post-Mao China*. Berkeley, CA: University of California Press.
- Lieberthal, K. and Oksenberg, M. 1988. *Policymaking in China: Leaders, Structures and Processes*. Princeton, NJ: Princeton University Press.
- Lin, C. 1989. "Open-Ended Economic Reform in China." in V. Nee and D. Stark, ed. *Remaking the Economic Institutions of Socialism: China and Eastern Europe*. Stanford, CA: Stanford University Press. Pp. 95-136.
- Lin, J., Fang, C., and Zhou, L., 2003. *The China Miracle: Development Strategy and Economic Reform*, Hong Kong: The Chinese University of Hong Kong.
- Lindblom, C. 1959. "The Science of 'Muddling Through'." *Public Administration Review*. 19:79-88.
- List, F. 1885 (1996). *The National System of Political Economy*. New York, NY: Augustus M. Kelley.
- Management Research Center, Department of Economics, University of Tokyo. http://merc.e.u-tokyo.ac.jp/mmrc/e_dp/index.html. Accessed on 2 January 2010.
- Mann, J. (1997). *Beijing Jeep: A Case Study of Western Business in China*. Boulder, CO: Westview Press.

- McGregor, R. 2010. *The Party: The Secret World of China's Communist Rulers*. New York, NY: HarperCollins.
- Maxton, G. and Wormald, J. 2004. *Time for a Model Change: Re-engineering the Global Automotive Industry*. New York, NY: Cambridge University Press.
- Meidan, M., Andrews-Speed, A., and Xin, M., 2009. "Shaping China's Energy Policy: Actors and Processes," *Journal of Contemporary China*, 18(61): 591-616.
- Meier, N. 2009. *China- The New Developmental State? An Empirical Analysis of the Automotive Industry*. New York, NY: Peter Lang.
- Mertha, A. 2005. *The Politics of Piracy: Intellectual Property in Contemporary China*. Ithaca, NY: Cornell University Press.
- Merton, R. 1976. *Sociological Ambivalence and Other Essays*. New York, NY: The Free Press.
- Naughton, B. 1985. "False Starts and Second Wind: Financial Reforms in China's Industry." in E. Perry and C. Wong, ed. *The Political Economy of Reform in Post-Mao China*. Cambridge, MA: Harvard University Press. Pp. 223-252.
- Naughton, B. 1995. *Growing Out of the Plan: Chinese Economic Reform 1978-1993*. New York, NY: Cambridge University Press.
- Naughton, B. 2003. "The State Asset Commission: A Powerful New Government Body." *China Leadership Monitor*, No.8, Fall.
- Naughton, B. 2007. *The Chinese Economy: Transitions and Growth*. Cambridge, MA: The MIT Press.
- Nathan, A. and B. Gilley. *China's New Rulers: The Secret Files (Second Revised Edition)*. New York, NY: New York Review of Books.
- National Bureau of Statistics of China, 2010. *China Statistical Yearbook 2010*. Beijing, China: China Statistics Press, 2010. <http://www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm> . Accessed 5 June 2011.
- National Development and Reform Commission of China, 2011. People's Republic of China Economic and Social Development Twelfth Five Year Guideline Outline (中华人民共和国国民经济和社会发展第十二个五年规划纲要). Beijing, China: NDRC. Full Chinese version can be found at <http://politics.people.com.cn/GB/1026/14159537.html> . Accessed on 6 June 2011.

- Noble, G., J. Ravenhill, and R. Doner. 2005. "Executioner or Disciplinarian: WTO Accession and the Chinese Auto Industry." *Business and Politics*, 7(2), Article 1.
- Nolan, P. 2001. *China and the Global Economy: National Champions, Industrial Policy, and the Big Business Revolution*. New York, NY: Palgrave.
- North, D. 1991. "Institutions." *Journal of Economic Perspectives* 5:97-112, Winter.
- O'Brien, K. 1996. "Rightful Resistance." *World Politics*, 49(1): 31-55.
- O'Brien, K. and L.J. Li, 1999. "Selective Policy Implementation in Rural China," *Comparative Politics* (31)2: 167-86. January.
- Oi, J. 1992. "Fiscal Reform and the Economic Foundations of Local State Corporatism in China." *World Politics* 45(1): 99-126.
- Oi, J. 1995. "The Role of the Local State in China's Transitional Economy." *The China Quarterly* 144:1132-1149. December.
- Oliver, H.Y., K.S. Gallagher, D.L. Tian, and J.H. Zhang. 2009. "China's Fuel Economy Standards for Passenger Vehicles: Rationale, Policy Process, and Impacts." Discussion Paper 2009-03. March. Cambridge, MA: Belfer Center for Science and International Affairs.
- Pearson, M. 1991. *Joint Ventures in the People's Republic of China*. Princeton, NJ: Princeton University Press.
- Peng, M.W. 2001. "How entrepreneurs create wealth in transition economies," *Academy of Management Executive*, 15(1):19-108.
- Perhson, C. 2006. "String of Pearls: Meeting the Challenge of China's Rising Power Across the Asian Littoral." US Army War College, Strategic Studies Institute, Carlisle Papers in Security Strategy. July.
- Perry, E. 1994. "Trends in the Study of Chinese Politics: State-Society Relations." *China Quarterly*, 139 (September 1994):704-13.
- Polanyi, K. 1957. *The Great Transformation*. Boston, MA: Beacon Press.
- Ramzy, A. 2009. "Why China's State-owned Companies are Making a Comeback," *Time Magazine*. 29 April. <http://www.time.com/time/world/article/0,8599,1894565,00.html>. Accessed on 2 January 2010.
- Remick, E. 2002. "The Significance of Variation in Local States: The Case of Twentieth Century China," *Comparative Politics*, (34)4: 399-418. July.

- Rowley, C., Rollison, R., and Tullock, G. (Eds.). 2010. *The Political Economy of Rent Seeking (Topics in Regulatory Economics and Policy)*. Norwell, MA: Kluwer Academic Publishers.
- Sauer, A. and Wellington, F. 2004. "Taking the High (Fuel Economy) Road: What do the New Chinese Fuel Economy Standards Mean for Foreign Automakers." November . Washington, DC: World Resources Institute. http://pdf.wri.org/china_the_high_road.pdf. Accessed on 12 April 2011.
- Segal, A. 2010. *Digital Dragon: High Technology Enterprises in China*. Ithaca, NY: Cornell University Press.
- Segal, A. and Thun, E. 2001. "Thinking Globally, Acting Locally: Local Governments, Industrial Sectors, and Development in China." *Politics & Society*, 29(4):557-588.
- Shafer, M.D. 1994. *Winners and Losers: How Sectors Shape the Developmental Prospects of States*. Ithaca, NY: Cornell University Press.
- Shapiro, H. 1994. *Engines of Growth: The State and Transnational Auto Companies in Brazil*. New York, NY: Cambridge University Press.
- Shridaran, L. 1999. *Industry and Corporate Competitiveness : The Auto Parts Industry in China, Taiwan, South Korea & India*. New Delhi, India: Wheeler Publications.
- Spence, J. 1990. *The Search for Modern China*. New York, NY: W.W. Norton & Company.
- Steinfeld, E. 1998. *Forging Reform in China: The Fate of State-Owned Industry*. New York, NY: Cambridge University Press.
- Sutherland, D. 2003. *China's Large Enterprises and the Challenge of Late Industrialization*. New York, NY: Routledge Curzon.
- Sturgeon, T. (2002). "Modular production networks: A new American model of industrial organization", *Industrial and Corporate Change*, 11(3):451-496.
- Tharumagnanam, T. 1994. *The Making of the National Car: Not Just a Dream*. Kuala Lumpur, Malaysia: Tassmag Publishing.
- Tarrow, S. 1983. "Struggling to Reform: Social Protest and Policy Response During Cycles of Protest," Western Societies Paper No. 15, Center for International Studies. Ithaca, NY. (Revised as *Struggle, Politics and Reform*. Ithaca. 1989, 1991).
- Thun, E. 2006. *Changing Lanes in China: Foreign Direct Investment, Local Governments, and Auto Sector Development*. New York, NY: Cambridge University Press.

- Tsai, K. 2002. *Back-Alley Banking: Private Entrepreneurs in China*. Ithaca, NY: Cornell University Press.
- Tuman, J.P. and Morris, J.T. 1998. *Transforming the Latin American Automobile Industry: Unions, Workers, and the Politics of Restructuring*. Armonk, NY: M.E. Sharpe, Inc.
- Tyson, L., and Zysman J. 1989. "Developmental Strategy and Production Innovation in Japan," in Johnson, C., Tyson, L. and Zysman, J., eds. *Politics and Productivity: The Real Story of Why Japan Works*. Ballinger Publishing.
- Wang, M., Huo, H., Johnson, L and He, D. *Projection of Chinese Motor Vehicle Growth, Oil Demand, and CO2 Emissions through 2050*. Document number ANL/ES/06-06. Argonne, Illinois: Argonne National Laboratory, Energy Systems Division. <http://www.osti.gov/bridge> . Accessed on 12 April 2011.
- Wang, H. 2008. "Innovation in Product Architecture – A Study of the Chinese Automobile Industry." *Asia Pacific Journal of Management*. (25):509-535. 19 January.
- Wang, H.B. 2010. "Characteristics and trends of China's Oil Demand." Congress Papers, World Energy Congress 2010, Montreal, Canada. <http://www.worldenergy.org/documents/congresspapers/83.pdf>. Accessed on 11 April 2011.
- Wang, S. and A. Hu. 2001. *The Chinese Economy in Crisis: State Capacity and Tax Reform*. Armonk, NY: M.E. Sharpe.
- Woo-Cumings, M. (ed.). 1999. *The Developmental State*. Ithaca, NY: Cornell University Press.
- Womack, J. P., Jones, D.T. and Roos, D. 1990. *The Machine that Changed the World*. New York, NY: Free Press.
- World Bank and PRTM Management Consultants, 2011. "The China New Energy Vehicles Program: Challenges and Opportunities." Beijing, China: World Bank Transport Office. http://siteresources.worldbank.org/EXTNEWSCHINESE/Resources/3196537-1202098669693/EV_Report_en.pdf. Accessed on 24 April 2011.
- Xia, M. 2000. *The Dual Developmental State: Developmental Strategy and Institutional Arrangements for China's Transition*. Brookfield, VT: Ashgate Publishing.
- Yang, J. 2010. "Beijing should let market decide winners and losers." *Automotive News China*. www.autonewschina.com. 15 June.

Yeoh, E. 2007. "China's de Facto Fiscal Federalism: Challenges and Prospects." Institute of China Studies, University of Malaya, ICS Working Paper No, 2007-7. Kuala Lumpur, Malaysia.

Yew, M. 2011. "Efficiency Strategy in China." Berkeley, CA: Atlantic Energy Efficiency Workshop. 12 February.

Yi, L. and L. Zhu. 2009. "Chinese local state entrepreneurialism: A case study of Changchun." *International Development Planning Review* 31(2): 199-220.

Zhou, N., Fridley, D., McNeil, M., Zheng, N., Ke, J. and Levine, M. 2011. "China's Energy and Carbon Emissions Outlook to 2050. Berkeley, CA: Lawrence Berkeley National Laboratory, Publication Number LBNL-4472E. <http://china.lbl.gov/publications/2050-outlook>. Accessed 9 June 2011.

Zysman, J. 1983. *Governments, Markets, and Growth: Financial Systems and the Politics of Industrial Change*. Ithaca, NY: Cornell University Press.

APPENDIX A:

PARTIAL LIST OF CHINA'S INDEPENDENT AUTOMAKERS

Company	HQ	Stock Ticker	Main products	Units produced (as of 11/2011)	2010 Share of China's light vehicle market	Company website (English)
Chery (奇瑞汽车)	Wuhu, Anhui Province	Not listed	Passenger cars, SUVs	610,465	7.60%	http://www.cheryinternational.com/
Beiqi Foton (北汽福田)	Beijing	600166 (Shanghai)	Commercial vehicles, minibuses	520,463	6.50%	http://english.foton.com.cn/index.php
BYD (比亚迪)	Shenzhen	1211 (Hong Kong)	Passenger cars	473,433	5.90%	http://www.byd.com/
Brilliance Jinbei (华晨金杯)	Shenyang, Liaoning Province	1114 (Hong Kong)	Commercial vehicles, passenger cars	418,408	0.10%	http://www.brillianceauto.com/main.html
Geely (吉利汽车)	Hangzhou, Zhejiang Province	0175 (Hong Kong)	Passenger cars	370,587	4.60%	http://www.geely.com/brands/international/
Great Wall (长城汽车)	Baoding, Hebei Province	2333 (Hong Kong)	Passenger cars, SUVs	342,624	4.30%	http://www.gwm.com.cn/en/
Hawtai (华泰汽车)	Rongcheng, Shandong Province	Not listed	Passenger cars, SUVs	73,072	0.70%	http://en.hawtaimotor.com/about-hawtai.html
Jiangnan (江南汽车)	Zhangjiagan g, Jiangsu Province	Not listed	Minibuses, passenger cars	2,432	0.20%	http://www.jiangnanauto.com/intro_en.htm
Jiangling (江铃汽车)	Nanchang, Jiangxi Province	200500 (Shenzhen)	Commercial vehicles, SUVs	12,424	0.10%	http://www.jmc.com.cn/chinese/index.asp
Lifan (力帆实业)	Chongqing	Not listed	Passenger cars	46,453	0.40%	http://www.lifan.com/
Kandi Technologies (康迪)	Jianhua, Zhejiang Province	KNDI (NASDAQ)	Electric vehicles, recreational vehicles	N/A	N/A	http://www.kanditechnology.com/index.php
Zhejiang Gonow (吉奥汽车)	Taizhou, Zhejiang Province	Not listed	Passenger cars, commercial vehicles	6,750	0.10%	http://www.gonowauto.com/global/
Zhongxing Auto (中兴汽车)	Baoding, Hebei Province	Not listed	SUVs	41,421	0.90%	http://www.zxauto.com.cn/
Zotye (众泰汽车)	Yongkang, Zhejiang Province	Not listed	Passenger cars, SUVs	88,994	0.80%	http://www.zotyeglobal.com/

Sources: Automotive Resources Asia (2010); Company

APPENDIX B: 2009 MAP OF AUTOMOTIVE PRODUCTION FACILITIES IN CHINA



Global automakers/Joint ventures		Domestic automakers	
1 - BMW Brilliance Automotive Ltd. Shenyang, Liaoning Province	14 - Hunan Changfeng Motor Co. Changsha, Hunan Province	1 - Dongfeng Liuzhou Motor Co. Liuzhou, Guangxi Province	12 - Great Wall Motor Co. Baoding, Hebei Province
2 - Beijing Benz-DaimlerChrysler Automotive Co. Beijing	15 - Zhengzhou Nissan Automobile Co. Zhengzhou, Henan Province	2 - Dongfeng Automobile Co. Xiangfan, Hubei Province	13 - Hafei Motor Co. Harbin, Heilongjiang Province
3 - Changan Ford Mazda Automobile Co. Chongqing	16 - Dongfeng Peugeot Citroen Automobile Co. Wuhan, Hubei Province	3 - FAW Car Co. Changchun, Jilin Province	14 - Hebei Zhongxing Automobile Co. Baoding, Hebei Province
4 - Jiangling Motors Corp. Nanchang, Jiangxi Province	17 - Chongqing Changan Suzuki Automobile Co. Chongqing	4 - FAW Haima Automobile Co. Haikou, Hainan Province	15 - Rongcheng Huatai Automobile Co. Rongcheng, Shandong Province
5 - Shanghai GM (Shenyang) Norsom Motors Co. Shenyang, Liaoning Province	18 - Jiangxi Changhe Suzuki Automobile Co. Jingdezhen, Jiangxi Province	5 - Tianjin FAW Xiali Automobile Co. Tianjin	16 - Jiangxi Jiangling Holding Co. Nanchang, Jiangxi Province
6 - SAIC-GM-Wuling Automobile Co. Liuzhou, Guangxi Province	19 - Tianjin FAW Toyota Motor Co. Tianjin	6 - Chery Automobile Co. Wuhu, Anhui Province	17 - Beijing Automobile Works Co. Beijing
7 - Shanghai General Motors Corp. Shanghai	20 - Sichuan FAW Toyota Motor Co. Chengdu, Sichuan Province	7 - Anhui Jianghuai Automobile Co. Hefei, Anhui Province	18 - Chongqing Changan Automobile Co. Chongqing
8 - Shanghai GM Dongyue Motors Co. Yantai, Shandong Province	21 - Sichuan FAW Toyota Motor Co. Changchun, Jilin Province	8 - Shenyang Brilliance Jinbei Automotive Co. Shenyang, Liaoning Province	19 - Chongqing Lifan Automobile Co. Chongqing
9 - Guangzhou Honda Automobile Co. Guangzhou, Guangdong Province	22 - FAW-Volkswagen Automotive Co. Changchun, Jilin Province	9 - BYD Auto Co. Xian, Shaanxi Province	20 - Hunan Jiang Nan Automobile Co. Xiangtan, Hunan Province
10 - Dongfeng Honda Automobile (Wuhan) Co. Wuhan, Hubei Province	23 - Shanghai Volkswagen Automotive Co. Shanghai	10 - Jiangxi Changhe Automobile Co. Jingdezhen, Jiangxi Province	21 - SAIC Motor Co. Shanghai
11 - Honda Automobile (China) Co. Guangzhou, Guangdong Province	24 - Dongfeng Nissan Passenger Vehicle Co. Guangzhou, Guangdong Province	11 - Zhejiang Geely Automobile Group Hangzhou, Zhejiang Province	
12 - Beijing Hyundai Motor Co. Beijing	25 - Guangzhou Toyota Motor Co. Guangzhou, Guangdong Province		
13 - Dongfeng Yueda Kia Automobile Co. Yancheng, Jiangsu Province	26 - Southeast (Fujian) Motor Co. Fuzhou, Fujian Province		

APPENDIX C: EXAMPLES OF INTELLECTUAL PROPERTY INFRINGEMENT BY CHINESE INDEPENDENT AUTOMAKERS



Copycat model: Chery QQ

Original model: Chevrolet Spark/Daewoo Matiz



Copycat model: Great Wall Coolbear

Original model: Scion XB



Copycat model: Geely Emgrand

Original model: Rolls Royce Phantom



Copycat model: BYD F3

Original model: Toyota Corolla

Sources: Company websites, Various websites, Google images (www.google.com/images)

**APPENDIX D:
LIST OF FIELD INTERVIEWS (2007-2010)**

	Date	Location of Interview	Position	Nationality of Interviewee	Name of Organization	Type of Organization
1	26-Dec-2007	Shanghai	Lead Engineer, Body & Exterior	USA	Shanghai General Motors	Joint Venture
2	26-Dec-2007	Shanghai	Quality Engineer	China	Shanghai General Motors	Joint Venture
3	26-Dec-2007	Shanghai	Manager, Body & Exterior	USA	Shanghai General Motors	Joint Venture
4	14-Jun-2008	Shanghai	Committee Chair of the Manufacturing Business Council	USA	American Chamber of Commerce	Industry Organization
5	15-Jun-2008	Shanghai	Administrator, Vehicle Integration	China	Pan Asia Technical Automotive Center	Joint Venture
6	15-Jun-2008	Shanghai	Managing Editor	China	Automotive News China	News Organization
7	17-Jun-2008	Shanghai	Deputy Director, Vehicle Integration	China	Pan Asia Technical Automotive Center	Joint Venture
8	18-Jun-2008	Shanghai	General Counsel	United Kingdom	GKN	Components Supplier
9	20-Jun-2008	Beijing	Process Integration Officer, Asia Pacific Region	Germany	Shanghai Volkswagen	Joint Venture
10	25-Jun-2008	Beijing	Journalist	China	Automotive News China	News Organization
11	1-Jul-2008	Beijing	Director	China	CDPF	Government Agency
12	2-Jul-2008	Beijing	Professor	China	Peking University	University
13	3-Jul-2008	Beijing	Commercial Officer	USA	Embassy of the USA	Government Agency
14	3-Jul-2008	Beijing	Managing Partner (Board of IAT)	Taiwan	GSR Ventures	Venture Capital Company
15	4-Jul-2008	Beijing	Chief Representative, Beijing Office	Japan	Bank of Japan	Financial Organization
16	10-Jul-2008	Shanghai	Former Vice Minister	China	Ministry of Foreign Trade and Economic Cooperation	Government Agency
17	11-Jul-2008	Shanghai	Senior Manager	China	Infineon Technologies	Global Components Supplier
18	12-Jul-2008	Shanghai	Sales Consultant	China	SAIC Roewe	SOE

	Date	Location of Interview	Position	Nationality of Interviewee	Name of Organization	Type of Organization
19	14-Jul-2008	Shanghai	Senior Market Analyst	China	Automotive Resources Asia	Market Research Organization
20	23-Jul-2008	Shanghai	Managing Director	Germany	Alix Partners	Consultancy
21	24-Jul-2008	Shanghai	Director, Service Parts Purchasing	USA	Ford China	Global Automaker
22	29-Jul-2008	Shanghai	General Counsel	USA	Caterpillar	Global Equipment and Logistics Company
23	31-Jul-2008	Shanghai	Senior Analyst, China Auto and Steel	USA	CLSA	Market Research Organization
24	31-Jul-2008	Shanghai	Analyst, China Auto and Steel	USA	CLSA	Market Research Organization
25	7-Aug-2008	Shanghai	Vice President	Taiwan	Fiat Group	Global Automaker
26	13-Aug-2008	Shanghai	Marketing Manager	China	Sumimoto	Global Components Supplier
27	14-Aug-2008	Shanghai	Sales Manager	China	Dassault	Automotive Software Company
28	18-Aug-2008	Beijing	Vice President of International Cooperation	China	Beiqi Foton	Independent Automaker
29	25-Aug-2008	Beijing (by phone)	Marketing Manager	China	Cummins	Global Equipment Company
30	28-Aug-2008	Beijing	President and Founder	China	IAT	Chinese Auto Design Company
31	2-Sep-2008	Shanghai	Manager	USA	Thermal Dynamics	Global Components Supplier
32	3-Sep-2008	Shanghai	Managing Director	China	Delphi Packard	Global Components Supplier
33	3-Sep-2008	Shanghai	General Manager	USA	Chrysler China	Global Automaker
34	5-Sep-2008	Shanghai	Technology Manager	China	Chang-An Ford	Joint Venture

	Date	Location of Interview	Position	Nationality of Interviewee	Name of Organization	Type of Organization
35	5-Sep-2008	Shanghai	General Manager	China	Johnson Controls China	Global Components Supplier
36	5-Sep-2008	Shanghai	Consultant	China	McKinsey	Consultancy
37	6-Sep-2008	Shanghai	Research Intern	China	SAIC Roewe	Traditional SOE
38	9-Sep-2008	Shanghai	Manager, Components Division	China	Shanghai Volkswagen	Joint Venture
39	9-Sep-2008	Shanghai	Manager, Components Division	China	SAIC Roewe	Traditional SOE
40	11-Sep-2008	Shanghai	Consultant	USA	PRTM Consulting Firm	Consultancy
41	11-Sep-2008	Shanghai (by phone)	Analyst , Transport Sector	France	Embassy of France, Beijing	Government Agency
42	11-Sep-2008	Shanghai	Manager	USA	Shanghai General Motors	Joint Venture
43	12-Sep-2008	Shanghai (by phone)	Auto Analyst	USA	UBS Warburg, Shanghai Office	Financial Organization
44	29-Oct-2008	Fremont, CA	Tour Guide	USA	Toyota-GM NUMMI Plant	Global Automaker
45	21-Nov-2008	Guangzhou	Dealer Representative	China	SAIC Roewe	Traditional SOE
46	21-Nov-2008	Guangzhou	Dealer Representative	China	Hawtai Auto	Independent Automaker
47	21-Nov-2008	Guangzhou	Dealer Representative	China	Haima Auto	Traditional SOE
48	21-Nov-2008	Guangzhou	Dealer Representative	China	FAW Bestern	Traditional SOE
49	22-Nov-2008	Guangzhou	Sales Representative	China	BYD	Independent Automaker
50	22-Nov-2008	Guangzhou	Auto Parts Manager	China	GAIC	Traditional SOE
51	23-Nov-2008	Guangzhou	Journalist	China	Automotive News China	News Organization
52	23-Nov-2008	Guangzhou	Journalist	China	China Automotive News	News Organization
53	24-Nov-2008	Shanghai	Journalist	United Kingdom	Automotive News China	News Organization
54	24-Nov-2008	Shanghai (2nd interview)	Auto Analyst	USA	UBS Warburg, Shanghai Office	Financial Organization

	Date	Location of Interview	Position	Nationality of Interviewee	Name of Organization	Type of Organization
55	30-Nov-2008	Shanghai (2nd interview)	Lead Engineer, Body & Exterior Department	USA	Shanghai General Motors	Joint Venture
56	3-Dec-2008	Baoding, Hebei Province	Manager, International Marketing Planning Department	China	Great Wall Auto	Independent Automaker
57	5-Dec-2008	Tianjin	Engineer	China	China Automotive Technology and Research Center	Government Agency
58	9-Dec-2008	Beijing	Director	China	Auto and Society Development Research Institute and Auto and Society Magazine	Non-Governmental Research Institute
59	17-Dec-2008	Shanghai	Manager	USA	Shanghai General Motors	Joint Venture
60	18-Dec-2008	Shanghai (2nd interview)	General Manager	USA	Chrysler China	Global Automaker
61	23-Dec-2008	Shanghai	Founder and CEO	China	Gasgoo	Industry News Organization
62	29-Dec-2008	Shenzhen	Assistant to the General Manager	China	BYD	Independent Automaker
63	6-Jan-2009	Shanghai	Founder and CEO	China	SICAR	Chinese Auto Design Company
64	9-Jan-2009	Shanghai	Director, Business Development	China	Chrysler China	Global Automaker
65	10-Jan-2009	Shanghai (by phone)	Journalist	USA	China Automotive News	Industry News Organization
66	11-Feb-2009	San Diego, CA	Professor	USA	UCSD, IRPS	University

	Date	Location of Interview	Position	Nationality of Interviewee	Name of Organization	Type of Organization
67	27-Feb-2009	Shanghai	Former President	USA	Shanghai General Motors	Joint Venture
68	4-Mar-2009	Shanghai (by phone)	Engineering Manager	Taiwan	SAIC Roewe	Traditional SOE
69	5-Mar-2009	Shanghai	Dean	China	Tongji University, School of Automotive Engineering	University
70	9-Mar-2009	Shanghai	Analyst	China	Automotive Resources Asia	Market Research Organization
71	10-Mar-2009	Shanghai (2nd interview)	Director, Business Development	China	Chrysler China	Global Automaker
72	11-Mar-2009	Shanghai	Former Chairman and President	China	SAIC	Traditional SOE
73	11-Mar-2009	Shanghai (by phone)	Policy Analyst	China	General Motors, Beijing Office	Global Automaker
74	13-Mar-2009	Beijing (2nd interview)	Journalist	China	Automotive News China	News Organization
75	13-Mar-2009	Beijing	Chief Representative	France	European Automobile Manufacturers Association	Industry Organization
76	14-Mar-2009	Beijing	Former Executive	USA	Chrysler China	Global Automaker
77	16-Mar-2009	Beijing (2nd interview)	Professor	China	Peking University	University
78	24-Mar-2009	Shanghai (by phone)	Dean of Education	USA	University of Michigan and Shanghai Jiaotong University Joint Program	University

	Date	Location of Interview	Position	Nationality of Interviewee	Name of Organization	Type of Organization
79	3-Apr-2009	Shanghai	Professor	USA	University of Michigan and Shanghai Jiaotong University Joint Program	University
80	10-Apr-2009	Shanghai	Senior Researcher	Korea	Korean Institute for Industrial Economy and Trade (KIET)	Research Institute
81	10-Apr-2009	Shanghai	Former Engineer	Korea	Hyundai	Global Automaker
82	13-Apr-2009	Beijing	Consultant	Germany	Roland Berger	Consultancy
83	13-Apr-2009	Beijing	Former Executive	Germany	Shanghai Volkswagen	Joint Venture
84	10-Nov-2010	Berkeley, CA	Professor	China	Tsinghua University, Automotive Technology Department	University

APPENDIX E: CHINA'S QUEST FOR OIL AT HOME AND ABROAD

Although the media tends to focus on Chinese oil imports, China like the United States is also one of the world's largest oil producers. In 2010, China overtook Iran to become the world's fourth largest oil producer behind Russia, Saudi Arabia and the United States. Nonetheless, relatively speaking, China's massive efforts to increase the domestic output of petroleum have only met with mixed success.

According to an analysis by Kambara and Howe (2007), China is estimated to have 30 distinct sedimentary basins with significant amounts of oil and gas. The largest basin is thought to be in the Bohai Bay Basin in the north-east, also known as Huabei Basin. The second largest basin is the Songliao Basin, also in the north-east. The third largest region in terms of estimated reserves is in the Tarim Basin in the western province of Xinjiang. Though there is considerable debate within China about the country's oil reserves, a detailed assessment by the Second Resources Assessment Conference put total petroleum resources at 94 billion metric tonnes, of which 73.8 percent was onshore and 26.2 percent was offshore (Kambara and Howe 2007:40). Although that figure seems impressive, it refers to resources that are theoretical and rather remote in operational terms. Unlike the concept of "proven reserves", Chinese figures include estimates of future discoveries and do not take into account the state of extraction technology or the economic costs of extraction. According to *Oil & Gas Journal*, China had 20.4 billion barrels (2.8 metric tonnes) of "proven" oil reserves as of January 2010²⁹¹, a dramatically different estimate than that made by the Chinese assessment of 94 billion metric tonnes.

Despite significant investments in domestic exploration, the pace of Chinese production – especially offshore in the South China Sea – has been slower than the government expected. Why? Part of the answer has to do with China's limited offshore drilling experience. Wei Chen, Senior Vice President of China's National Offshore Oil Corporation (CNOOC), has said that "because of the country's late involvement in the offshore oil and gas industry, its exploration and development technologies and independent intellectual property rights are still underdeveloped, and the key technologies used in deepwater equipment are behind those of the countries advanced in offshore exploration and development by 15 to 20 years."²⁹² The EIA predicts that China's domestic oil production will only increase by about 150 thousand bbl/d in 2011.

Nonetheless, one cannot rule out the possibility that China could develop more of its domestic oil resources in the future, especially if oil prices in international markets continue to rise. Remember that the CCP under Mao was determined to increase China's energy self-reliance by overcoming capital shortages and technological backwardness by mobilizing thousands of

²⁹¹ Quoted in EIA (2010).

²⁹² W. Chen, 2009. "Going Deeper: China's Offshore Oil and Gas Industry," Proceedings of the Nineteenth International Offshore and Polar Engineering Conference, Osaka, Japan. June 21-26. <http://www.isopec.org/publications/proceedings/ISOPE/ISOPE%202009/data/papers/2009-TPC-742.pdf>. Accessed on 19 April 2011.

men through military work methods. Developing the Daqing oil field in northeast China became a test of political strength and the CCP's ability to weather the Sino-Soviet split of 1960. At any one time, up to 40 thousand workers were mobilized in the Daqing development. These men performed every task, from basic land construction, drainage and the construction of living accommodation, to the transportation of machinery, often by means of long human chains. The Daqing project was a huge success, with crude oil production rising from less than 1 million metric tonnes in 1960 to over 17 million metric tonnes in 1970. The Daqing field peaked at 50 million metric tonnes in 1976 and more or less maintained that level of production until 2002. Today, Daqing is still China's single largest oil field, though its share of national output has been falling since 2002. Could China successfully pursue another Daqing-style national oil project in the future? Perhaps. The key question is whether the central state has the political power to compel the national oil companies (NOCs) to invest in a particular project, even if the economics do not support it. As Erica Downs (2004) has argued, the Chinese NOCs are increasingly independent from the Center.

Due to the uncertainty of future domestic oil production, Chinese oil companies have been aggressively diversifying their foreign oil assets. The IEA predicts that China will have to import upwards of 79 percent of its oil by 2030 (IEA 2010). Sometimes the foreign activities of NOCs have received a lot of negative attention, as was the case with CNOOC's failed bid for American oil firm Unocal.²⁹³ The Unocal debacle discouraged Chinese NOCs from pursuing assets in the United States, but it did not stop them from seeking assets in other regional markets, especially those in countries often inaccessible to Western oil multinationals.

In recent years, the three major state-owned NOCs – CNOOC, China National Petroleum Corporation (CNPC), and China Petroleum & Chemical Corporation (Sinopec) – have emerged as significant players in global mergers and acquisitions in upstream oil assets. The global financial crisis (2008-2009) presented numerous opportunities for these firms to purchase quality assets abroad. According to the IEA, Chinese NOCs spent USD 18.2 billion on merger and acquisition deals in 2009, accounting for 13 percent of total global oil and gas acquisitions and 61 percent of all acquisitions by national oil companies (Jiang and Sinton 2011:7). In 2010, Chinese NOCs spent USD 19.39 billion on overseas acquisitions, over half of which were in Latin America. Some of the most notable deals from 2009 to 2010 can be found in Table E below.

²⁹³ Back in 2005, the proposed acquisition of American oil company Unocal by Chinese CNOOC was heavily criticized by members of the U.S. Congress who viewed the sale as a threat to American interests. The Chinese government responded angrily to what it saw as unfair treatment of CNOOC. Ultimately, CNOOC withdrew its USD 18.5 billion bid.

Table E: Select Chinese Overseas Acquisitions (2006-2010)

Date	Chinese Company	Assets	Location of Assets	Share	Deal size (USD billion)
Nov 2010	CNOOC	Purchased interest in Chesapeake Energy's 600,000 net acres in the Eagle Ford Shale (Texas)	U.S.A.	33.3%	2.2
Oct 2010	CNOOC	Purchased interest in Brazilian subsidiary of Spanish firm Repsol	Brazil	40.0%	7.1
May 2010	CNPC	Purchased interest Shell's Syrian subsidiary, which owns three production licenses covering 40 oil fields.	Syria	35%	1.2-1.5
Apr 2010	Sinopec	Purchased interest in Canadian oil sands company Syncrude from ConocoPhillips.	Canada	50%	4.7
Mar 2010	CNOOC	Purchased interest in Argentinian firm Bidas, which has oil and gas operations in Argentina, Bolivia and Chile	Argentina, Bolivia, and Chile	50%	3.1
Jun 2009	CNPC/ PetroChina	Purchased interest in Singapore Petroleum Company	Singapore	96%	2.0
Jun 2009	Sinopec	Purchased Geneva-based Addax, which gives Sinopec assets and reserves in Western Africa and Northern Iraq's Kurdish region	West Africa and Kurdish region of Iraq	100%	7.3

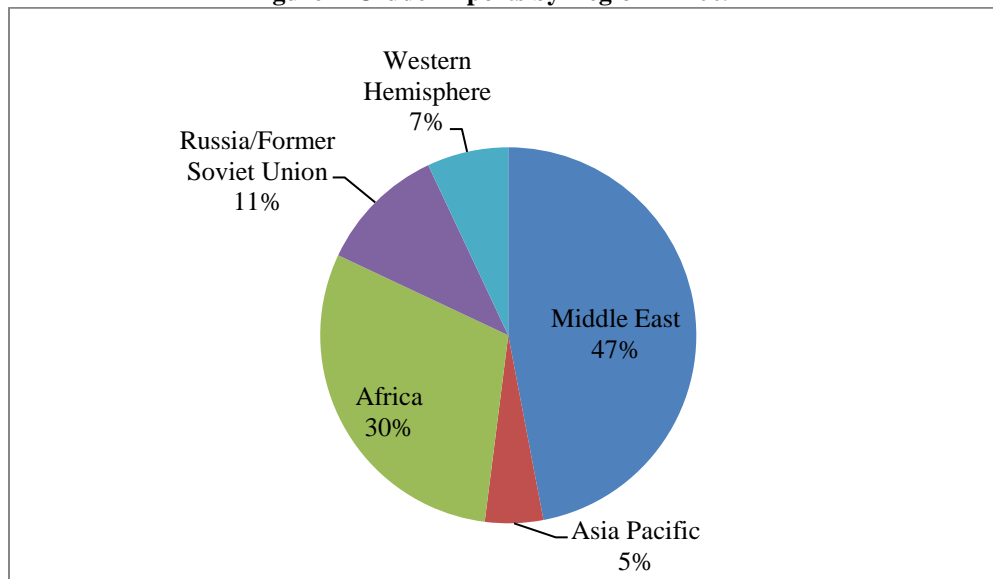
Source: Jiang and Sinton (2011); Various news sites.

Leveraging China's enormous foreign exchange reserves²⁹⁴, Chinese banks have been willing partners in financing foreign asset acquisitions of Chinese NOCs. The China Development Bank and the China Export-Import Bank are the two main banks providing funding, not only in the form of loans to finance the purchase of assets abroad, but also in the form of long-term "loans-for-oil" to resource rich countries. In such deals, countries receive loans in exchange for a negotiated amount of oil each year. From 2009 to 2010, CNPC and Sinopec alongside Chinese banks were involved in 12 loan-for-oil deals with nine countries worth an estimated USD 77 billion: Angola, Bolivia, Brazil, Ecuador, Ghana, Kazakhstan, Russia, Turkmenistan, and Venezuela (Jiang and Sinton 2011).

In all, Chinese oil companies are now operating in 31 countries and have equity production in 20 of these countries, though most of their equity equity shares are concentrated in Kazakhstan, Sudan, Venezuela, and Angola. Figure E below breaks down 2009 Chinese crude imports by region.

²⁹⁴ China's foreign exchange reserves topped USD 2.45 trillion at the end of June 2010.

Figure E Crude Imports by Region in 2009²⁹⁵



Source: Table replicated from Jiang and Sinton (2011:12)

Given that 54 percent of Chinese oil imports came from the Middle East in 2000 (Lai 2007), China has made progress in diversifying its sources of crude imports. Yet the fact remains that 47 percent of Chinese crude oil comes from the Middle East. And because most of the oil coming from the Middle East is shipped through the Persian Gulf and the Strait of Malacca, the Chinese NOCs have felt increasingly vulnerable to the U.S. Navy’s projection of power in those vital sea lanes. To increase the security of Chinese oil tankers through these treacherous waters, the Chinese government has not only been modernizing its blue water navy, but has been actively strengthening diplomatic ties, building naval bases and ports, and constructing airfield projects throughout the region (Chang and Saez 2010:94-95).

For example, China is building a naval base and modern port in Gwadar, Pakistan, an industrial port in Hambantota, Sri Lanka, a container shipping facility in Chittagong, Bangladesh, and an upgrade airstrip on one of the Paracel Islands. A report produced for the U.S. Department of Defense has called China’s development of these strategic geopolitical nodes “the string of pearls strategy”(Perhson 2006). Though the Chinese foreign ministry has vehemently denied the existence of a so-called “string of pearls strategy”, some American and Indian observers view Chinese activities in the region with increasing unease.

In addition to their presence along strategic sea lanes, the Chinese NOCs with support from the Chinese government are also investing heavily in transnational oil pipelines in North, Central and Southeast Asia. In an effort to reduce reliance on the Strait of Malacca, CNPC signed an MOU with Myanmar’s Ministry of Energy in 2009 to construct, operate and manage the parallel Sino-Myanmar Oil and Gas Pipelines. The 1,100 km pipeline will traverse the length of Myanmar, linking the Indian Ocean with China’s landlocked southwestern province of Yunnan, where CNPC is building new refineries. Similarly, after many years of difficult

²⁹⁵ In 2009, the top ten crude oil suppliers to China (in order of import volumes) were Saudi Arabia, Angola, Iran, Russia, Sudan, Oman, Iraq, Kuwait, Libya and Kazakhstan (Jiang and Sinton 2011:11).

negotiations, China and Russia signed a long-term oil supply deal worth USD 25 billion. CNPC, along with Russian oil firm Transneft, is constructing a 1,030 km pipeline that links the East Siberia-Pacific Oil pipeline to the Daqing refinery complex in northeast China.

Not only is the Chinese government helping the NOCs in transnational negotiations, but it is bringing in Chinese state-owned banks to finance expensive pipeline projects. For example, Transneft will receive a USD 10 billion loan from a Chinese bank to build the 65 km section of the pipeline that will be located in Russia. The rest of the pipeline, about 965 km, was completed by CNPC within 17 months of the signing of the deal (Jiang and Senton 2011). The pipeline was officially started flow in January 2011, and has the potential to transport 15 million metric tonnes of oil annually.²⁹⁶

Even more impressive is the 2,200 km Kazakhstan-China oil pipeline that connects Kazakhstan's Caspian Shore to the Chinese border in Xinjiang Uygur Autonomous Region. By 2015, this pipeline could supply 6 percent of China's total crude imports from Kazakhstan and Western Siberia. Though CNPC and Kazakh oil company Kasmunaigas took equal shares in the pipeline, some reports suggest that CNPC paid for 85 percent of the total cost of building the pipeline (Jiang and Senton 2011:31).

Rather than curbing demand for oil domestically, the Chinese government has focused on increasing supply internationally. It is yet unclear whether these large and costly overseas investments will serve to both meet Chinese oil consumption needs and enhance China's sense of energy security in the long run. Because many of these foreign acquisitions are subsidized with easy access to cheap Chinese credit, it is hard to determine if they make economic sense for the Chinese NOCs, which are forced to sell gasoline at controlled domestic retail prices. What is clear is that unfettered demand for cars and hence oil will have consequences for China's CO₂ emissions and hence climate change.

²⁹⁶ *Xinhua News Agency*, 2011. "China-Russia Oil Pipeline Officially Starts Operations." 11 January. http://news.xinhuanet.com/english2010/china/2011-01/01/c_13673416.htm. Accessed on 20 April 2011.

APPENDIX F: CHINA'S FUEL EFFICIENCY AND EMISSION STANDARDS

In the early days of auto sector development, Chinese leaders were most concerned about modernizing the domestic automotive supply chain and ramping up automobile production. When foreign automakers were brought in to help traditional SOEs ramp up Chinese auto production, they were not incentivized to share their most sophisticated and efficient engine designs. As a result, they tended to bring older generation engine technologies that were not necessarily the most fuel efficient by global standards. When vehicle volumes and oil consumption were low, the Chinese government was not overly concerned about fuel economy. However, in the early 2000s, when annual vehicle production began to consistently exceed 2 million and oil imports surged, the state began to study the benefits of fuel economy standards.

In 2004, the Chinese government enacted the country's first fuel economy standards. Forcing automakers to develop and produce more efficient vehicles seemed to be a good solution to alleviate the growing conflict between the desire to establish a thriving domestic auto industry and the need to alleviate growing concerns about China's energy security. The new standards were based on the weight of the vehicle and were to be rolled out in two phases (2005 and 2008). The standards were classified into 16 weight classes, ranging from 38 miles per gallon (mpg) in 2005 (43 mpg in 2008) for the lightest vehicles, such as mini-cars, to 19 mpg in 2005 (21 mpg in 2008) for the heaviest vehicles, such as small pick-up trucks, SUVs and minivans. The light truck category of vehicles, which includes small pick-ups, SUVs and minivans, are the heaviest vehicles to be regulated in these standards; those vehicles considered commercial vehicles, such as heavy duty trucks and large buses, are not included. As of 2003, 66 percent of the passenger cars sold in China met the Phase 1 standard (with 35 percent meeting the Phase II standard); meanwhile, only 4 percent of SUV's and minivans met Phase I standards (with no light pick-up trucks meeting Phase II standards).²⁹⁷ In other words, the new fuel economy standards are tougher as the size of the vehicle increases.

At the time the 2004 standards were implemented, Chinese standards ranked third globally behind Japanese and European standards. Notably, Chinese standards were more stringent than U.S. Corporate Average Fuel Economy (CAFE) regulations in 2004. Whereas Chinese standards prescribe a maximum level of fuel consumption for every vehicle within its weight class, the CAFE system only requires that the fleet of cars and trucks produced by a single automaker meet an *average* fuel economy for its entire fleet. That way, the production of large, fuel-thirsty trucks and SUVs could be balanced out by smaller, more fuel efficient models. However, on May 19th, 2009, President Barak Obama announced new CAFE standards that increase fuel efficiency and reduce greenhouse gas emissions for all new cars and trucks sold in the United States beginning in 2012. Though the required average fuel economy for automakers' passenger vehicle fleets (35.5mpg) is closer to Chinese standards, the U.S. still lags China in terms of the required timing of implementation (2016 versus 2008).²⁹⁸

²⁹⁷ These figures come from Sauer and Wellington (2004).

²⁹⁸ The new CAFE standards apply to model years 2012-2016 for all passenger vehicles sold in the United States, including cars, light trucks and SUVs. Significant improvements in fuel efficiency will be required of all new

As mentioned earlier, commercial vehicles and heavy duty trucks, which are the heaviest and least efficient vehicles on the road, are not regulated under China's 2004 standards. Though it is unclear why these vehicles were not regulated, it may be because that market segment is dominated by traditional SOEs, FAW and Dongfeng, which may not have the technological know-how to upgrade improve the efficiency of their engines and transmissions. Also conspicuously left out of the 2004 fuel economy standards are imported vehicles. Nearly all of the fuel-thirsty sports cars and large SUVs sold in China are imported. Despite the high import taxes on such vehicles, they are very popular among the wealthy Chinese elite.

According to a 2009 study conducted by the Energy Technology Innovation Policy (ETIP) research group at Harvard University, the Chinese standards were successful in reducing the average fuel consumption of the new national light duty and passenger vehicle fleet by 11.5 percent and stimulating broader deployment of more advanced vehicle technologies (Oliver et al 2009). Based on a detailed analysis of new models introduced by the 12 largest automakers in China, the ETIP research group found that that the new standards motivated these firms to introduce diversified and modern models and to apply newer and more efficient technologies.

Though fuel economy standards were not primarily intended to reduce the carbon intensity of vehicles produced in China, they nonetheless have that effect. Since CO₂ emissions are relatively constant per gallon of fuel, they are proportional to fuel consumption. In other words, the less gasoline consumed per mile, the less the CO₂ emissions for that more fuel efficient vehicle compared to a less fuel efficient vehicle.

There have been media reports that China is drafting even more stringent fuel economy standards, which could further help reduce the carbon intensity of Chinese vehicles, but such standards are still under review and have not been formally announced. The *New York Times*, for example, has been reported that the new plan would require automakers in China to improve fuel economy by an additional 18 percent by 2015, which would be impressive.²⁹⁹ Nonetheless, though stricter fuel economy standards will reduce the rate at which oil consumption grows, total oil consumption and hence vehicle-related CO₂ emissions in the aggregate will continue to grow alongside China's vehicle consumption.

A direct way of curbing transport-related carbon dioxide(CO₂) emissions is to implement emission controls for vehicles produced and sold in China. In many ways, the Chinese government has made consistent progress in upgrading national emission standards for vehicles produced in China. In 2000, China enacted its first emissions controls on automobiles, which were based on Euro I standard. In 2004, China adopted the equivalent of the Euro II standard. Then in 2007, China once again updated its emission standards to reflect the Euro III standard.

vehicles in 2012 model, with yearly gains of 5 percent or more in subsequent years. By 2016, passenger vehicle fleets must achieve a combined average fuel economy standard of 35.5 mpg - 39 mpg for cars and 30 mpg for light trucks and SUVs - a 40 percent improvement over current standards. The new CAFE standards also achieve the target goal four years sooner than the current law passed by Congress in 2007, which required average fuel economy of 35 mpg by 2020. States and environmentalists got higher fuel efficiency and lower greenhouse gas emissions, and automakers got a single national standard that makes it unnecessary for them to build different versions of the same car, or to meet a patchwork of different state and federal standards.

²⁹⁹ For example, see Bradsher, K. "China is said to plan strict gas mileage rules." *New York Times*. 27 May 2009.

The Euro I, II, and III standards, upon which the current Chinese emission standards are based, regulate emissions of nitrous oxide, total hydrocarbon, and carbon monoxide, all of which are crucial to abating air pollution and environmental degradation. Yet neither the European emission standards nor the Chinese emission standards specifically regulate CO₂ emissions. Due to rising concerns over Europe's growing vehicle-related CO₂ emissions in the 2000s, the European Parliament finally passed separate regulations for vehicle-related CO₂ emissions in 2009.³⁰⁰ In contrast, China has not yet proposed regulations for vehicle-related CO₂ emissions.

³⁰⁰ For years, CO₂ emissions generated by vehicles were only subject to a voluntary agreement between the EU and automakers. But as it became clear that automakers were still far from meeting the original target of 120g of CO₂/km for all new passenger cars by 2012, the European Parliament enacted Regulation (EC) No 443/2009 in April 2009 that for the first time set CO₂ emission standards for new passenger cars. The new regulation sets a limit of 130g of CO₂/km to be phased in over 4 years, which is lower than the original objective of 120g of CO₂/km. http://ec.europa.eu/clima/policies/brief/eu/index_en.htm. Accessed on 19 April 2011. In contrast, the average American passenger car emits about 255.6 g of CO₂/km. <http://www.gizmag.com/us-european-japanese-car-market-co2-pollution/15485/>. Accessed on 19 April 2011. According to a recent JATO Dynamics' study of the U.S. light vehicle market, in the first quarter of 2010, the American car market's average CO₂ output is 268.5 g/km. <http://www.gizmag.com/us-european-japanese-car-market-co2-pollution/15485/>. Accessed on 19 April 2011.