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# Engines of Change: China's Rise and the Chinese Auto Industry

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**CLAREMONT McKENNA COLLEGE**

**Engines of Change: China's Rise and the Chinese Auto Industry**

SUBMITTED TO

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AND

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for

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## **Abstract**

The following thesis outlines the Chinese government's push for new-energy vehicles within their auto industry. By giving a history of the Chinese automotive industry and the central planning devices used to push the industry forward, we should develop a more refined understanding as to the direction of China's auto industry in the future.

## **Acknowledgments**

I would like to acknowledge my thesis reader Professor Ilai Saltzman. Without his encouragement, guidance, and patience, this thesis would not have been possible. Thank you. I would also like to thank my family and parents for supporting me throughout my college career and never giving up. This is for you.

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## I. Introduction

China has seen an unprecedented rise over the last thirty years, mainly flourishing after Deng Xiaoping opened the Chinese economy through radical economic reform.<sup>1</sup> This reform was supplemented by the Chinese Communist Party's (CCP) attempt to overcome the "Century of Humiliation" that China claims to have experienced, using it as a platform for modern Chinese identity.<sup>1</sup> The "historical memory" of the country's "humiliation" at the hands of foreigners began with China's defeat in the Opium Wars in the mid-nineteenth century. The "humiliation" reached an understandable high point with Japan's successful industrialization and subsequent invasion and occupation of Manchuria during World War II.<sup>2</sup> China experienced many different economic and political reforms since the occupation by Japan in Manchuria; but I believe that it was Deng Xiaoping's reforms that started in around 1979 that helped to bring his country back into the ranks of great powers in the modern world economy.

After nearly three decades as the world's fastest-growing economy, its' Gross Domestic Product (GDP) increasing at a average rate of nearly 10 percent, China became, early in the twenty-first century, the world's third largest economy and third largest trading economy.<sup>3</sup> In 2006 China also became the world's largest holder of foreign

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<sup>1</sup> Rosemary Foot, *The Practice of Power: US Relations with China since 1949*, (New York: Oxford, 1997), 195

<sup>2</sup> Orville Schell, "China: Humiliation & the Olympics," *The New York Review of Books*, August 14, 2008 issue

<sup>3</sup> Warren I. Cohen, *America's Response to China*, (New York: Columbia University Press, 2010), 5<sup>th</sup> ed., 263-264

exchange reserves, surpassing Japan, with an estimated more than two trillion dollars in 2009, much of it in US Treasury and mortgage company bonds.<sup>4</sup> China's GDP fell below 10 percent in 2009 after the 2007/08 global economic crisis and has since had 10.4% in 2010, 9.3% in 2011, 7.8% in 2012 and so far in the first half of 2013 it is maintaining, and projected to keep its' goal of 7.5% by the end of the year.<sup>5</sup>

This rise in economic power has enabled China to spend heavily on the modernization and expansion of its military forces.<sup>6</sup> According to the Stockholm International Peace Research Institute (SIPRI) military expenditure database, China spent an average of nearly \$24 billion US between 1989-98, \$65 billion US between 1999-2008, \$142 billion US from 2009-2012, and is currently standing at \$166 billion US in military spending.<sup>7</sup> From these numbers we can see that China's average expenditure on military in ten-year spans since 1989 has doubled, with continued projections to keep rising. While China is still far behind United States current 2012/13 spending of \$68 billion US, it is still a most impressive and dramatic increase.<sup>8</sup> The most notable military expenditure by the Chinese government has been into China's space program that has taken flight in recent years, putting up satellites, humans, and the development of the Chinese own space laboratory to help it further conduct research and development.<sup>9</sup>

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<sup>4</sup> Warren I. Cohen, *America's Response to China*, 264

<sup>5</sup> Percent's of GDP growth rate provided by the World Bank website, <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

<sup>6</sup> Warren I. Cohen, *America's Response to China*, 264

<sup>7</sup> SIPRI Military Expenditure Database, [http://www.sipri.org/research/armaments/milex/milex\\_database/milex\\_database](http://www.sipri.org/research/armaments/milex/milex_database/milex_database)

<sup>8</sup> Ibid.

<sup>9</sup> China launches Tiangong-1 space lab; Jonathan Amos, "Rocket launches Chinese space lab," *BBC News*, September 29, 2011, <http://www.bbc.co.uk/news/science-environment-15112760>



It is important, I believe, to address the progress of the Chinese space program because of how historically influential the space race between the Soviet Union and the United States in the 1950's was to eventual uni-polar world system that the United States leads. The early success of the Soviet Union's Sputnik satellite caused the United State to place a new national priority on research science, which led to the development of microelectronics-the technology used in today's laptop, personal, and handheld computers. Many essential technologies of modern life, including the Internet, owe their early development to the accelerated pace of applied research triggered by Sputnik and the space race that followed.<sup>10</sup> While China has yet to make any ground breaking developments in space technology so far, it is important to understand the increase in space capabilities may lead a country, such as the United States, to question the confidence in their political and military advantages.

The progress and influence of the Chinese space program is addressed by Kevin Pollpeter in his monograph, *Building for the Future: China's Progress in Space Technology During the Tenth 5-year plan and the U.S. Response*, in which he argues that China's use of space power is part of an integrated approach to increasing its comprehensive national power and achieving great power status.<sup>11</sup> It was during the 10<sup>th</sup> Five-year plan (2001-05) that the Chinese space program made impressive gains, but compared to other major space powers, China's space technology still lags behind.<sup>12</sup> The Five-year plan is a key central planning device that is used by the Chinese government to

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<sup>10</sup> Paul Dickson, *Sputnik: The shock of the Century*, (Bloomsbury Publishing USA, 2009)

<sup>11</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology During the Tenth 5-year plan and the U.S. Response," March 2008, ISBN 1-58487-347-7

<sup>12</sup> Kevin Pollpeter, "Building for the Future," vii

establish goals and targets for key Chinese industries and the development of weaker industries lacking in prowess. An official grand strategy has emerged from the Chinese leadership in their publishing of the White Papers beginning in 1998, and each subsequent year after, in which the Chinese leadership appears to have reached a consensus on a plan which sustains the conditions necessary for economic growth and military modernization in the context of operating in a uni-polar world dominated by the United States. This strategy is designed to ultimately usher in a multi-polar world in which China is one of several great powers by protecting China's core national interests against external threats and by shaping the international system in which it operates.<sup>13</sup>

In pushing for a multi-polar world, Chinese diplomatists devised a variety of “partnerships” with major powers. With Russia they crafted a “strategic cooperative partnership” that they insisted was not an alliance or directed at any third country, it was still perceived as such nonetheless. Neither Moscow nor Beijing was ready to antagonize Washington. Chinese leaders sought to develop similar ties to Great Britain, France, and Germany, anticipating a strategic relationship with the European Union. They even worked toward partnerships with Japan and India, two nations with which their relations were prickly. But their highest priority was always achieving a stable relationship with the United States. They needed the American market and American technology.<sup>14</sup>

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<sup>13</sup> Ibid. pg vii

<sup>14</sup> Warren I. Cohen, *America's Response to China*, 265

The American economy is a free capitalist economy, open and subject to many market forces, with no individual player able to change the direction.<sup>15</sup> The idea of state involvement in business as a bad thing has been supported both theoretically and empirically but is still and will continue to be a subject of debate.<sup>ii</sup> This can be contrasted to the Chinese economy that relies on central planning and heavy state involvement to develop markets within its economy. A recent example of this form of state involvement that addresses the structure of the economy as well as the role the government should play in a citizen's life was the release of Document No: 9 in August 2013.<sup>16</sup> This document and the "guidelines" provided look to end the "western anti-China forces" that have attempted to advocate "new liberalism" with the aim of dismantling State-Owned Enterprises (SOEs) and changing China's basic economic system and the challenging of the Party's control.<sup>17</sup> But what is the Chinese economic system?

Ian Bremmer, president of the Eurasia group, describes the Chinese system as a state capitalist economy that has seen undisputed progress economically with state intervention and central planning. There are two fundamental differences between free-market and state capitalism. First policy makers do not embrace state capitalism as a temporary series of steps meant to rebuild a shattered economy or to jump-start an economy out of recession. It's a strategic long-term policy choice. Second, state capitalists see markets primarily as a tool that serves national interests rather than as an

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<sup>15</sup> The US government did step-in in 2009 and bail out companies to keep the market afloat, however if it were to enforce such control during a prosperous market there would be severe backlash from companies and citizens.

<sup>16</sup> Jayadeva Ranade, "China: Document No. 9 and the New Propaganda Regime," *Institute of Peace and Conflict Studies*, (4175), (November 2013), <http://www.ipcs.org/article/china/ipcs-special-commentary-china-document-no-9-and-the-new-4175.html>

<sup>17</sup> Jayadeva Ranade, China: Document No. 9

engine of opportunity for the individual. State capitalist use markets to extend their own political and economic leverage – both within society and on the international stage.<sup>18</sup> As noted by Kevin Pollpeter, the Chinese space program is an example of a strategic policy choice used to gain political and economic leverage through the central planning device of the Five-year plan.

I argue that an often overlooked example of such strategic planning process induced by the political objective of the Chinese government to further modernize and empower the national economy and its international standing, is the auto industry. The Chinese auto industry, its' development, and planned future fit this category perfectly. The significance of this industry should not be overlooked and there has been little documentation of its importance to help China create a new multi-polar world system. In this paper I will provide a brief history of the Chinese auto industry, followed by an examination of the central planning used to develop the industry, then discuss the short comings of the plans and what may have contributed to those failures, and close with an examination of the future of the industry. I hope that my presentation of the material will help articulate a story in which China is planning to use its' auto industry to shift the center of the global economy from an unipolar system dominated by the United States to a new Chinese world order of multi-polarity.

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<sup>18</sup> Ian Bremmer, "The end of the free market: who wins the war between states and corporations?," *European View*, (9), (2010), 249-252

## **II. History of Central Planning and the Emergence of the Chinese Auto Industry**

To first understand the history of the auto industry in China we must first identify what the central planning system of the Chinese government is and how it was shaped and developed over time. This will give us a framework as to how the development of the Chinese auto industry is in line with the central planning of the government, and even though China is considered to be a market based economy by many, it is still the central planning that drives its' industries forward.

The Great Leap Forward was one of the biggest mass mobilizations of a country's people by a central government. Initiated by Mao Zedong around the 1950's, it was a duplicate of the Stalinist model – rapid, forced industrialization, under state direction and control.<sup>19</sup> This soviet model included a steep rate of capital formation, overwhelming emphasis on industrial development, high priority of heavy industry in investment allocation, and preference for large plants and capital-intensive techniques.<sup>20iii</sup> The Chinese government carried out a system of planned economy, and targets and quotas for various spheres of economic development were all set by the special “planning committees” of the state. Factories produced goods according to state plans, and farmers planted crops also according to state plans. Commercial departments replenished and sold their stocks according to state plans, and the qualities, quantities and prices of the goods were all fixed by planning departments. Mao Zedong wanted to achieve even more rapid industrial growth once the soviet institutional model was in place by using this system of

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<sup>19</sup> Morris L. Bian, *The Making of the State Enterprise System in Modern China*, (Cambridge, Mass.: Harvard University Press, 2005), 2

<sup>20</sup> Ibid. pg 2

planned economy; however, there were dire consequences to the mass mobilization and reforms needed to be made.<sup>2122</sup>

The Chinese recognized that, on one hand, this system contributed to the stable, planned development of China's economy, but on the other it also limited the development of the economy and sapped its vitality. The government's policies kept the Chinese economy stagnant and inefficient, mainly because most aspects of the economy were managed and run by the central regime (and thus there were few profits incentives for firms, workers, and farmers), competition was virtually nonexistent, foreign trade and investment flows were mainly limited to soviet bloc countries, and price and production control caused widespread distortions in the economy. By 1978 nearly three-fourths of industrial production was produced by centrally controlled, State-owned Enterprises (SOEs), according to centrally planned output targets as briefly mentioned before.<sup>23</sup> In 1978 after Mao's death, the Chinese government initiated gradual economic reforms according to free market principles to break with its' soviet style economic policies and open up trade and investment with the West, with the hope that it would significantly increase economic growth and raise living standards.<sup>24</sup>

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<sup>21</sup> Morris L. Bian, *The Making of the State Enterprise System*, 3

<sup>22</sup> The mass mobilization of Chinese citizens into a commune system to push and develop industrial growth led to the Great Leap Famine; a crisis that resulted in 30 million excess deaths and about 33 million lost or postponed births, making it one of the worst catastrophes in human history. An examination of existing economic studies of the Great Leap crisis is provided by Justin Yifu Lin and Dennis Tao Yang: "On the Causes of China's Agricultural Crisis and the Great Leap Famine," *China Economic Review*, Volume 9, (2), (1998), 125-140

<sup>23</sup> Wayne M. Morrison, "China's Economic Rise: History, Trends, Challenges, and Implications for the United States," *Congressional Research Service*, September 5, 2013, 2

<sup>24</sup> Wayne M. Morrison, "China's Economic Rise," 3

Some of the first reforms that were initiated were direct ownership and price incentives for farmers that enabled them to sell a portion of their crops on the free market and keep the rest for themselves.<sup>25</sup> The continual push for trade liberalization in other sectors was a major key to China's economic success; removing trade barriers encouraged greater competition and attracted Foreign Direct Investment (FDI).<sup>26iv</sup> The exceptional growth of the Chinese economy since the reforms started demonstrate how effective they were and how the gradual implementation allowed their government to identify which policies produced favorable outcomes and which did not so that the correct industries received investment.<sup>v</sup> So when did the auto industry emerge as a favorable economic industry to the Chinese government?

The Chinese automotive industry was established after Japan's occupation of Manchuria that began in 1931. While the occupation of the Japanese Imperial Army was, in many ways, devastating to Chinese society, a future focal point for the "Century of Humiliation", the Japanese, after their defeat and subsequent withdrawal, left behind an industrial base in Manchuria, allowing China to gain some of the some of the hardware necessary to support a commercial vehicle industry.<sup>27</sup> Manchuria owes its early development to a combination of good natural resources and easy access to the world outside China; the availability of iron ore facilitated the development of an iron and steel

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<sup>25</sup> This led to the breakdown of the agricultural commune system whose failure had eventually caused the Great Leap Famine.

<sup>26</sup> Wayne M. Morrison, "China's Economic Rise," 3

<sup>27</sup> G. E. Anderson, *Designated Drivers: How China Plans to Dominate the Global Auto Industry*, (John Wiley & Sons: Singapore, 2012), 53

industry, mainly under Japanese control.<sup>28</sup> In lacking sufficient expertise in the industry China reached out to the Soviet Union in 1950 that transferred designs for commercial trucks and a Jeep-like all-terrain vehicle.<sup>29</sup> The Chinese government established First Auto Works (a state-owned enterprise) in Changchun, the capital of Jilin province in northeast China that produced trucks from the soviet designs. By 1958 First Auto Works also began to produce the Hongqi limousine for state leaders, and in another factory in Shanghai it began to produce a Phoenix model sedan. However, production of passenger cars never reached significant scale; China never produced more than 100 passenger cars in a single year.<sup>30</sup> In terms of its role in Chinese industry, Manchuria had become the counterpart of Pittsburgh, Detroit, and the industrial Midwest of the United States put together.<sup>31</sup> In the late 1960's, it established the Second Auto Works in the mountains near Wuhan in central China.<sup>32</sup> The handful of passenger cars that were manufactured in Changchun or Shanghai went either to China's leaders or to taxi fleets in the larger cities.

It should be noted that this initial development of the auto industry was under the supervision of Mao Zedong whose strict ties to communism had little interest in consumerism and a vast need for passenger cars for the everyday citizen. This mind set

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<sup>28</sup> Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, (Chicago: Aldine Publishing Company, 1969), 85

<sup>29</sup> G. E. Anderson, *Designated Drivers*, 53

<sup>30</sup> Eric Harwit, "China's Automobile Industry: Policies, Problems, and Prospects," *Studies on contemporary China*, (Armonk, NY: M.E. Sharpe, 1995), 17-18.; Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, 85

<sup>31</sup> Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, 8; Detroit was the home of the United States automotive industry as it emerged. See: Steven Klepper, "The Evolution of the U.S. Automobile Industry and Detroit as its Capital," (Carnegie Mellon University, Pittsburgh: November 2001)

<sup>32</sup> Wan-Wen Chu, "How the Chinese government promoted a global automobile industry," *Industrial and Corporate Change*, (Oxford University Press), (2011), 5



shifted as Deng Xiaoping was able to consolidate power and gain support for major economic reforms in 1978.<sup>33</sup>

The communist influences from the Mao era carried over into the new development of the Chinese auto industry because not all of China's senior leaders agreed on the importance of an automobile industry, particularly one that produced passenger cars. Personal ownership of vehicles would remain technically illegal until 1984, and even if ownership had not been illegal, few Chinese could afford to buy a car.<sup>34</sup> 1978 was perhaps the first year following the Cultural Revolution in which China enjoyed enough political stability that officials could begin to think seriously about the industry. Deng Xiaoping stressed that China should learn from the west and from his overall leadership, the automobile industry shifted gears from imports to partnerships with the foreign automakers to stop the flooding of Japanese imports that occurred during the late 1970's and early 1980's as China removed its' trade barriers.<sup>35</sup>

China approached and formed joint ventures during the 1980's with American Motor Corps of the United States to set up the Beijing Jeep Company, Volkswagen of Germany formed the Shanghai Auto Industry Corporation-VW, and PSA Peugeot-Citroen of France followed with Guangzhou-Peugeot. Meanwhile, First Auto Works (FAW) and Second Auto Works (SAW) also shifted to joint venture. In 1992, FAW-VW

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<sup>33</sup> On Deng Xiaoping's consolidation, see Richard Baum, *Burying Mao: Chinese Politics in the Age of Deng Xiaoping* (Princeton, NJ: Princeton University Press, 1994), 27-47.

<sup>34</sup> G. E. Anderson, *Designated Drivers*, 57.

<sup>35</sup> G. E. Anderson, *Designated Drivers*, 56

was established, and SAW and Citroen also set up the joint venture Shenlong.<sup>36</sup> The chart below depicts how explosive the rise in passenger car production was in China after 1978.

Refer to Figure 1 in Appendix

The rise in production, as provided by Figure 1, sparked the reinstatement of the China National Automotive Industry Corporation (CNAIC) which had seen a short lived authority over some 75 industrial plants including China's main auto factories in Changchun, Beijing, Nanjing, Chongqing, and Wuhan from 1964 to 1965 after which it was disrupted by the Cultural Revolution. It was the governmental body that had approved the establishment of Second Auto Works (that would later change its name to Dongfeng).<sup>37</sup> Before the reemergence of CNAIC the Machinery Industry Ministry (MIM) was the leading government body in charge of the auto industry.<sup>38</sup> This new version of CNAIC that emerged in 1982 was, on paper, a powerful organization; it oversaw the major auto enterprises, FAW and SAW, as well as factories in Beijing, Tianjin, Shanghai, Chongqing, and elsewhere.<sup>39</sup>

CNAIC did play a key role in increasing the importance of the auto industry to the highest level of leadership in China's State Council and economic planning apparatus by acting as a think tank for the industry and giving policy recommendations.<sup>40</sup> In its very

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<sup>36</sup> "A Fifty Year Chronology of China's Automotive Industry," *China Automotive Technology and Research Center*, (2003), <http://www.chinaauto.ac.cn/zhishi/ZG50DSJ.htm>

<sup>37</sup> G. E. Anderson, *Designated Drivers*, 54.

<sup>38</sup> Wan-Wen Chu, "How the Chinese government promoted a global automobile industry," 5

<sup>39</sup> Eric Harwit, "China's Automobile Industry: Policies, Problems, and Prospects," 52

<sup>40</sup> Previously to CNAIC, the automobile industry was not even included in the sixth five-year plan. Wan-Wen Chu, "How the Chinese government promoted a global automobile industry," 6

first policy recommendation document, CNAIC received the following instruction from the Chinese leaders, “as long as there is a market, produce without limits;” which essentially gave permission to produce vehicles according to market demand.<sup>41</sup> The China National Automobile Industry *Corporation* was later changed into the China National Automobile Industry *Association*, in effect, changing it from ‘a high-level, independent organization into one managed by its members, serving as a bridge between enterprises and the government.’<sup>42</sup> A further administrative reform in 1998 disbanded 15 industry-aligned ministries, and the MIM was restructured into a Machinery Industry Bureau under the State Economic and Trade Commission (SETC). Then in 2003, this part of the SETC merged with the State Development Planning Commission, originally the State Planning Commission, to form the National Development and Reform Commission (NDRC) in 2003. Now the industrial policy bureau under NDRC has an auto section that governs auto related policies. The newly established State-Owned Assets Supervision and Administration Commission (SASAC) manage major SOEs, including the FAW and SAIC, from 2003. The state-owned China Automotive Technology and Research Center, which does R&D works, was established in 1985 and came under SASAC in 2003. The semi-official China Association of Automobile Manufacturers handles many of the policy and coordination tasks.<sup>43</sup> The shift within these organizations shows a struggle to find a way to better conduct the industrial policy. What then can direct the traffic over this bridge between the different enterprises and the central government? The traditional five-year planning system/process is such a device. The automobile industry was part of the

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<sup>41</sup> G. E. Anderson, *Designated Drivers*, 58

<sup>42</sup> *Ibid.* Pg 59

<sup>43</sup> Wan-Wen Chu, “How the Chinese government promoted a global automobile industry,” 11

seventh five-year plan (1986-1990) which announced that the ‘automotive industry was an important pillar industry, demanded it follow the principles of high starting point, mass production, and specialization to establish backbone enterprises as leaders.’<sup>44</sup>

In the next chapter I will analyze some of the key five-year plans in which the automotive industry is represented and discussed, however, I will mostly focus on the 1994 and 2004 auto industry specific plans along with *The Auto Industry Adjustments* made from 2009-2011 that was implemented after the 2007/2008 world economic crisis so we can better understand the current trends the Chinese automotive industry is taking and if they have been successful with past goals and objectives.

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<sup>44</sup> Wan-Wen Chu, “How the Chinese government promoted a global automobile industry,” 12

### **III. Five-year Planning and the Development of the Auto Industry**

The basic central planning device of the Chinese government is the Five-year planning system. This planning apparatus is inherited from the Soviet model that emerged under Stalin, who enacted the Soviet Union's first Five-year plan in 1928. This initial model received much debate within the Russian Communist Party as to the appropriate policy lines; one wanting joint development of agriculture and industry, and the other who urged that industry be accorded high priority with agriculture to fulfill the function of providing the means of capital accumulation without itself receiving any substantial initial investment. Stalin chose the latter course and instituted collectivization of farming to facilitate the collection of agricultural commodities from a recalcitrant peasantry.<sup>45</sup> The Chinese Communist Party, shortly after assuming power in 1949, developed and enacted their first Five-year plan in 1953 to overcome an economy that was badly battered by war and inflation.<sup>46</sup> In choosing their initial development strategy, the Chinese Communist Party had to take into account a pattern of land, labor, and capital resources that differed greatly from that confronting the Soviet Union at the time of their first Five-year plan.

The Chinese were clearly at a considerable disadvantage compared with the Soviet Union who had a better endowment of arable land, and its grain output per capita was twice that of China. The Russian transportation network was better developed. While the Soviet Union of 1928 was by no means an advanced nation economically, it was considerably ahead of the China of 1952. In its educational and technical training levels,

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<sup>45</sup> Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, 34

<sup>46</sup> *Ibid.* pg 33-34

particularly important for development, the Soviet Union was substantially more advanced.<sup>47</sup> The Chinese peasants were living close to the margin of subsistence, and little food was left over to feed the thousands of workers required by new industrial enterprises; Stalin was able to extract a continuous stream of saving from the farm sector to finance his industrialization program, while the Chinese eventually ran up against the limiting factor of inadequate food supplies.<sup>48</sup> The Chinese, however, were determined to outdo the Russians in speed of industrialization.

Almost half of the Chinese first Five-year plan went to industry, considerably more than the first Soviet Five-year plan allocated for this sector.<sup>49</sup> The Chinese were still at the mercy of the Soviets, even in 1953. Lacking in engineers and designers, as well as skilled labor, it would have been difficult for the Chinese to reject the advice of the Soviet technicians sent to help them construct and operate new plants as about half of all investment in heavy industry consisted of 156 Russian-designed projects.<sup>50</sup> The Chinese new found industry was only, again, a replica of the Soviet model that had come before. Among these designs would have been the commercial trucks, Liberation C10, and the Jeep-like all-terrain vehicles that kick started the automotive industry in China.<sup>51</sup>

In the previous chapter and the beginning of this chapter it was discussed that the Great Leap Forward, initiated by the First Five-year plan, led to the eventual Great Leap Famine which in turn led to the introduction of more cautious policy planning by the

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<sup>47</sup> Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, 35

<sup>48</sup> *Ibid.* pg 36

<sup>49</sup> *Ibid.* pg 39

<sup>50</sup> *Ibid.* pg 39

<sup>51</sup> Fu Baozong, "Comparison of Automotive Industry Policy between China & Korea," (a presentation given at the Academy of Macroeconomic Research, National Development & Reform Commission, P.R China), slide 6

Chinese Communist Party.<sup>vi</sup> The Chinese seemed to embrace the strategy of balanced growth, except that the planners, rather than the market, are to guide the economy into activities that maximize current output.<sup>52</sup> As mentioned in Chapter one, it was not until the 7<sup>th</sup> Five-year plan that the auto industry was specified as an important pillar to continue China's industrial and economic success. The top concerns for the industry in the 7<sup>th</sup> Five-year plan were industry fragmentation, technology acquisition, and foreign exchange.<sup>53</sup> At this early date, industry leaders had already become concerned that there were too many factories, stating the goal for the industry was to follow the lead of backbone enterprises and gradually form a number of enterprise groups.<sup>54</sup> The Chinese economic planners already had in mind a system in which the industry would operate, influenced by their initial industrial experience with the Soviet Union.

As the Soviets had provided technology, designs, and advice to the Chinese in the initial foreign exchange to get their industry up in running, the Chinese had high hopes that early joint ventures they engaged in with American Motor Corps, Volkswagen, and PSA Peugeot-Citroen would be as beneficial to establishing the foundation for a complete auto industry in China. Much to the disappointment of the Chinese, this was not the case. The joint ventures were counted upon to build cars and parts that could be exported (in addition to those built for the domestic market). Those exports would then generate foreign exchange needed to pay for imports of foreign made parts. Those imports would bring Chinese automakers the technology they needed to advance their industry. With

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<sup>52</sup> Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, 48

<sup>53</sup> G. E. Anderson, *Designated Drivers*, 60

<sup>54</sup> This was a continuation of the points established by the Communist Party in 1961, where they also called for consolidation of industries. *Ibid.* pg 60.

that technology in hand, the plan urges enterprises to absorb equipment, technology and processes from overseas ... [and] carry out improvements and innovation on imported car models.<sup>55</sup> Without first mastering the technology, it would be impossible for China to sell exports, so the system of foreign exchange, as hoped by the Chinese, never fully materialized. China's planners envisioned a fairly quick localization of parts production for cars assembled by joint ventures, but the foreign partners resisted using locally made parts until the parts could be made according to their standards of and safety and quality.<sup>5657</sup> This wishful thinking by the Chinese could have been in part because of their previous experience with the Soviet Union who willfully engaged in foreign exchange with China's industries. While this hopefulness is not particularly blatant in Chinese legislation, the connection does seem relevant since the Chinese were again looking to foreign technology to boost their economy.

The 7<sup>th</sup> Five-year plan envisioned that the auto industry would produce 600,000 vehicles by 1990. This target was reached two years early, in 1988, when China produced a total of 648,951 vehicles. However, production dropped below the 600,000 mark in 1989 and 1990 during the upheaval following the unrest in Beijing in the spring of 1989 (after which Chinese companies had difficulty getting raw materials from over seas) and subsequent backlash by conservative hard liners among the Chinese Communist Party

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<sup>55</sup> G. E. Anderson, *Designated Drivers*, 60

<sup>56</sup> *Ibid.* pg 61

<sup>57</sup> SAE International is an organization that helps to regulate the safety and quality of automobiles across the world. These were such standards that China had trouble reaching in their early joint ventures. <http://www.sae.org/>



leadership effected the country's economic plans.<sup>58</sup> The 8<sup>th</sup> Five-year plan (1991-1995) contained mostly variations on a common theme. Whereas the previous plan had called for innovation through improvement of foreign technology, this plan simply wanted it done faster. And in a clear indication that China had yet to shake off the yoke of central planning, the industry's quantitative target was once again based on supply instead of demand. The industry set a production target of 900,000 vehicles by 1995 (from 509,000 in 1990), a target that it very easily surpassed with 1,452,237 vehicles produced in 1995.<sup>59</sup> However, the Chinese Communist Party was not satisfied with the direction of the auto industry and developed specific policies to move the industry in the direction they wanted during the 8<sup>th</sup> Five-year plan.

The State Planning Commission, State Economy, Trade Commission, and the Ministry of Machinery Industry submitted the 1994 Automotive Industrial Policy in February 1994; the State Council approved it in March of that year and published it in July 1994. The policy had four key objectives: (1) to establish large-scale groups of saloon and light truck producers (to replace the small-scale, scattered manufacturers, again trying to consolidate the industry); (2) to improve the components industry; (3) to create automotive product development capabilities and (4) to encourage individual car ownership.<sup>60</sup> A report submitted by the Development Research Center of the State Council, *World Trade Organization, and China's Auto Industry*, summarized Chinese

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<sup>58</sup> G. E. Anderson, *Designated Drivers*, 64. Also see; Baum, *Burying Mao*, Chapter 13; Joseph Fewsmith, *China Since Tiananmen*, (Cambridge: Cambridge University Press, 2008) which addresses the political and social change since the government crack down in Tiananmen.

<sup>59</sup> G. E. Anderson, *Designated Drivers*, 64

<sup>60</sup> Matthias Holweg and Jianxi Luo and Nick Oliver, "The Past, Present and Future of China's automobile industry: a value chain perspective," *Int. J. Technological Learning, Innovation and Development*, Vol. 10, (2005), 6

autos' weak competitive position as 'outdated products, high prices, and lack of independent research and development ability,' and attributed this to too much protection by the import substitution policy (used in the previous Five-year plans), and insufficient private demand. At this stage, none of the existing Chinese automakers or local government had the ability to lead the changes. It was still up to the central government to drive the next round of industrial upgrading; entering the World Trade Organization and improving competitiveness.<sup>61</sup>

This push to enter the World Trade Organization (WTO) is captured in the 10<sup>th</sup> Five-year plan of China that includes specific directions for the auto industry.<sup>vii</sup> The 10<sup>th</sup> Five-year plan echoed those sentiments from the *World Trade Organization and China's Auto Industry* report that China's auto industry was not competitive with the foreign producers, and that a structural adjustment would be necessary.<sup>62</sup> So what niche of the auto industry did the Chinese believe they could become competitive in and how would they adjust the industry to make this happen?

China joined the WTO in 2002, one year after the start of the 10<sup>th</sup> Five-year plan, and from this followed a number of steps to open up the market, including tariff reductions and eliminating local content requirements.<sup>63</sup> These actions rapidly advanced the growth of China's automotive market. The government looks to the automotive industry to drive economic growth throughout the entire economy including a variety of

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<sup>61</sup> Wan-Wen Chu, "How the Chinese government promoted a global automobile industry," 18

<sup>62</sup> Matthias Holweg and Jianxi Luo and Nick Oliver, "The Past, Present and Future," 6

<sup>63</sup> The issues involved with local content requirements are discussed in Munson C. L. and Rosenblatt, M. J., "The Impact of Local Content Rules on Global Sourcing Decisions," *Production and Operations Management*, (1997), 6, 277–290.

basic and service-related sectors such as machinery, rubber, petrochemicals, electronics, textiles, auto financing, aftermarket distribution channels and automotive repair services.<sup>64</sup> As an aspiring economic power, China had noted that all other major economic powers had auto industries and decided that that this was an important status indicator.<sup>65</sup> After China's entrance into the WTO, the automotive industry began to grow faster than ever.

Refer to Figure 2 in the Appendix

Due to such rapid success of the Chinese auto industry after joining the WTO (depicted in the sharp jump after 2002), the 1994 Automobile Industrial Policy was revised in 2004.

The old 1994 'Automobile Industrial Policy took on new light in 2004 entitled, 'Automotive Industry Development Policy.'<sup>66</sup> It differed from the industrial policy of 1994 as it offered encouragement and strategic direction, rather than regulation. First, the lifting of high tariffs loosened government control over the industry, allowing market forces to influence its' future. Second the government encouraged and supported private auto consumption, which helped to expand the passenger car market. Third, the increase in foreign investment and the entrance of more private capital into the industry has meant that overall production capacity (and economies of scale) have been growing fast. With falls in vehicle prices, private ownership has grown and private buyers are now the majority market; the parts industry has grown along with automobile-related services

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<sup>64</sup> Matthias Holweg and Jianxi Luo and Nick Oliver, "The Past, Present and Future," 6

<sup>65</sup> G. E. Anderson, *Designated Drivers*, 73

<sup>66</sup> *Ibid.* pg 78

such as auto finance, repair, maintenance and insurance.<sup>67</sup> The effects of this change in policy (along with the new WTO membership) can again be seen in the dramatic increase in Figure 2.

Following this growth the Chinese put forth the 11<sup>th</sup> Five-year plan (2006-2010) with the observation that China's approach to auto manufacturing would need to become more strategic; changing their policy approach once again from a gradual evolution from a list of wants and production targets, to more detailed plans covering aspects of the industry that had not even rated a mention in years past.<sup>68</sup> The opening paragraphs of the auto industry's portion of the 11<sup>th</sup> Five-year plan contain words that had not previously appeared in industrial plans: independent development, sustainable development, and structural optimization. Translated, this meant that Chinese auto makers would continue to be urged to develop their own brands and vehicles, and that those vehicles needed to be more efficient, more environmentally friendly, and made from more recycled and recyclable materials. The overall message of the 11<sup>th</sup> Five-year plan was that auto firms would no longer be judged simply by the size or number of vehicles produced annually but also by whether they truly contributed to the eventual dominance by Chinese automakers of their domestic market and to the industry's independence from reliance on foreign technology and intellectual property.<sup>69</sup> The push to dominate and assume control of their domestic auto industry by the Chinese in the 11<sup>th</sup> Five-year plan, I believe, is an attempt to protect themselves from influences abroad and a continued push for their multi-polar world by focusing on energy security through the auto industry.

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<sup>67</sup> Matthias Holweg and Jianxi Luo and Nick Oliver, "The Past, Present and Future," 8

<sup>68</sup> G. E. Anderson, *Designated Drivers*, 81

<sup>69</sup> *Ibid.* pg 82

The next chapter will continue the evaluation of centrally planned policies, however, it will highlight that because of the dramatic increase in auto production and the domestic market, sparked by the WTO membership, China's energy security has been compromised due to an increasing gap between the production and consumption of oil. The Chinese have implemented and adjusted certain policies, beginning with the 11<sup>th</sup> Five-year plan, to use their auto industry as a platform to overcome vulnerability and, hopefully, shift the balance of the global auto industry in their favor.

#### **IV. Energy Security and Emergence of New-energy Vehicles**

In 1993, China became a net oil importer, and by 2010 more than 54% of the crude oil supply relied on imports.<sup>70</sup> This gap between production and consumption took a large increase after WTO ascension in 2002, as provided by the graph below.

Refer to Figure 3 in Appendix

The large increase in consumption was a result of the auto industry increasing at the same time; cars use gasoline: more cars = a higher need for gasoline. So to overcome this direct correlation, and potential future hazard to energy security, the Chinese government exemplified the need for new-energy vehicles<sup>viii</sup> in the 11<sup>th</sup> Five-year plan.

The first mentioning of electric or hybrid vehicles in policies affecting the auto industry actually occurred during the 10<sup>th</sup> Five-year plan; however, the most advanced auto markets had barely began to experiment with alternative ways to power personal transportation.<sup>71</sup> General Motors had developed the EV1 electric car during the 1990's, than unceremoniously killed the project in 1990.<sup>72</sup> The only production hybrid vehicles on the road at this time were Toyota's Prius and the Honda Insight, both still only items of curiosity outside of Japan at the time. In short, Japan's auto makers were only beginning to test the market for alternative vehicles, Detroit appeared to have lost interest, and the leaders of China's Communist Party thought it an important enough

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<sup>70</sup> Huiming Gong and Michael Q. Wang and Hewu Wang, "New Energy Vehicles in China: Policies, Demonstration, and Progress," *Springer Science and Business Media*, (March 2012), 1

<sup>71</sup> G. E. Anderson, *Designated Drivers*, 72

<sup>72</sup> *Ibid.* pg 72

trend to mention it in their economic plan.<sup>73</sup> The 10<sup>th</sup> Five-year plan only looked to support research institutions to develop the technological research and development of NEV's; it was not until the 11<sup>th</sup> Five-year plan that the production of NEV's became an important policy mandate.<sup>74</sup>

In 2006, the State Council adopted the China Science and Technology Medium and Long-term Development Plan, which moved NEVs from the laboratories or prototypes to the market and road in a large volume. It was the first time the NEV term was mentioned in the official policies and specified focusing on hybrid, alternative fuel, and fuel cell vehicles and later officially defined in the Management Rule on New Energy Vehicle Production. The Ministry of Science and Technology continued its support on the NEVs and initiated the Energy Savings and New Energy Vehicle Key Project under the 863 Program.<sup>75</sup> The year 2008, however, brought a new set of challenges for China's auto industry and in response, the "Automotive Readjustment and Revitalization Plan" was released in March of 2009 by the State Council.<sup>76</sup>

The "Automotive Readjustment and Revitalization Plan" was among 10-issued industry adjustment and renovation plans that aimed to boost different Chinese industries amid a global economic slowdown. The plan intended to make the Chinese auto motive industry more competitive; the plan called for the overall improvement in automotive technologies, including greater fuel efficiency, development of new energy sources, and

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<sup>73</sup> Iain Carson and Vijay V. Vaitheeswaran, "Zoom: The Global Race to Fuel the Car of the Future," (Penguin, 2008), 270-271

<sup>74</sup> G. E. Anderson, *Designated Drivers*, 82

<sup>75</sup> Huiming Gong and Michael Q. Wang and Hewu Wang, "New Energy Vehicles in China: Policies, Demonstration, and Progress," 4

<sup>76</sup> Rachel Tang, "China's Auto Sector Development & Policies: Issues and Implications," *Congressional Research Service*, (June 25, 2012) 18

new safety features. These measures appear to be inline with the government's ongoing efforts to curb growing energy dependence on imported oil; gasoline consumption by motor vehicles accounts for about one-third of China's total oil demand.<sup>77ix</sup> This plan can be seen as a step by the Chinese government to address the energy security issue and by focusing economic growth on NEV's, they can side step the effects of their growing oil dependence; or at least try to diminish their effects and vulnerability that showed during the economic crisis of 2007/2008. To do so the Energy Savings and New Energy Vehicle Pilot Program was required and initiated by the plan, setting the goal that, by 2011, NEV sales should account for 5% of the total sales of passenger vehicles. As a result of the auto industry stimulus plan, China exceeded the United States as the world's largest new vehicle market in 2009, an the Ministry of Finance and Ministry of Science and Technology launched the NEV demonstration and promotion program by issuing the Notice on Implementing Energy Savings and New Energy Vehicle Pilot Program.<sup>78</sup> This pilot program was also widely called the Thousands of Vehicles, Tens of Cities Program (TVTC Program).

The TVTC Program focuses on the demonstration of HEV's, BEV's, and FCV's in public service vehicle fleets, including buses, taxis, government vehicles, and special purpose vehicles. Beginning in January 2009, 13 Tier I cities were approved to carry out demonstration, following that seven additional, Tier II cities, were added in May 2010 and five more cities (Tier III) in August 2010 for a total of 25 cities.<sup>79</sup> Both the national

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<sup>77</sup> Rachel Tang, "China's Auto Sector Development & Policies," 18

<sup>78</sup> Huiming Gong and Michael Q. Wang and Hewu Wang, "New Energy Vehicles in China: Policies, Demonstration, and Progress," 6

<sup>79</sup> Ibid. pg 6



government and local governments provide financial support to NEV demonstration in the 25 cities. National subsidies mainly cover the extra cost to buy NEV's, while financial support of local governments partially covers the extra cost of the vehicle and focuses on infrastructure development (like charging stations) and vehicle maintenance. The amount of subsidies that each vehicle could receive depends on the vehicle's category, technology type, and vehicle efficiency performance.<sup>80</sup> These types of subsidies help to create many benefits to the buyer who normally would not consider an NEV.

The cities involved in this program created their own goals for NEVs, and by the end of 2012 these 25 cities could add up to 52,623 vehicles to the public sector. Some of these cities, Shenzhen, Beijing, and Shanghai have the most ambitious goals while some other cities have even tried to set goals higher than the government provided ones.<sup>81</sup> 343 models from 70 makers were approved to receive subsidies after launching the TVTC program. Among the 70 makers, the median number of models per maker is only three, although the top maker has 26 NEV models; moreover, 20 makers have only 1 model each. From the technology aspect, hybrid vehicles definitely were the mainstream technology before 2009. After that, impacted by the national policy direction shift to battery electric vehicles, BEV models became popular. Several FCV models were certified for demonstration, but the number is quite small. Overall, HEVs, BEVs, and

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<sup>80</sup> For example, hybrid electric cars could receive a subsidy of 50,000 RMB per car from the national government if the car could save at least 40% fuel relative to regular cars and its electric power ratio exceeds 30%. On the other hand, incentives for BEVs and FCVs are much simpler, and they could receive subsidies of 60,000 and 250,000 RMB per car respectively. The NEV buses have similar technical performance requirements, but receive large subsidies per bus. Hybrid electric buses, battery electric buses, and fuel cell buses could receive as much as 420,000, 500,000, and 600,000 RMB per bus. Ibid. pg 6

<sup>81</sup> Huiming Gong and Michael Q. Wang and Hewu Wang, "New Energy Vehicles in China: Policies, Demonstration, and Progress," 6

FCVs account for 41%, 55% and 4% of the total NEV models respectively. Buses, cars, and specialty vehicles account for 63%, 21%, and 16% respectively.<sup>82</sup>

In comparing NEV bus and car makers with conventional bus and car makers, data shows that most top 10 conventional bus and car makers have joined the NEV production, but only some of them play an active role in developing NEVs. Interestingly, new players or conventional makers that are not in a leading market position tend to be more active in NEV market. For example, in 2011, none of the top 3 NEV buses come from the conventional bus makers. Cherry and BYD (Chinese auto companies) rank first and third as NEV carmakers, but they only rank seventh and ninth among top 10 conventional carmakers. This trend implies that the non-dominating, conventional vehicle makers consider that NEVs offer a better opportunity to successfully compete against the dominating makers.<sup>83</sup>

NEV's offer, not only, the Chinese automakers an opportunity to leapfrog and successfully compete against the dominating automakers around the world, but it is also developing a wall against energy security threats. As the Chinese auto market continues to grow so will China's dependence on oil, unless, as the Chinese Communist Party hopes as seen by the establishment of the TVTC program, the push to develop NEVs on a national scale will help cut that dependence. The subsidies provided by the TVTC program allow cities and citizens to purchase NEVs for a price normally not possible, opening the door to an increase in the market as a whole. The Chinese government is now

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<sup>82</sup> Huiming Gong and Michael Q. Wang and Hewu Wang, "New Energy Vehicles in China: Policies, Demonstration, and Progress," 7

<sup>83</sup> Ibid. pg 10

half way through its 12<sup>th</sup> Five-year plan that has again used the auto industry as an important pillar for development, however, this time its focus is purely on the development of NEVs as the government does not believe that the whole auto industry be included.<sup>84</sup> The next chapter will examine the 12<sup>th</sup> Five-year plan and how it highlights the shift in policy by the Chinese government to promote alternative energy, NEVs, and its energy security.

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<sup>84</sup> Liang Dongmei, “China to Forgo Five-Year Plan for Auto Industry,” *Caixin newspaper*, April 7, 2011

## V. The 12<sup>th</sup> Five-year Plan And The Focus on New Energy

The 12<sup>th</sup> Five-year plan<sup>x</sup> that was adopted in March 2011 turns out to be a key period for China to transform its economic development model in order to find an appropriate way of lower carbon development, which will largely rely upon a clean and efficient development engine.<sup>85</sup> By 2015, the Chinese economy is expected to grow by 50% to \$7.5 trillion US. It is also expected that the working population in China will peak in 2015 to 2017. With a large working population expected in its' near future, and expected continual growth of its economy, China, through emphasis in the 12<sup>th</sup> Five-year plan, is shifting from a focus on the quantity of growth to the quality of development.<sup>86</sup> China realizes there is a need to restructure its economy to address the energy security threats from oil consumption mentioned earlier. China is trying to steer its economy toward higher value-added sectors so that its competitiveness will lie not only on its low labor cost but also in putting more focus on innovation, technology, and higher productivity; while at the same time, it's ability to develop its low-carbon policy and strategy in meeting the United Nations Framework Convention on Climate Change. The 12<sup>th</sup> Five-year plan includes many new industrial policies to support clean energy industries and related technologies.<sup>87</sup>

These industries include nuclear, solar, wind, and biomass energy technology industries, as well as hybrid and electric vehicles (NEVs), and energy saving and

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<sup>85</sup> Jun Li, Xin Wang, "Energy and climate policy in China's twelfth five-year plan: A paradigm shift," *Energy Policy*, Vol. 41, (February 2012), 519–528

<sup>86</sup> Kin Man Amazon Lee and Hong Chua, "China's 12<sup>th</sup> five-year plan: Challenges and opportunities for sustainable energy technologies," *International Journal of Low-Carbon Technologies*, (March 2013), 1

<sup>87</sup> *Ibid.* pg 2

environmental protection technology industries.<sup>88</sup> The 12<sup>th</sup> Five-year plan highlights its goal of energy intensity reduction of 16% through some of its planned targets for the NEV industry. China will support the development of key components of energy-efficient and new energy automobiles. With regard to manufacturers of electric motors and batteries, China hopes that three to five ‘backbone’ enterprises will emerge with their combined market share exceeding 60%. China will produce 5 million NEVs and become the number one producer of new energy vehicles in the world by 2020. The average fuel economy of passenger vehicles will be 4.5/100 kilometers by 2020, the same as European standards.<sup>89</sup> China wants to show that it can follow the same standards as the other global players, such as Europe, and by targeting a 30% reduction for fuel consumption and carbon emissions of new vehicles, they can begin to talk the same issues as other countries. The 12<sup>th</sup> Five-year plan continues China’s plans to reduce its dependence on fossil fuels by laying out policies for its alternative energy sector.

The Chinese want, by the end of 2015, to generate a total power generation capacity from non-fossil fuels of 474 GW, which is 33% of the total power generation capacity; while the non-fossil-fuel energy sources will replace over 500 million tons of coal<sup>90</sup>, this will exceed the total non-fossil fuel generated by the EU of about 450 GW in

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<sup>88</sup> Kin Man Amazon Lee and Hong Chua, “China’s 12<sup>th</sup> five-year plan: Challenges and Opportunities,” 2

<sup>89</sup> Ibid. pg 3

<sup>90</sup> Coal is used for both coal-powered electricity plants and is one of the biggest household sources of energy in China. This article highlights those pollution concerns from coal burning and other biomass; Junfeng (Jim) Zhang and Kirk R. Smith, Household Air Pollution from Coal and Biomass Fuels in China: Measurements, Health Impacts, and Interventions, *Environ Health Perspective*. 2007 June; 115(6): 848–855.

2015.<sup>91</sup> While China continues to try and overcome the European countries with its new policy goals, what alternative energy industries does it see fueling this change? As mentioned earlier, nuclear, solar, wind, and hydroelectric power are the main industries under the Chinese focus, but I believe this change in alternative energy and true reduction in carbon emissions will be derived from the development of the NEV policies of the 12<sup>th</sup> Five-year plan.

There have been some very ambitious targets formulated by the Chinese government as well as individual provinces and municipalities: overall, China has set out a goal of introducing 1 million new-energy cars by 2015 (cumulatively) and that number to reach 5 million by 2020. It furthermore aims to drive down battery costs and achieve a production capacity of 1 million new-energy vehicles by 2015, with pure-electric and plug-in hybrids each accounting for 50%.<sup>92</sup> In reaching these goals, China would become not only the largest market for NEVs, but also the largest producer of NEVs in the world. In the last chapter, the Thousands of Vehicles, Tens of Cities Program that was discussed helped increase NEV production through subsidy initiatives, but the overall ratio increase was relatively low;<sup>93</sup> meaning that China still has a long way to go before they achieve these targets, especially when other countries, such as the United States and leading countries of the EU, have also been pushing for NEV development.

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<sup>91</sup> Kin Man Amazon Lee and Hong Chua, “China’s 12<sup>th</sup> five-year plan: Challenges and Opportunities,” 3

<sup>92</sup> Ibid. pg 9

<sup>93</sup> Huiming Gong and Michael Q. Wang and Hewu Wang, “New Energy Vehicles in China: Policies, Demonstration, and Progress,” 20

In Europe, electric vehicle activity has been led by cities like London, Paris, and Berlin, largely at the local level. The mayor of London advocated the incentive schemes to reduce taxes and fees on electric vehicles to reduce congestion and clean the air. Paris, where Renault and Peugeot already have some 30,000 battery powered electric vehicles in use, worked with the local utility and the local government to develop a plan that includes more than \$2.5 billion US in investments in charging infrastructure. Berlin has been following a similar path, but the key driver has been utilities that see major dividends in electric vehicles for future revenues and in capacity investment reduction through the use of the vehicle's batteries for storage.

The U.S. Government has been promoting electric vehicle technology and has invested approximately \$2.4 billion US in electrification grants. This has included \$1.5 billion US in battery manufacturing, \$500 million US in electric vehicle components and \$400 million US in infrastructure projects. In many respects, the U.S. program is similar to the Chinese model where there is a top-down funding and coordination, albeit on a smaller scale. Infrastructure pilots are being deployed under the EV Project Program across several states including Tennessee, Arizona, California, Oregon and Washington. Cities like San Diego, Los Angeles, San Francisco, Chicago, New York, and Washington D.C. are all preparing for deploying charging infrastructure.<sup>94</sup>

The Chinese infrastructure varies as each different city has tried to adapt the policies in their own way; the Beijing Bus Pilot Program of (none other than) Beijing City relies heavily on automated battery swapping infrastructure. Shenzhen is actively seeking

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<sup>94</sup> World Bank Organization, *The China New Energy Vehicles Program, Challenges and Opportunities*, April 2011, 22

to position public charging lots close to apartment buildings where most residents live.<sup>95</sup> China not only has to be conscious of the lofty goals set by the central government and individual provinces but that their global competitors are also taking NEVs as a serious means to help reduce pollution and oil dependence. They also have to be aware that infrastructure issues are important hurdles to overcome when trying to establish NEVs as the dominant mode of transportation in your country.<sup>96</sup>

In many parts of the U.S., urban drivers have access to garages for overnight home charging their needs. In Chinese cities where high rises dominate, authorities will have to explore parking centers close to residential buildings where owners can charge vehicles overnight. Public charging will also be required for drivers who wish to travel beyond the reach of their battery charges. This need for charging stations and infrastructure was demonstrated in a study conducted by the Japanese Utility, Tokyo Electric Power Company in 2007 and 2008.

Tokyo Electric Power Company (TEPCO) initially installed chargers at the home of electric vehicle owners. Due in part to what is commonly referred to as “range anxiety,” the drivers returned home with batteries typically less than half depleted. Later in 2008, TEPCO installed a number of public charging stations. Curiously, although the public chargers were not used extensively, drivers began to return home with batteries

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<sup>95</sup> World Bank Organization, *The China New Energy Vehicles Program*, 22

<sup>96</sup> The concern has also been raised that China’s roads will not be able to cope with the growing volume of traffic. Some cities have already introduced car-purchasing restrictions; people in Shanghai have to enter an auction for car licenses because of massive demand. While this concern is very valid, I believe the Chinese will not give up on the auto market and as one analyst pointed out, “new products are going to stimulate people’s desire to buy, and the vast rural area is waiting to be explored.” Xie Yu, “Auto industry faces uphill Challenges: Experts,” *China Daily*, 2013-05-30



significantly more depleted than in 2007 – they knew the public chargers were available even if they did not need to use them.<sup>97</sup> Therefore, it is generally accepted that some amount of public charging infrastructure will be required, even if it is not clear how much precisely. These infrastructure costs will be borne by the Chinese government who, given the 12<sup>th</sup> Five-year plan, sees this industry as a key component to lowering pollution and protecting itself from energy security risks and understands that the cost of infrastructure is a small price to pay. The 12<sup>th</sup> Five-year plan is monumental in the establishment of policies to increase energy security in China by reducing consumption of fossil fuels and to acknowledge NEV's as a pillar industry which can address their efforts to restructure the economy, promote social equality, protect the environment, slow energy demands, and transition from a “Made in China” to “Designed in China” technology.<sup>98</sup>

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<sup>97</sup> World Bank Organization, *The China New Energy Vehicles Program, Challenges and Opportunities*, April 2011, 24

<sup>98</sup> APCO, “China’s 12<sup>th</sup> 5-Year Plan, How it actually works and what’s in store for the next five years,” *APCO Worldwide*, December 10, 2010, 8

## **VI. Conclusion**

The Chinese auto industry is a window into the planning process of the Chinese Communist Party; the Five-year planning process and other central policies discussed through out this paper demonstrate the Chinese governments adjustments and recognition to concerns both within their country and externally. The adjustments made by the Chinese are not just to make progress, but they are efforts to become the dominant player in the market so that technology can be “Designed in China” instead of “Made in China.” The recent victory at the LA Auto Show is an example of the Chinese efforts paying off.

At the 2013 Auto Show in LA, a Chinese team from SAIC Motors was declared the winners of the Los Angeles Auto Show Design Challenge for its Roewe Mobiliant design. Design houses from all around the world, such as Mazda, Subaru, Toyota, and JAC Motors submit futuristic and unusual vehicles based around a central theme. This year judges deliberate on the most effective answers to the theme, “Biomimicy and Mobility 2025 – Natures Answer to Human Challenges.” Vehicles designs took inspiration from nature, as well as addressing some of the modern world’s most pressing transportation issues – such as congestion, pollution, sustainability, and safety; all of which China is currently facing within its’ auto industry.

The Mobiliant design not only is a car design, but a whole new design of infrastructure that includes a new highway system that features non-stop intersections and connections straight to the floor of your office building. It was inspired by the relationship between ants and trumpet trees. The judges did agree that the Chinese design was the most optimistic, however, it demonstrates a new ability that Chinese companies

have always lacked in; design. Chinese car companies have relied heavily on foreign technology and designs in the past to develop their auto industry but new design ability demonstrated at the LA Auto Show could be the shift we have been waiting for.

The design by the SAIC Motor team addresses all of the issues China has faced or might eventually face with their auto industry.<sup>99</sup> Energy security issues are no more as the Mobilant car is zero emissions and part of an ‘urban ecological system’ that creates a continuous cycle of fuel. Foreign technology will be not be of concern as the new system provides everything the Chinese need for individual transportation. This new design is truly the answer to all of the Chinese problems, however, it must be pointed out that this was simply a concept design and the technology to put this idea into mass scale production does not exist yet. That should not damage the hopes of the Chinese auto industry, as the ability to design such a system is the true achievement.

In attending the 2013 LA Auto Show myself, I was able to get a first hand experience of the cars available in the United States the next year. And what was on display at almost every car company? New-energy vehicles. It was plain to see that NEVs are the near future of the global auto industry, as the sales pitch across the convention center was ‘you do not have to give up luxury and power when considering a NEV for purchase.’ While there were no Chinese brands present at the LA Auto Show this year, it will be interesting to see how much longer it takes them to enter into the American market given the Chinese push to develop NEVs on such a national scale and their goal to become the top producer and market for new-electric vehicles. Will China be able to

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<sup>99</sup> Congestion and failure of the current highway system is a looming possibility as mentioned in footnote 109

make this adjustment to NEVs on their own and be able to employ new technology and designs or will they continue in the shadow of their foreign partners and competition. Only time will tell but as long as China maintains their efforts, I believe that they will usher in their multi-polar world order.

## **BIBLIOGRAPHY**

- “A Fifty Year Chronology of China’s Automotive Industry,” *China Automotive Technology and Research Center*, (2003),  
<http://www.chinaauto.ac.cn/zhishi/ZG50DSJ.htm>
- APCO, “China’s 12<sup>th</sup> 5-Year Plan, How it actually works and what’s in store for the next five years,” *APCO Worldwide*, December 10, 2010, 8
- Eric Harwit, “China’s Automobile Industry: Policies, Problems, and Prospects,” *Studies on contemporary China*, (Armonk, NY: M.E. Sharpe, 1995), 17, 18, 52
- Fu Baozong, “Comparison of Automotive Industry Policy between China & Korea,” (a presentation given at the Academy of Macroeconomic Research, National Development & Reform Commission, P.R China), slide 6
- Garry Kasparov, “Does the free market corrode moral character?,” *John Templeton Foundation*, <http://www.templeton.org/market/PDF/Kasparov.pdf>
- G. E. Anderson, *Designated Drivers: How China Plans to Dominate the Global Auto Industry*, (John Wiley & Sons: Singapore, 2012), 53, 54,56-61, 64, 72, 73, 78, 81, 82
- Huiming Gong and Michael Q. Wang and Hewu Wang, “New Energy Vehicles in China: Policies, Demonstration, and Progress,” *Springer Science and Business Media*, (March 2012), 1, 4, 6, 7, 10, 20
- Iain Carson and Vijay V. Vaitheeswaran, “Zoom: The Global Race to Fuel the Car of the Future,” (Penguin, 2008), 270-271
- Ian Bremmer, “The end of the free market: who wins the war between states and corporations?,” *European View*, (9), (2010), 249-252
- Jamil Andertoni, “Bo Xilai: power, death and politics,” *Financial Times Magazine*, (July 20, 2012), <http://www.ft.com/cms/s/2/d67b90f0-d140-11e1-8957-00144feabdc0.html#axzz2jqV89HHI>
- Jayadeva Ranade, “China: Document No. 9 and the New Propaganda Regime,” *Institute of Peace and Conflict Studies*, (4175), (November 2013),  
<http://www.ipcs.org/article/china/ipcs-special-commentary-china-document-no-9-and-the-new-4175.html>
- John Sudworth, “Chinese court rejects Bo Xilai’s appeal and upholds life sentence,” *BBC News*, October 25, 2013, <http://www.bbc.co.uk/news/world-asia-china-24652525>

- Jonathan Amos, "Rocket launches Chinese space lab," *BBC News*, September 29, 2011, <http://www.bbc.co.uk/news/science-environment-15112760>
- Joseph Fewsmith, *China Since Tiananmen*, (Cambridge: Cambridge University Press, 2008)
- Jun Li, Xin Wang, "Energy and climate policy in China's twelfth five-year plan: A paradigm shift," *Energy Policy*, Vol. 41, (February 2012), 519–528
- Justin Yifu Lin and Dennis Tao Yang: "On the Causes of China's Agricultural Crisis and the Great Leap Famine," *China Economic Review*, Volume 9, (2), (1998), 125-140
- Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology During The Tenth 5-year plan and the U.S. Response," March 2008, ISBN 1-58487-347-7, vii
- Kin Man Amazon Lee and Hong Chua, "China's 12<sup>th</sup> five-year plan: Challenges and opportunities for sustainable energy technologies," *International Journal of Low-Carbon Technologies*, (March 2013), 1, 2, 3, 9
- Liang Dongmei, "China to Forgo Five-Year Plan for Auto Industry," *Caixin newspaper*, April 7, 2011
- Matthias Holweg and Jianxi Luo and Nick Oliver, "The Past, Present and Future of China's automobile industry: a value chain perspective," *Int. J. Technological Learning, Innovation and Development*, Vol. 10, (2005), 6, 8
- Minxin Pei, *China's Trapped Transition: The limits of a developmental autocracy*, Cambridge, Mass.: Harvard University Press, 2008, 8, 206
- Morris L. Bian, *The Making of the State Enterprise System in Modern China*, (Cambridge, Mass.: Harvard University Press, 2005), 2, 3
- Munson C. L. and Rosenblatt, M. J., "The Impact of Local Content Rules on Global Sourcing Decisions," *Production and Operations Management*, (1997), 6, 277–290
- Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, (Chicago: Aldine Publishing Company, 1969), 8, 33-35, 36, 48, 85
- Orville Schell, "China: Humiliation & the Olympics," *The New York Review of Books*, August 14, 2008 issue

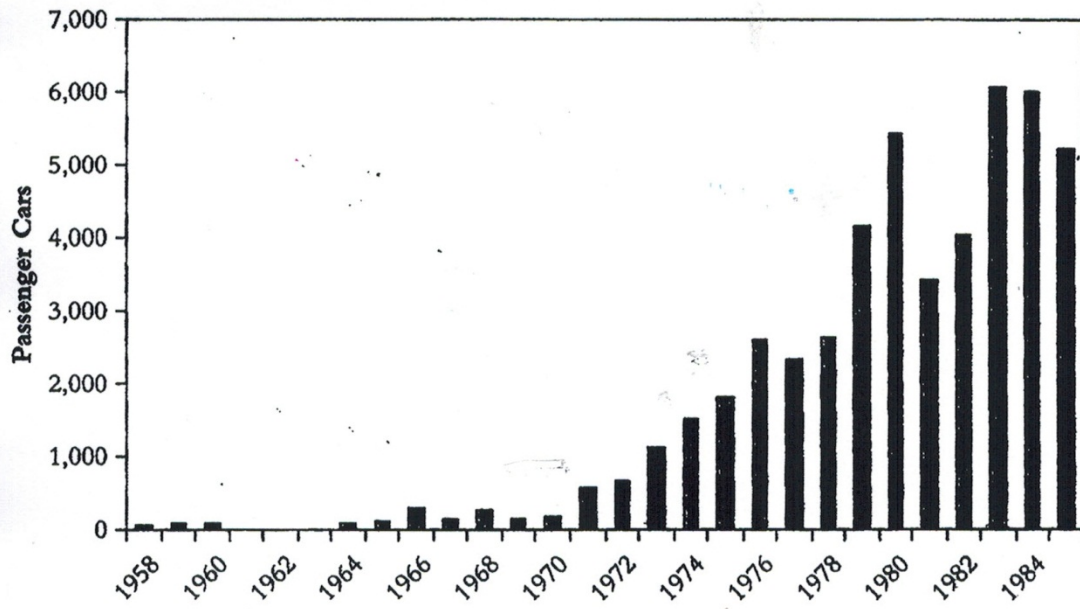
- Paul Dickson, *Sputnik: The shock of the Century*, (Bloomsbury Publishing USA, 2009)
- Rachel Tang, "China's Auto Sector Development & Policies: Issues and Implications," *Congressional Research Service*, (June 25, 2012), 18
- Richard Baum, *Burying Mao: Chinese Politics in the Age of Deng Xiaoping* (Princeton, NJ: Princeton University Press, 1994), 27-47
- Rosemary Foot, *The Practice of Power: US Relations with China since 1949*, (New York: Oxford, 1997), 195
- Seung-Wook Baek, "Does China Follow 'the East Asian Development Model'?", *Journal of Contemporary Asia*, Vol. 35, No. 4 (2005)
- Steven Klepper, "The Evolution of the U.S. Automobile Industry and Detroit as its Capital," (Carnegie Mellon University, Pittsburgh: November 2001)
- Sun Lin, "China's Development and Policies of New Energy Auto Industry," *Institute for Technology, Enterprise and Competitiveness, Working Paper Series*, (March 2010)
- Susan Rose-Ackerman, "The Political Economy of Corruption," *Institute for International Economics*,  
[http://www.iie.com/publications/chapters\\_preview/12/2iie2334.pdf](http://www.iie.com/publications/chapters_preview/12/2iie2334.pdf)
- Wan-Wen Chu, "How the Chinese government promoted a global automobile industry," *Industrial and Corporate Change*, (Oxford University Press), (2011), 5, 6, 11, 12, 18
- Wang Hui, "The Rumor Machine," *London Review of Books*, Vol. 34, No. 9, (May 2012),  
<http://www.lrb.co.uk/v34/n09/-wanghui/the-rumour-machine>
- Warren I. Cohen, *America's Response to China*, (New York: Columbia University Press, 2010), 5<sup>th</sup> ed., 263-264
- Wayne M. Morrison, "China's Economic Rise: History, Trends, Challenges, and Implications for the United States," *Congressional Research Service*, September 5, 2013, 2,3
- World Bank Organization, *The China New Energy Vehicles Program, Challenges and Opportunities*, April 2011, 22, 24
- Xie Yu, "Auto industry faces uphill Challenges: Experts," *China Daily*, 2013-05-30

Zheng Wang, "National Humiliation, History Education, and the Politics of Historical Memory: Patriotic Education Campaign in China," *International Studies Quarterly*, (52), (2008)



Appendix

Figure 1:



Passenger Car Production in China, 1958 to 1985

Figure 2:

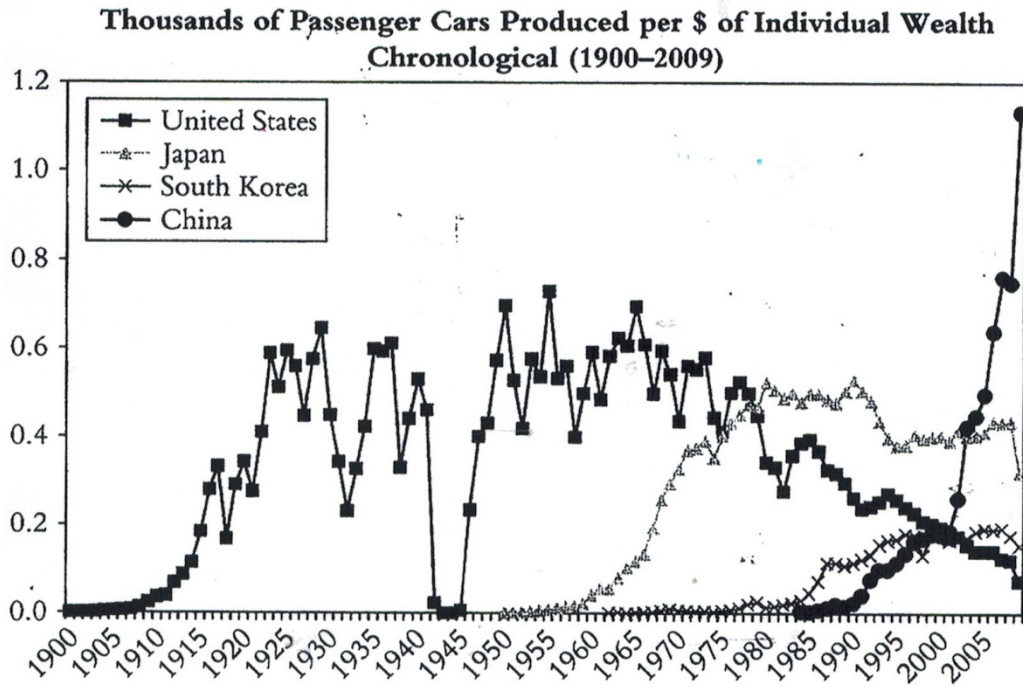
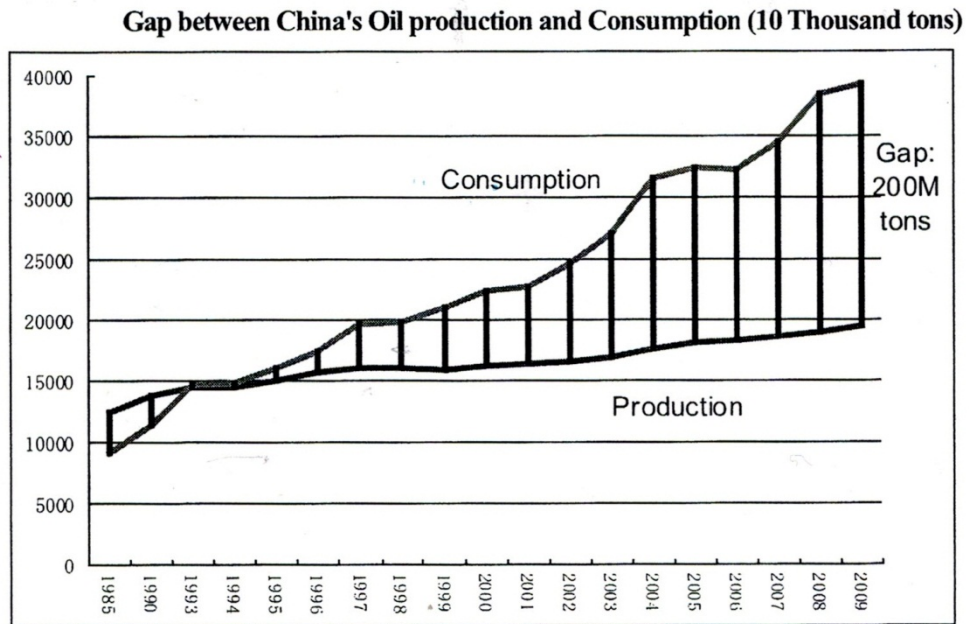


Figure 3:



## **Beginning of End Notes**

It, I believe, is important to address a said limiting factor that many scholars believe China faces as it moves forward with its central planning which is the corruption within Communist ruling party. Minxin Pei, for example, argues this point in his book, *China's Trapped Transition, the limits of Developmental Autocracy*, and captures, I believe, very nicely this issue in his quote of the former general secretary of the CCP, Zhao Ziyang,

“The problem is, the CCP is a party built on the basis of Leninism. It controls all the resources of the country... under a market economy, after property becomes legitimate and legal, the CCP inevitable becomes corrupt. Those with power still certainly use their control of the resources to turn society's wealth into their private wealth. These people have become a huge entrenched interest group... What China has now is the worst form of capitalism. Western capitalism in its early phase was also bad, but it could gradually become more progressive. But the worst form of capitalism in China today is incapable of becoming more progressive.”<sup>100</sup>

The corruption in China is hard to ignore, especially after the public denouncement of Bo Xi li and his corrupt ties.<sup>101</sup> I do believe that dealing with corruption has become an integral part of the Chinese governments planning and can be seen as a less important part of how Chinese business is conducted, although none-the-less still present as it is in any market place, free or controlled.<sup>102</sup> I also believe that democratization, again argued

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<sup>100</sup> Minxin Pei, *China's Trapped Transition: The limits of a developmental autocracy*, Cambridge, Mass.: Harvard University Press, 2008, 8

<sup>101</sup> Bo Xilai was a demonstration of the Chinese government that corruption will not be tolerated and is recognized as a huge political scandal; Wang Hui, “The Rumor Machine,” *London Review of Books*, Vol. 34, No. 9, (May 2012); Jamil Anderton, “Bo Xilai: power, death and politics,” *Financial Times Magazine*, (July 20, 2012). A Chinese court rejects Bo Xilai's appeal and upholds life sentence, further demonstrating the Chinese attempt to thwart corruption; John Sudworth, “Chinese court rejects Bo Xilai's appeal and upholds life sentence,” *BBC News*, October 25, 2013

<sup>102</sup> Garry Kasparov makes the case that “the free market is a crucible of competition that can bring out the basest in human nature. Competition is fierce, and when survival is at stake, there is no room for morality. But for all its flaws, the free market is still superior to all the other economic arrangements that have been tried.” Garry Kasparov, “Does the free market corrode moral character?,” *John Templeton Foundation*

Susan Rose-Ackerman points out “Corruption occurs at the interface of the public and private sectors. In large, diverse countries, such as the United States [a free market] and China [state capitalist system], there is no way to measure the level of corruption. Reliable data on the magnitude of corruption across countries does not exist and probably cannot exist in principle.” So we must assume that each state is aware of internal corruption and does its best to limit its

by Minxin Pei, will not be necessary for China to continue to grow and prosper and the self-destructive dynamics he talks about can be overcome by the governments push to further develop its auto industry.<sup>103</sup>

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<sup>i</sup> Zheng Wang, “National Humiliation, History Education, and the Politics of Historical Memory: Patriotic Education Campaign in China,” *International Studies Quarterly*, (52), (2008); This studies provides a summary how the CCP used the “Century of Humiliation” to reinforce the regime’s educational socialization of the Chinese citizenry. Particularly the “Patriotic Education Campaign” that started around 1991, the same time as Deng Xiaoping pushed for economic reforms, and attempts to answer the question if manipulation of China’s “historical memory” and economic development was the answer to the CCP regaining legitimacy.

<sup>ii</sup> William L Megginson, *The Financial Economics of Privatization* (New York: Oxford University Press, 2005); Armen Albert Alchian, *Economic Forces at Work* (Indianapolis: Liberty Press, 1977); Avinash Dixit, “Power of Incentives in Private versus Public Organizations,” *The American Economic Review* 87, no. 2 (May 1997): 378-382; John Vickers and George Yarrow, “Economic Perspectives on Privatization,” *The Journal of Economic Perspectives* 5, no. 2 (Spring 1991): 111-132; Eytan Sheshinski and Luis F. Lopez-Calva, “Privatization and Its Benefits: Theory and Evidence,” *CESifo Economic Studies* 49, no. 3 (January 1, 2003): 429-459; Maxim Boycko, Andrei Shleifer, and Robert W. Vishny, “A Theory of Privatisation,” *The Economic Journal* 106, no. 435 (March 1996): 309-319; Andrei Shleifer, “State versus Private Ownership,” *The Journal of Economic Perspectives* 12, no. 4 (Autumn 1998): 133-150; Janos Kornai, *The Socialist System: The Political Economy of Communism* (Princeton, NJ: Princeton University Press, 1992).

<sup>iii</sup> This connection to the soviet model has been argued for by many different intellects: A. Doak Barnett, *Communist Economic Strategy: The Rise of Mainland China* (Washington, D.C.: National Planning Association, 1959, 7.); K. C. Yeh, “Soviet and Communist Chinese Industrialization Strategies,” in *Soviet and Chinese Communism: Similarities and Differences*, ed. Donald W. Treadgold (Seattle: University of Washington Press, 1967, 327-363.); Chu-yuan Cheng, *The Economy of Communist China* (Ann Arbor: University of Michigan Center for Chinese Studies, 1971), 2.; Dwight H. Perkins, “China’s Economic Policy and Performance,” in *Cambridge History of China*, ed. R. MacFarquhar and John Fairbank (Cambridge, UK: Cambridge University Press, 1991), vol. 15, 475.; Robert F. Dernberger, “The People’s Republic of China at 50: The Economy,” *China Quarterly* 159 (September 1999): 607-615.; Louis Putterman and Xiao-yuan Dong, “China’s State-Owned Enterprises: Their Role, Job Creation, and Efficiency in Long Term Perspective,” *Modern China* 26, no. 4 (October 2000): 403-447.

<sup>iv</sup> Overall, FDI flows are expected to have significant long-term growth and development effects on host economies through spillover effects from transfer of know-how and technology translating into higher productivity and efficiency. Aitken, B. and Harrison,

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effects on their own individual market system. Susan Rose-Ackerman, “The Political Economy of Corruption,” *Institute for International Economics*

<sup>103</sup> Minxin Pei, *China’s Trapped Transition*, pg 206

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A. (1999), “Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela,” *American Economic Review*, 89(3) 605-618.; Haddad, M. and Harrison, A. (1993), “Are There Positive Spillovers from Direct Foreign Investment? Evidence from Panel Data for Morocco,” *Journal of Development Economics*, 42(1), 51-74.; Hall, R. and Jones, C. (1999), “Why Do Some Countries Produce So Much More Output Per Worker than Others?” *The Quarterly Journal of Economics*, 114(1), 83-116.; Haskel, J., Pereira, S., and Slaughter, M. (2007), “Does Inward Foreign Direct Investment Boost the Productivity of Domestic Firms?” *Review of Economics and Statistics*, 89(3), 482-496.

<sup>v</sup> China has been contrasted to the East Asian Development Model which highlights state control over finance, direct support for State-owned Enterprises by the government, import substitution industrialization in heavy industry, a high dependence on export markets and high rate of domestic savings. See Seung-Wook Baek, “Does China Follow ‘the East Asian Development Model’?,” *Journal of Contemporary Asia*, Vol. 35, No. 4 (2005)

<sup>vi</sup> This shift in policy is captured by a declaration of the Communist party in 1961, highlighted by point four: “As to the heavy industries, the scope of capital construction should be appropriately reduced; the speed of development readjusted; and, based on previously achieved advances, a guideline of consolidation, reinforcement, and improvement is to be adopted. Strenuous efforts must be made to improve the quality of products, to increase their variety, to strengthen the weak links in the production system, to continue the development of technical transformation among the people, to economize on raw material, to lower the cost of production, and to raise labor productivity.” Nai-Ruenn Chen and Walter Galenson, *The Chinese Economy Under Communism*, 48

<sup>vii</sup> The 9<sup>th</sup> Five-year plan contains little in the way of detail, only a few statistical targets, so I will refrain from talking about it.

<sup>viii</sup> In the Chinese context, New Energy Vehicles (NEVs) include hybrid electric vehicles (HEV), especially plug-in hybrid electric vehicles; battery electric vehicles (BEV); and fuel cell vehicles (FCV). However, the definition sometimes covers broader vehicle technologies, such as alternative fuel vehicles. I will be using NEVs to describe the broader range of electric vehicles. *Ibid.* pg 1

<sup>ix</sup> There is much research into the development of air pollution in China and its effects; here are a few reports on its effects. Junfeng Zhang, PhD, Denise L Mauzerall, PhD, Tong Zhu, PhD, Song Liang, PhD, Majid Ezzati, PhD, Justin V Remais, PhD, Environmental health in China: progress towards clean air and safe water, *The Lancet*, Volume 375, Issue 9720, 27 March–2 April 2010, 1110–1119; Kira Matus, Kyung-Min Nam, Noelle E. Selin, Lok N. Lamsal, John M. Reilly, Sergey Paltsev, Health damages from air pollution in China, *Global Environmental Change*, Volume 22, Issue 1, February 2012, 55–66; Shi An, Xiaowei Hu, Jian Wang, Urban taxis and air pollution: a case study in Harbin, China, *Journal of Transport Geography*, Volume 19, Issue 4, July 2011, 960–967; Daisheng Zhang, Kristin Aunan, Hans Martin Seip, Steinar Larssen, Jianhui Liu, Dingsheng Zhang, The assessment of health damage caused by air pollution and its implication for policy making in Taiyuan, Shanxi, China, *Energy Policy*, Volume 38, Issue 1, January 2010, 491–502

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<sup>x</sup> I wanted to highlight again that China's Five-year plans are blueprints: they provide overall objectives and goals related to social and economic growth and industrial planning in key sectors and regions. Although most consider the Five-year plan to be a single document, the Five-year plan represents a complex web of Chinese policy-making, containing previously-implemented regional and long-term development plans and hundreds of targeted policy initiatives, all of which undergo constant review and revision over the course of the five-year cycle. I have tried to show, up to now, the different policies and programs that were implemented along the auto industry timeline in hopes that you could see the adjustments the Chinese government made as new issues arose within the industry and from external threats.