

## Growth of a Giant: A Historical and Current Perspective on the Chinese Automobile Industry

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### 1. Introduction and Context of Chinese Motorisation

Development patterns at national and international levels not only depend on relations between society and economy within and across regions, but also on the ecosystem capacity of other regions (Folke et al., 1998). As a result, the majority of developed cities around the world have gained useful social, economic and especially, environmental returns from their recent mitigation of vehicle overuse (Puentes and Tomer, 2009; Newman and Kenworthy, 2011). However, cities in most emerging economies are undergoing rapid motorization such that it is imperative to explore the current status and negative impacts of this growing motorization in these countries. China is particularly important in this regard since it is now widely acknowledged as the world's largest car market and is the focus of most major car manufacturers, selling products from basic cars up to luxury models. In 2010 China overtook Japan as the second largest economy behind the United States. Cities in developed countries have stepped into an era of declining car use, which some are terming "peak car use" (Newman and Kenworthy, 2011). The Chinese cities, on the contrary, are in a stage of flourishing development with a prosperous automobile industry supporting it. Undoubtedly, social and economic benefits from increasing motorization cannot be ignored. Nonetheless, this comes at the cost of scarce natural resources, serious environmental impacts and large cultural changes expressed partly in the way that urban public spaces are being turned over to roads and parking and the old walking fabrics previously reliant on pedestrian and bike traffic are often transformed into congested, noisy and polluted places (Mao and Chen, 2009).

Based on Petty-Clark's Law and Kuznets Theory<sup>1</sup>, China has experienced an upgrade of its industrial structure along with

<sup>1</sup> They refer to the transformation of industrial structure from labor-intensive to capital-intensive and finally to technology-intensive with the process of economic development.

an advanced economy. The automotive industry partly pushed forward the process. The mounting desire for motor vehicles is deemed as a vital driving force for boosting domestic demand and energizing economic growth. The contribution of the auto sector to GDP in China is reported to have risen from 0.97% (1999) to 2.29% (2009). Furthermore, global automobile focus has shifted eastwards to China. The International Organization of Motor Vehicle Manufacturers (or Organisation Internationale des Constructeurs d'Automobiles/OICA) reported that U.S. auto sales experienced a precipitous tumble to 13.49 million vehicles or an 18% decline in 2008, the worst performance since 1992, strongly affected by the 2008 Global Financial Crisis (GFC). Chinese auto sales rocketed in 2009 by 46% and China overtook the U.S. as the major car consumer worldwide (notwithstanding this was at a time when global auto sales were at a depressed level).

Nevertheless, current levels of private motorized transport worldwide are unsustainable. The International Energy Agency (IEA) in 2010 recognised that the production of conventional crude oil had peaked in 2006 and that from here on only expensive and vulnerable oil sources remained (World Energy Outlook 2010). About 14% of all oil is consumed by road transportation (World Development Indicators 2012). The 2011 CO<sub>2</sub> emissions by transport around the world accounted for 22% of the total. Road transportation, as the fastest-growing sector, contributed 52% of that in 1990, but some 75% in 2011 (CO<sub>2</sub> Emissions From Fuel Combustion Highlights 2013). The other pertinent costs from road transportation include noise pollution, infrastructure costs, congestion costs, and costs from community severance and destruction of the public realm of cities (Newman and Kenworthy, 1999). Transport in general, and urban transport in particular, is broadly recognized as the major contributor to energy vulnerability, climate change and these issues grow daily in significance on the world stage.

China, whose proportion of global energy consumption has risen to 18.5% in 2009 (Global Energy Statistical Yearbook 2013), has overhauled the U.S.A as the largest energy consumer (Kennedy, 2011). The dramatic growth of motor vehicles is one of the most rapidly rising drivers of Chi-

na's increasing oil demand, accounting for roughly 32% in the national context in 2002 (He et al., 2005). In regard to globally serious environmental deterioration, China achieved a worrying status in 2006. Its fossil fuel CO<sub>2</sub> emissions were 24% worse than the United States level and China became the world's largest emitter of CO<sub>2</sub> (Yan and Crookes, 2009), stoking the increasingly severe global warming problem (Photo 1). The road transport-related CO<sub>2</sub> emissions in China were 280.47 Mt, accounting for 57.5% of the transport-related CO<sub>2</sub> emissions and 4.6% of the total CO<sub>2</sub> emissions in China (Reducing Transport Greenhouse Gas Emissions Trends and Data 2010).



**Photo 1:** China's rapid increase in private motorised transport is fuelling increased CO<sub>2</sub> emissions

*Source: Yuan Gao*

This paper begins with an overview of the Chinese auto-industry from its trial establishment, tortuous development, tremendous prosperity to sound planning. It then retrospectively discusses the driving factors that resulted in the prosperous development and unparalleled influence of the Chinese automobile industry. It examines economic growth, rising disposable income, high savings rates, population explosion, urban sprawl, shifting land use practices and traditional culture, with a focus on the formulated and applied industry policies from the Chinese government. With industrial policies shifting towards managing transportation demand and improving urban public transport (UPT), it also discusses several on-going incentives including New Energy Vehicles (NEVs) and rail transport. In light of the expanding clout of this industrial giant worldwide, appropriate development of the Chinese

automobile industry will be an important focus for sustainable development that can stimulate economic growth as well as social and environmental well-being both nationally and internationally.

## **2. History of the Automobile Industry in China**

The "Preparatory Group of the Auto-Industry" under the Ministry of Heavy Industry was set up in 1950 shortly after the People's Republic of China (PRC) was established in 1949 (Liu, 2000). The Chinese automobile industry, which was originally designated to meet military and transportation need, was more oriented to freight vehicles. The Automotive Industrial Policy (AIP) enacted in 1994 and the Tenth Five-Year Plan (FYP) (2001-2005) successively encouraged individuals and families to purchase passenger vehicles. Passenger vehicles, which reflect higher technologies and more profitability, have therefore gradually been developed. Faced with integration into the global automobile community through entry into the World Trade Organization (WTO) in 2001, the Chinese auto industry strategically shifted its development focus from expanding its production scale to enhancing its industrial structure. After these early developments, which helped pave the way for the Chinese automobile industry, the next step was the "Plan on Automobile Industry Restructuring and Revitalization" (2009). This report stated that the auto-industry would play a crucial role in Chinese economic growth and social development.

The automobile industry in China, which has now marched into its 5th decade, went from a situation where not a single vehicle had been produced before 1956, to one where in the space of just over 50 years, it has grown to be the largest auto producer and consumer on a global scale since 2009 (Ferrazzi and Goldstein, 2011). What makes the achievement even more extraordinary is that for much of this 50-year period China was a centrally planned, communist economy, not functioning with the capitalist principles that gave birth to the world's other major auto manufacturing countries, such as Japan, the USA and Germany. It is therefore important to understand some of the detailed history behind this astonishing achievement. The following sections divide the development

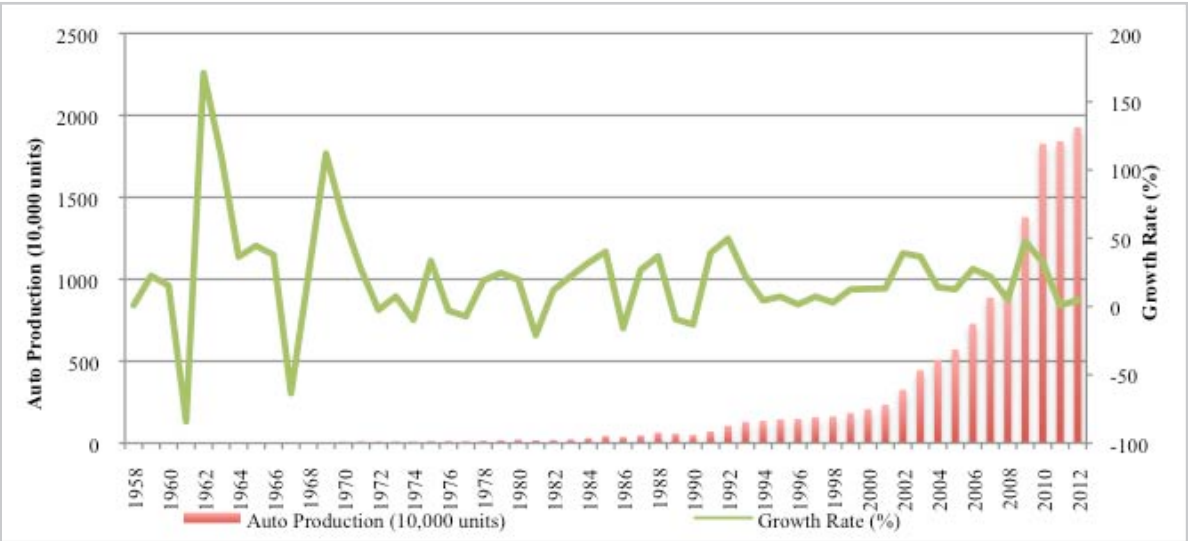
of the Chinese auto industry into four distinct phases:

- Start-up Phase from 1956 to 1978;
- Growing Phase from 1979 to 2000;
- Prosperity Phase from 2001 to 2010; and
- Stationary Phase from 2011 until the present day.

2.1 Start-up Phase (1956-1978)

In an attempt to transform China from an agricultural country to an industrial power, (the so called "New China"), the "Common Program of the Chinese People's Political Consultative Conference" (1949) stipulated that nationally concentrated efforts

From then on, at least until China's 1978 "Reform and Opening-up Policy," the country groped forward with a dramatically fluctuating growth trend in its vehicle production rate (see Figure 1). Even after 1978, growth rates were very variable, but not of the same order as the "roller coaster" levels that characterised the period between 1958 and 1978. The 1955, 1956 and 1957 data are also available but are even more intensely volatile as would be expected with the small numbers being compared. For example, the auto production of 1955 (61 Units) is 2611 times less than the 1956 level (1,654 units). Hence, these three earliest years are omitted from the time-series dataset.



**Figure 1:** 1958-2012 Auto Production (10,000 Units) and Growth Rate (%) in China  
*Source: Compiled based on China Automotive Industry Yearbook and National Data (National Bureau of Statistics of China)*

should focus preferentially on revitalization and development of heavy industry. The automobile industry was accordingly included in China's first Five-Year Plan (1953-1957) under Mao Tse-tung and throughout all China's national planning since then, right up until the latest Five-Year Plan (2011-2015), China's twelfth such plan since the communist revolution. The First Automobile Works (FAW), which was established in 1953, within the framework of a technology collaboration program between China and the former Soviet Union, was geared towards heavy vehicles production for defence demand (Gan, 2003). The Chinese auto-industry formally broke ground in 1956 when the first group of heavy-duty trucks rolled off the production line (Zhou and Nie, 2007).

In the time of the Cold War when China was antagonistic towards the U.S., the full acceptance of Soviet-style technology undoubtedly sped up the process of industrialization. But it also caused the Chinese auto-industry to become isolated from real economic conditions, and it built up institutional obstacles to self-developed products (Holweg, et al., 2009). Thus, the kind of administrative management and economic frameworks in which Chinese vehicle production operated thwarted innovation. Vehicle production in China was run by the government rather than through the market economy and it mainly served to develop the mechanized means of freight transport to satisfy economic construction. The central government held a monopoly on automobile supply in China. Vehicles



manufactured from the FAW accumulated up to 150,000 units until 1965, representing 88.2 per cent of the national total (Hu, 2002). Auto-enterprises were deficient in intrinsic motivation under the mandatory plan in strict compliance with China's Planned Economy and therefore lacked the necessary innovation processes for a progressive, modernising auto industry.

In spite of this general situation, some national strategies emerged that, although being recognized as going against the 'law' of Chinese development, nevertheless somewhat helped to facilitate the Chinese automotive industry. Mao's Great Leap Forward (1958-1960) is an example. It aimed to emulate and surpass the United Kingdom in the field of major industrial products output within 15 years. Consequently, more than one hundred minor local automotive factories were quickly formed and the entire vehicle production in 1958 almost doubled the 1957 level (China Automotive Industry Yearbook 2002). The resulting proliferation promoted four more automobile production sites built in the cities of Nanjing, Shanghai, Beijing and Jinan. Similarly, the Cultural Revolution (1966-1976) caused nationwide upheaval but improved the localization of the automotive industry with the decentralization of central government power. The Second Auto Works (SAW), established in 1969, has been recognised as becoming basically technologically independent in auto-manufacturing (Sit and Liu, 2000). Its location and products also reflected Chinese conditions. Since the Sino-Soviet split in 1960, China felt threatened by both the U.S. and the former Soviet Union. The SAW was therefore placed in a mountainous region and mainly supplied military crossover vehicles and trucks designed to help prepare China against a possible foreign attack (Harwit, 1995).

The Chinese auto-industry, which started out with imported international technology and national financial support, featured weak autonomy and rigid administration practices under a centrally planned economy. Under no circumstances can private auto-enterprises enter into the automobile market, or existing ones retreat from the auto market, when a national government erects such strong industrial barriers. Such practices generate inefficiencies and uncompetitive production systems. The

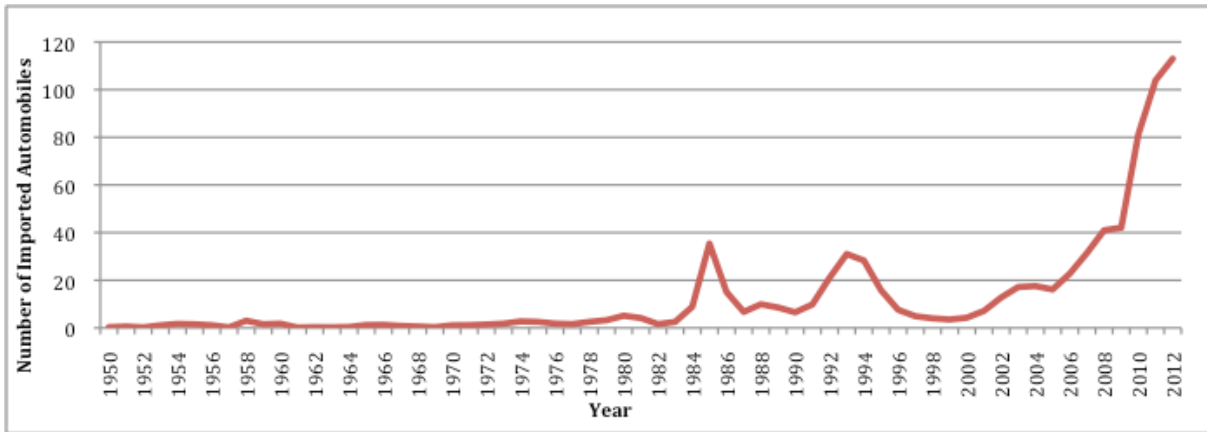
cumulative output of automobiles in China in the 22 years from 1955 until 1977 was 1,252,527, about equivalent to the monthly production in 2009 (China Automotive Industry Yearbook 2010).

## 2.2 Growing Phase (1979-2000)

The 1978 institutional reform from a state-controlled economy to a market-oriented one had a remarkable influence on everyday aspects of social, economic and cultural life (Qian, 2000). As far as the automobile sector was concerned, the commercialisation of motor vehicles was not initiated until 1983 when the government relinquished a 10 per cent share of self-marketing to auto-manufacturers themselves (Zhang, 2004). As explained earlier, the automotive industry in China in its formative years was regarded as a producer of freight vehicles and this generated a shortage of light vehicles. With respect to the passenger car that was first produced by the FAW in 1958, it remained in a state of slow development until 1978. In that year its production reached a low of 2,640 units, accounting for just 1.7 per cent of China's entire automotive products. It was at this time actually the "Chinese Truck Industry" rather than the "Chinese Automobile Industry".

A large transformation occurred in China in 1984 when the purchase of private vehicles was explicitly acknowledged as legal at the national policy level (Provisions on Individual or Corporate Farmers Purchase Motor Vehicles, Vessels and Tractors for Transportation Business). The Chinese government then adopted an even more positive stance towards ownership of private vehicles in the AIP (1994) and entrenched the concept of "Encouraging Passenger Cars into Family" into the Tenth Five-Year Plan in 2001. The demand for automobiles in China, which had been dominated by government cars, subsequently transformed to private ownership of vehicles, which was even forbidden before 1979 (Liu, 2008).

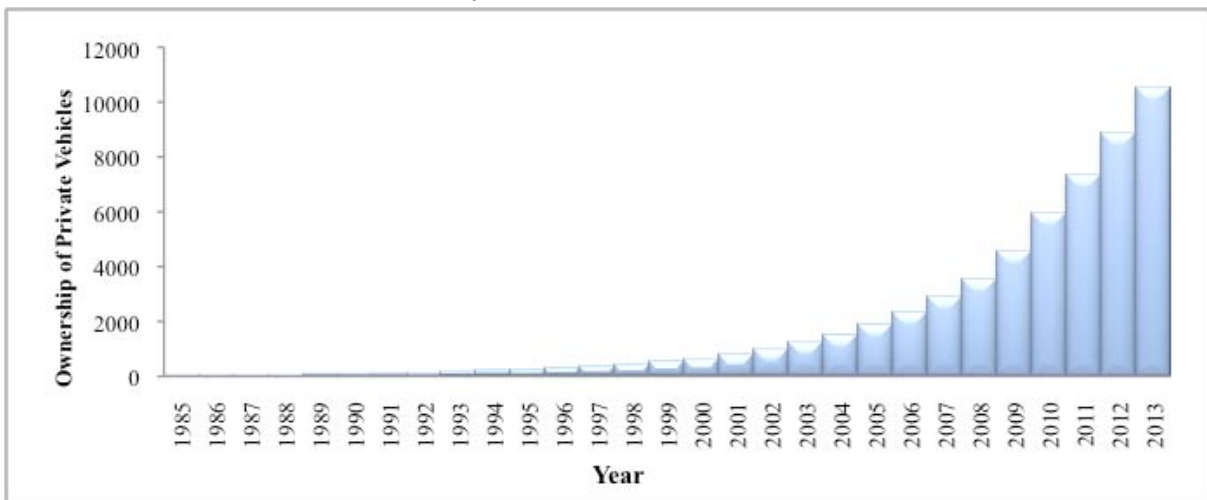
Consequently, the surging imbalance between a rapidly inflated demand for automobiles and limited domestic production triggered an import binge (see Figure 2). Imported-automobiles poured into China, both legally and illegally. The amount of imported automobiles from 1978 to 2012



**Figure 2:** Number of Imported Automobiles in China (1950-2012) (10,000 Units)  
*Source: Compiled based on China Automotive Industry Yearbook (2010) and China Association of Automobile Manufacturers/CAAM*

occupied up to 93 per cent of China’s gross imports of all types of vehicles. The share of foreign imports of automobiles to the domestic market hit a peak of 44.5% in 1985 (Ministry of Commerce/MOC, 2009). For the purpose of mitigating the exacerbated drain on China’s foreign exchange, the central government resolved to tighten macro-regulatory conditions and cultivate its own national car-industry instead. More specifically, starting in 1985, high tariffs were levied on car-imports in order to protect the infant Chinese car industry. Such

mobile production up to 15% per annum from 1992 to 2002, which was ten times more than the global level (CAAM, 2002). The proportion of light-, mid-sized- and heavy-vehicles was adjusted to 78.5%, 17.8% and 3.7%, respectively in 1998. The amount of imported cars accordingly reduced throughout the 1990s and bottomed out in 1998 (18,016 Units), whereas the ownership of private vehicles rose from 284,900 Units in 1985 to 4,236,500 Units in 1998, an almost 14 times increase in just 13 years (see Figure 3).



**Figure 3:** Ownership of Private Vehicles (10,000 Units) from 1985 to 2013  
*Source: Compiled based on National Data (National Bureau of Statistics of China)*

tariffs reached up to 220 per cent in 1992 according to Notice on Cancelling Import Adjustment Tax (China Customs General Administration/CCGA, 1992). On the other hand, Sino-foreign joint ventures under the “Market for Technology Strategy” that was approved in 1984, promoted the integration of the Chinese auto-industry into the world. Promulgation of incentives boosted the average growth rate of Chinese auto-

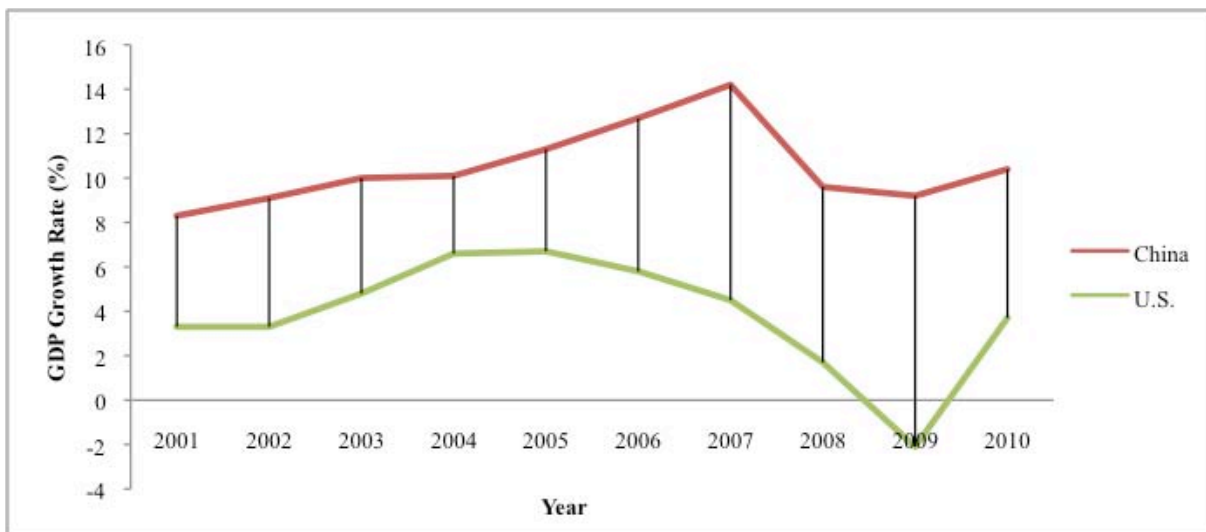
### 2.3 Prosperity Phase (2001-2010)

Following from the previous period, China came under the gaze of the WTO and China itself also recognized the value of being admitted to the WTO. As a result an agreement was struck between China and the WTO, that the import tariff on an assembled car would in 2001 be reduced to 80 per cent where the size of the engine

is less than or equal to three-litres, or 110 per cent where the size of the engine is bigger than three-litres and to 25 per cent by July 1, 2006 (Tianjin Economic-Technological Development Area Automotive Industry Development Research Report). These significantly decreased tariffs, as well as deregulation of non-tariff barriers (such as easing restrictions on car-import permits), made China's entry into the WTO in 2001 the major new thrust in the development of the Chinese car industry.

In the meantime, in the face of the accelerated pace of globalization, China made significant economic progress from 2001 onwards. Its real per-capita Gross Domestic Products (GDP) stayed on an annual 8 per cent high-growth trajectory, whilst the American economy went into a downturn (see Figure 4). Personal income, which is recognized as the principal economic stimulus to vehicle ownership (Dargay et al., 2007), remained for the most part in double-digit<sup>2</sup> annual growth, along with national economic development during the same period.

to over 10 million in 2010 (Shenzhen Statistical Yearbook 2013). The National Urban System Planning (2010-2020) (Draft) selected Shenzhen, which was basically a fishing village, as the central city of southern China since 2010. This unprecedented demographic leap forward on such a huge scale in China has caused people to gradually move away from the central cities to suburban areas to avoid daunting housing prices and other serious urban problems. However, the central districts of Chinese cities have continued to serve as the sites for the main political, economic and recreational functions, due to the deficiency of ancillary facilities in peripheral regions (Song, 2013). The resulting commuting times rise rapidly with such mono-centric urban forms and expanding urban sprawl, albeit at considerably higher densities than in other sprawling cities such as Atlanta, Houston or Sydney (Newman and Kenworthy, 1999). This phenomenon, together with an element of the car being a symbol of social status, meant that the ownership of private vehicles in China ac-



**Figure 4:** Trend of GDP Growth Rate between China and USA (2001-2010)  
*Source: Compiled based on World Bank and Bureau of Economics Analysis (BEA)*

Furthermore, Chinese urbanization has been experiencing a continuous increase from 39.1% in 2002, up to 51.3% in 2011, with an average annual growth rate of 1.35% (China National Human Development Report 2013). This means that nearly 188 million rural dwellers have relocated to urban areas in China over that 9-year period. Shenzhen is a clear example, growing from 314,100 residents in 1979

celerated dramatically in the 2000s (Gan, 2003).

The rising purchasing power and increasing distances of daily commuting trips have generated huge demand for motorised travel, especially individual motorised transport. Cars owned by private individuals are reported to outweigh those by public authorities, accounting for 74.4 per cent of the Chinese market in the year 2006 (Statistical Bulletin on National Eco-

<sup>2</sup> Personal income growth was actually 8.8% in 2009.

nomics and Social Development in 2006). By 2010, ownership of private vehicles had reached 59.39 million, with a 25 per cent annual growth rate, 7.7 times more than the 2001 level in China (see Figure 3). China officially entered into the era of rapid motorization, driven by surging private vehicle ownership. It took thirty-six years from 1956 to 1992 for China to achieve its first million in auto production. The pace since Chinese accession to the WTO has accelerated to exceed millions of automobiles each year since 2003 (see Table 1).

in force since 1978 to introduce foreign investment and technology. In practice, however, China has become essentially one big assembly plant for the global giant carmakers. The AIP (1994) has prohibited imported technology through the Semi-Knocked Down (SKD) or Completely Knocked Down (CKD) approach to car manufacture, to protect the import substitution rate. But all requirements relating to the legal and institutionalised protection of China’s car industry should be cancelled, as required by the WTO. External factors, including government intervention are

Year	1992	2000	2002	2003	2004	2005*	2006	2007	2008	2009	2010
Duration (years)	36	8	2	1	1	1	1	1	1	1	1
Yield (10,000 units)	100	200	300	400	500	600	700	800	900	1400	1800

**Table 1:** Year and Duration of Automobile Production Exceeding Given Amount

Source: Compiled based on China Automotive Industry Yearbook (2011)

\* The actual auto production in 2005 was 5,707,688, which is less than the data shown in Table 1. It is rounded to 6 million in the paper for simplicity.

Both the opportunities and challenges that the Chinese auto-industry has faced are extraordinary since its entry into the WTO. China’s CR3 of “Big Three” auto-manufacturing bases<sup>3</sup> produced 75% of the country’s cars in 2002, which reveals the high industrial concentration in a few sites, dictated by administrative intervention. The urgency for China is to transform from ‘reactive protection’ characterised by government interference towards ‘proactive protection’ featuring global competitive advantages. According to WTO commitments, tariff protection and non-tariff barriers to cars should be gradually phased out within a five-year transitional period to buffer the stress from market liberalization. Fostering self-developed capacity and optimizing industrial structure are the long-run solutions for the future of the Chinese automotive industry.

still overemphasised in China compared to pure market mechanisms or the management of the enterprise itself. This has stifled the innovation ability of Chinese car manufacturing enterprises (MOC, 2004). To better confront the realities of the global environment with respect to cars, featuring a well-developed competition system and powerful multinational automakers, China adopted the integration of imported technology with independent innovation to avoid “Technology Hollowing-out” and to establish its national brand.

In light of China’s out-dated manufacturing system and incomplete component enterprises, the “Bring in” strategy has been

The Swedish auto company Volvo was ranked 232 of “The World’s 500 Most Influential Brands”, compiled by the World Brand Lab in 2006 based on its advantageous Share of Market, Brand Loyalty and Global Leadership. However, in the GFC of 2008 its auto sales fell by 18.3% to 374,297 Units worldwide compared to 2007. In 2010 the Chinese-owned Geely Automobile Holding company saw the opportunity for a takeover and made an agreement with the Ford Motor Company on acquisition of 100% stakes in Volvo and related assets, especially its intellectual property regarding technology. The Volvo Car Group subsequently announced its 2013 global sales increased by 1.4%, with a 46% surge in China (Volvo Car Group,

<sup>3</sup> The state council officially sanctioned the FAW, SAW and Shanghai-VW as China’s three major car-manufacturing bases in 1987. One year later, three small car assemblers in Beijing, Tianjin and Guangzhou were approved. It is the well-known “Big Three and Small Three” strategy. The SAW has been officially renamed as Dongfeng Motor Corporation in 1992.



Global Newsroom). Geely also transformed its operation from lower level cars towards more upscale models by way of Volvo's technology combined with Chinese market conditions.

The production capacity utilization of Chinese car manufacturing businesses was 72.5% in 2005. This means that there is potentially a structural overcapacity problem if things remain on a business-as-usual basis (National Development and Reform Commission/NDRC, 2006). The Tenth Five-Year Plan (2001-2005) enacted in 2001 accordingly suggested improving and updating product structure. The Automobile Industry Development Policy (2004), which listed Structural Adjustment as one chapter and the special policy called Notice on Opinions of Automobile Industry Structural Adjustment approved in 2006, both stressed the urgency of the above situation. The Plan on Automobile Industry Restructuring and Revitalization (2009) implied an acceleration of China's industrial restructuring in proper response to the 2008 GFC. Rightly or wrongly, depending on the perspective one takes, China has thus become the ray of hope for the global car market.

#### 2.4 Stationary Phase (2011 until Present Day)

In 2014 the global automobile industry stepped into its 128th year since the first automobile was introduced in 1886 (Ruiz, 1985). China surpassed the U.S. as the giant of global automobile production and consumption in 2009 and has been the major contributor to global automobile industry growth since then (Market Analysis Report: China's Automotive Industry), even though it came into being seven decades later.

After the extraordinary growth rates of auto production and auto sales in 2009 (48.3%; 45.5% respectively) and 2010 (32.4%; 32.4% respectively), the Chinese auto-industry uncommonly underperformed in 2011 (0.8%; 2.45%) (OICA, 2009-2011). This has ushered in a new 'stationary phase' of Chinese automobile industry development, partly affected by the implemented policies including Transportation Demand Management (TDM) and prioritising public transport development. This change has in turn been brought about by crippling levels of congestion in

many Chinese cities, dangerous levels of air pollution, growing traffic fatalities and injuries and other serious impacts from the introduction of such huge numbers of motor vehicles into Chinese cities in such a short space of time (Pucher et al., 2007). Photo 2 shows how the public spaces of Chinese cities are being taken over by motor vehicles.



**Photo 2:** Colonisation of footpaths by motorcycles in Shanghai

Source: Yuan Gao

However, before this period, The Chinese government formulated three pro-auto policies aiming to rebound from the 2008 GFC comprising "Purchases Duty Preferential" (Notice on Reduction in Vehicle Purchase Duty for 1.6-liter or less Passenger Cars, 2009), "Bring Auto into Countryside" (Plan on Automobile Industry Restructuring and Revitalization, 2009) and "Car-Scrapping" (Implemented Measures on Car-Scrapping, 2009) These are summarised in Table 2. The Purchase Duty Preferential, which stimulated sales of cars of 1.6 litres or less by 71% in 2009, was very influential in boosting the total auto sales in China (CAAM, 2010). However, these preferential policies and subsidy plans for auto purchases were required to terminate from 2011(MOF, 2011a, b, c). China began to free up in order to build a more resource-saving and environment-friendly society as per the Twelfth Five-Year Plan (2011-2015), in which the New Energy Vehicle<sup>4</sup> (NEV) is listed as one of the nation's strategic emerging industries (SEI).

<sup>4</sup> It consists of HEV (Hybrid Electric Vehicles), BEV (Battery Electric Vehicles, including Solar-Powered Autos), Fuel Cell Electric Vehicles (FCEV), Hydrogen-Powered Vehicles and other New-Energy vehicles defined by the New-Energy Vehicles Manufacturing Enterprises and Products Access Management Rules from 2009.



Policy	Content	Extension
Purchase Duty Preferential	The duty will be temporarily levied at the half-reduced rate of 5% on passenger cars with engines of 1.6-liter or less purchased from January 20 to December 31, 2009.	In the end of 2009, the State Council approved its extension to December 31, 2010. The newly formulated purchase duty was increased to 7.5%.
Bringing Auto into Countryside	A financial subsidy amounting to five billion RMB will be granted to farmers who replace three-wheeled vehicles or low-speed trucks with light-duty trucks or 1.3-liter or less mini-cars from March 1 to December 31, 2009.	It was extended to the end of 2010.
Car-Scrapping	The subsidy will be offered to upgrade old or yellow-label vehicles in advance. This includes gasoline or diesel vehicles failing to meet the National Emission Standard. The compensation value varied from 3,000 to 6,000 RMB and functioned from June 1, 2009 until May 31, 2010.	Its validity was extended to December 31, 2010.

**Table 2:** Three Auto-Encouragement Policies Designed to Overcome the 2008 GFC

In contrast to this short-term response to the GFC, deeper issues have taken over and have set China into a new phase of restrictions on private vehicles, in order to reduce some of the major problems afflicting Chinese cities due to large numbers of vehicles (Photos 3 and 4). Strategies restricting purchase and use of private vehicles are now emerging in the megacities of China. For instance, the Beijing municipal government initiated the rationing of road space since the 2008 Olympics. Car



use in Beijing was curtailed according to the number on the license plates. Another example is limiting the quota of new car registrations in Beijing in an attempt to curb unsustainable levels of automobile ownership (Song, 2013). This has since been further tightened by 37.5% to only 150,000 new car registrations per year since 2014 (in a metropolitan population which will be approximately 22 million people by that time) (Notice on the Work Plan of Beijing Motor Vehicle Emission Pol-



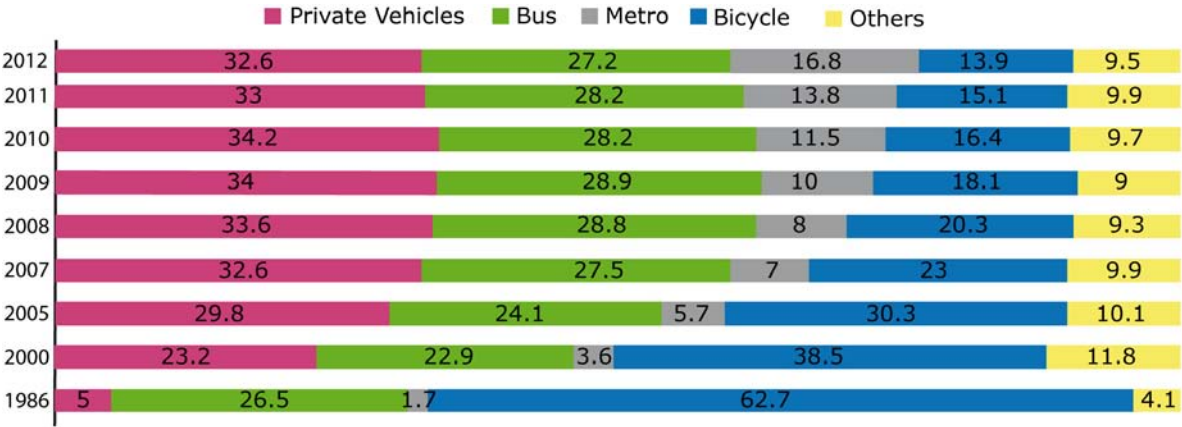
**Photos 3 and 4:** The dense urban fabric of Chinese cities is increasingly filling with cars, which is leading to programmes to limit car ownership in cities.

Source: Yuan Gao

lution Control 2013-2017). Up until the end of March 2014, Beijing, Shanghai, Guiyang, Guangzhou, Shijiazhuang, Tianjin and Guangzhou had already joined in similar efforts to restrain car ownership. There are two distinctive systems for new car registration around China: (1) an unpaid lottery system and (2) a paid bidding system. For instance, Beijing distributes the new car registration quota for free to the applicants through a lottery system. Conversely, Shanghai has adopted the Singapore-style Certificate of Entitlement

a 32.3% compound annual growth rate (2012-2013 China Urban Rail Transport Development Report). By the end of 2013, there were 87 urban rail lines in service among nineteen Chinese cities, with a total network length of 2,539 km (2013 Statistical Length of Chinese Operating Urban Rail Transport).

Rail transport is of critical importance in shifting trips away from cars and motorcycles. As shown in the modal splits for Beijing in Figure 5, the 465 km (2013) Beijing metro network length has had a dramatic



**Figure 5:** Travel Modes of Beijing Residents' Daily Trips (%) (Excluding Walking) (1986-2012)  
*Source: Compiled based on 2013 Beijing Transport Development Annual Report*

for new car purchase, which means bidding at an auction for the right to buy a new car. Chen and Zhao (2012) and Zhao et al (2014) have analysed the respective merits of both these schemes.

Additionally, transport investment priority has now been transferred towards developing Urban Public Transport (UPT) at the national strategy level, especially Rapid Mass Transit (RMT) through the Twelfth Five-Year Plan. RMT, which includes Subway/Metro and Bus Rapid Transit (BRT) within cities, as well as inter-city High-Speed Rail (HSR), is now undergoing massive growth (Newman et al, 2013). The case of Chinese urban rail transport is illustrative of this new priority. The "metro" as a mode of transport first appeared in 1969 in Beijing, 106 years after the London Underground/Tube was first constructed in London (Strickfaden and Devlieger, 2011). Although developing urban rail transport was primarily embraced in the Tenth Five-Year Plan in China (2001-2005), Chinese investment in urban rail transport mushroomed from RMB 12 billion (2001) to RMB 260 billion (2012), with

effect on public transport modes. Beijing's subway is nationally the second longest, eclipsed only by Shanghai (577 km). The trips by metro in Beijing surged from 1.7% (1986) to 16.8% (2012). On the negative side there was a decimation of bicycle trips from 63% in 1986 to 13.9% in 2012. This was due primarily to a political move away from bikes as being "backwards" and the concomitant destruction of bicycle facilities in the city to make way for cars (Photo 5). It also became increasingly dif-



**Photo 5:** Cars parked in bike lane in Beijing  
*Source: Yuan Gao*

difficult to travel by bike due to the long trip lengths for many needs as the city spread (Yang et al, 2014). Finally, conditions for buses were not ideal either in Beijing, as reflected in the slow-growth of regular bus transit (RBT), which increased only from 26.5% to 27.2% during the same period.

### 3. Conclusions

China, as the largest rapidly developing country, accommodates 19 per cent of the global population (China Population Census, 2010) and contributes 9.4 per cent of global GDP (World Bank, 2010). It has become the object of widespread interest around the world. Its automotive industry has been facing a dilemma of risk and possibility throughout the institutional reforms of the decades since the end of the Second World War, including the New China Foundation in 1949, the Reform and Opening-up Policy in 1978, Entry into the WTO in 2002 and the New Era starting from 2011. This paper has documented China's automotive development history from a "Truck Industry" to a national pillar industry, from the global automobile giant of only a few years ago (a status which it still largely retains), to the current period of restricting car ownership in many cities and prioritising public transport within China's urban environments, especially through rapid development of rail transport.

The Chinese automotive industry, which mainly served military and economic construction needs due to strained international relations and a distinct command economy at the beginning of New China, overweighted its automotive production towards freight vehicles. The constantly changing national policies and excessive technology dependence resulted in an unproductive and uncompetitive automobile production system.

The 1978 open-door economic policy, which pushed towards the devolution to local economies, raised production motivation but intensified regional rivalry. Furthermore, permitting and encouraging the ownership of private vehicles along with enhancement of individual purchasing power, shifted the industrial emphasis specifically towards the manufacture of cars. The contradiction between ever-growing automobile demand and incompatibly low domestic automobile supply drove the thirst for auto imports in China, which

peaked in 1985. The Chinese auto industry attempted to achieve production-sales balance and then profitability through increasing its industrial concentration and importing foreign technology.

Being the 143rd member of the WTO has promoted the Chinese auto industry from an outlier towards a major contributor to the global automobile market. In contradistinction to mature automobile countries such as the USA, China's advantage in the car industry is having a huge base of new first time car buyers, rather than just updating requirements for cars. However, it has also suffered from the lack of internationally influential automobile products. Establishing and growing its car industry in a relatively protectionist environment, the Chinese auto industry has needed to upgrade its industrial structure and to develop self-owned intellectual products. On the downside, the car industry in China, especially in the dense and space-constrained Chinese cities, has generated very significant impacts in local communities (congestion, air pollution, increased traffic fatalities and degraded public environments to name a few impacts). Nationally and globally, the sheer size of the Chinese automotive industry brings many resource, environmental and other problems which reduce its positive economic aspects. This must be taken into account in any further efforts that China makes to become an automobile powerhouse of the world.

There is now evidence that China is beginning to see these bigger problems and is responding accordingly. An awareness is developing that it is not possible, wise nor even economically sensible to turn Chinese cities into automobile dependent cities. It is now possible to see the beginnings of a new focus on public transport and the regeneration of walking and cycling as important modes of urban transport. If continued, this will allow a diversity of modes, including cars and motorcycles, to co-exist better in Chinese cities. This does not spell any kind of "end" to automobiles in China, but rather it heralds a new realisation that Chinese cities will be better functioning, more environmentally attractive and better off economically to encourage a healthy balance of modes, in a similar way that many economically, environmentally and socially successful cities in Europe



have done (e.g. Copenhagen and Zurich). Chinese cities have more than enough capacity to head in such directions, and in a relatively short space of time, especially since they still have comparatively dense urban development patterns that support public transport, walking and cycling (Photos 6 and 7).



**Photo 6:** Bicycle parking outside a Beijing metro station  
*Source: Yuan Gao*



**Photo 7:** Chinese cities will increasingly look to extending good quality, green walking environments  
*Source: Yuan Gao*

Starting around 2011, we have now seen China quite aggressively pursuing TDM policies and vigorously advocating prioritising UPT. There has thus been a momentous shift in the Chinese automobile industry policy from 'stimulation to sustainability'. The Beijing Declaration (Wang, 1996) suggested that the primary objective of transportation systems is to realise the movement of freight and passengers rather than the movement of vehicles. Despite the significant achievements of the Chinese auto industry for the national economy, the liveability and sustainabil-

ity of Chinese cities cannot be realised if urban mobility is primarily oriented to private motorised travel modes (cars and motorcycles). An integrated and diverse urban transport system in China is now designated to satisfy the daily trip demand and mitigate environmental and social vulnerability.

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