Automobile Safety and Technical Policies in China[1]

Associate Prof. Dr. Lin Sun
Shanghai Academy of Social Sciences
Institute of National Economy
7/622, Huaihai Zhonglu, Shanghai 200020
China

PhD Candidate Yong-hua Wang
Shanghai Academy of Social Sciences
Institute of Economy
7/622, Huaihai Zhonglu, Shanghai 200020
China

Abstract

With the rapid growth of Chinese economy, the vehicle population, especially the population of passenger vehicles with private cars as the mainstay, has been increasing rapidly. At the same time, the problems, such as frequently-occurred traffic accidents are gradually becoming more and more rigorous. This paper sorted out the problem of traffic accidents in China, moreover, the collative, introductive and qualitative evaluation of the related policies formulated by Chinese government is implemented, and the future trend of the policy is discussed.

Key words: Automobile, Safety, Technical Policies

1. Introduction

The production and consumption of automobiles centering on passenger ones in China has come into the stage of fast increase since the 21st century, especially since the year 2002. However, the demand of passenger vehicles in China was mainly from governments and state-owned enterprises before. The vehicle market has seen great changes since China's entry into the WTO in December, 2001. With the anticipation of reduced tariff for imported vehicles, the domestic market of passenger vehicles gradually witnessed more and more price competition. In the meantime, a proportion of consumers having benefited from the long-term economic growth and accumulated some fortune showed their surging desires of passenger vehicle consumption. Therefore, the favorable factors on the sides of both supply and demand have resulted in the significantly enlarged market scale of passenger vehicles, most of which are sedans, since the year 2002. In 2010, the sales scale of new vehicle market exceeded 18.26 million, of which passenger vehicles were 11.33 million, accounting for over 76.1% of the total vehicle sales quantity. By the end of 2011, the amount of civil vehicles was 105.78 million, of which private passenger vehicles were 78.72 million.

At present, China has a roughly same market scale of new vehicles as America did in the late l960s and Japan in the 1990s, moreover, and sees a growth trend which is stronger than that of Japanese market in the late 1960s, during which cars were fast popularized in Japan, and equal to that of the 1960s American market. However, in terms of popularity rate, China is at a very low level compared with developed countries. According to data from National Bureau of Statistics, we derive that the popularity rate of passenger vehicles in China was just 7.9% at the end of 2011.

With the rapidly enlarged automobile market scale and the increased vehicle population, comes the continuously increasing accidents, which claims lives ranging from around 65,000 to 120,000 annually in recent years. Since the end of 2011, an intensely discussed public issue in China has been the school bus security aroused by a series of tragic traffic accidents involving heavy death tolls (Note 1).

[1] This work was supported by a Grant-in-Aid for Scientific Research (B) No. 21310099 from the Ministry of Education, Culture, Sports, Science and Technology of Japan, and the Fund of Shanghai philosophy and Social Science (2008BJB031). The views presented in the paper are authors' personal, and they need not be ascribed to the organizations with which they are associated.

While a national campaign in strengthening school bus security is underway, this might pose a crucial nexus for China's overall automobile development strategy in its run-up to auto society. This article sorts out and analyzes automobile transportation safety and relevant technical policies and measures, and projects the direction of relevant policies from Chinese government.

2. The Status Quo of Automobile Traffic Safety in China

The traffic accidents in China have shown an obvious rising trend since the 1990s. The traffic accident frequency and casualties have seen a fall since 2003. However, the victims claimed by traffic accidents in 2007 still reached as many as 80,000 (see table 2). According to statistics from the development research centre of the State Council (Note 2), the death toll in the accident per motor vehicle is 9.5 times and 12.2 times as much as that in Germany and in Japan, respectively. It is anticipated that the vehicle population in China, exclusive of farm transportation vehicles, will continuously rise by the year 2020, bringing more rigorous challenges to traffic safety.

The main reasons for traffic accidents in China are actions against the traffic regulations including over freight and over speed as well as fatigue driving and vehicle malfunctions. International comparison shows that China's relatively large death toll of traffic accidents is mainly attributed to severe traffic accidents involving coaches in rural areas due to bad vehicle conditions or road conditions. In recent years, the government has been strengthening large-scale inspections of safety measures during rush periods of long distance passenger transportation, thus having contained frequent heavy traffic accidents and effectively controlled the rise in death toll claimed by traffic accidents. However, in another aspect, with the increase in vehicle population, the death toll caused by the accidents of vehicle collisions has been on the rise.

3. A Brief review on Automobile Safety and Traffic Externality Analysis

The US has led the way in safety standards for vehicles, but other countries which are well motorized have adopted the US standards of vehicles partly for their desire to sell cars to the United States. Great emphasis on new standard formulation is placed on harmonizing regulations internationally to avoid trade problems and ensure a competitive environment (Elvik et al, 2009).

From around middle 1960s to 1970, American authorities introduced safety standards for new vehicles including dual-master braking systems, head rests, laminated front windscreens, collapsible steering wheel columns and seat belts and/or airbags in cars. Crandall et al (1986) found that after more stringent safety standards for vehicles were taken the total fatality number in traffic accidents in the United States in 1981 was around 30% lower than it would otherwise have been.

If the technical standards play roles of passive protection, the major study had been diverted to more of an active protection pattern. Fruitful new studies in curbing traffic accidents follow a tradition of economic analysis and its resulting policy design. Externality of road use can explain much causality of traffic accidents as road is becoming more scarce a resource. Arnott (2001) proposes a microscopic research agenda arguing that the preoccupation of congestion pricing has distorted researchers' perception. Parry (2007) provides a comprehensive survey on traffic externality including local pollution, global pollution, oil dependence, traffic congestion and traffic accidents.

For policy design, pay-as-you-drive is actually the essence on which various policy instruments are constructed, Parry (2004) has made comparison among them. Some studies (e.g. Schrage 2006) that set out to examine congestion relieving can help to address traffic accident issues. Cohorts of drivers might have different effects on traffic externality too (e.g. Huang 2010), therefore some discriminatory policy instruments can be considered.
Under non-strict condition, a policy experiment of significant novelty was conducted to test a Pay-as-you-speed mechanism on the vehicles installed GPS speeding meters (Hultkrantz 2009), this idea might be inspiring for future work because the GPS is widespread than ever and its signal can be easily monitored by the traffic authorities.

In a word, the externalities of automobile transportation which had once been experienced by the developed countries are gradually becoming significant in China. Although not having been solved fundamentally even in developed countries, the above-mentioned problems caused by vehicle transportation have been alleviated with some effects through some policies in these countries such as the law, regulation and technical regulation.

Though China currently has a relatively smaller vehicle population and is at a much lower level of vehicle population per capita than the developed countries, it must be realized that it is witnessing a rapid increase in vehicle population. Therefore, it is necessary to pay enough attention to the problems mentioned above, to learn from the developed countries, and to formulate and implement suitable policies as soon as possible. Actually, Chinese government has been taking positive measures to promote the development and popularity of technologies related to the automobile transportation. Such efforts include the establishment of technical standards such as the elevation of the regulation standard for vehicle safety performance.

As for China however, the study on automobile externality is still preliminary since the car popularity is just a phenomena in recent years. Moreover the auto makers would have unavoidable problems in this emerging market and lack a ready mind for the new era during the rapid development. Many traffic accidents stem to technical failure, thus the technical standard study has gained more momentum than other concerns.

4. Policies on the Improvement of the Vehicle Safety Performance

4.1 Formation of safety regulations in China

Before 1990, almost all technical standards of vehicles in China were focused on the engine performance, while the standards of vehicle safety had not been established. According to "Standardization Law of the People's Republic of China" and with reference to European ECE/EEC technical regulations of vehicle safety, relevant national departs in China began the constitution of technical standards of vehicle safety (Si, 2006). A total of 47 compulsory standards related to the vehicle and 9 compulsory standards related to the motorcycle have been established in terms of safety performance by the 1st, January, 2006. However, many other technical standards for safety performance still exist to instruct the vehicle enterprises, and have not yet become compulsory standards.

4.2 Safety regulations on the large coach

According to the census of coach-related safety consciousness released by the Society of Automotive Engineers of China, six items including illicit driving (49.2%), fatigue driving (40.8%), bad road condition (39.5%), over-freight (34.4%), braking performance (33.4%) and scarcity of safety belt (31.8%) have received the most public concerns among 12 factors related to the safety of passenger transportation. Among them, both of the braking performance and safety devices directly relate to the safety performance of the coach itself (Note 3).

According to the "Safety Specifications for Motor Vehicles Operating on Roads" in China, qualified ABS must be installed on the long distance coaches and traveling ones with a total weight of over 12 tons. It is also required in "The Classification and Grade Evaluation of the Operating Coaches" constituted by Ministry of Communications that ABS must be equipped on the large operating coaches of high grade or above, however, no compulsory installation of ABS are required for the other kind of coaches. There are no relevant standards which compulsively require safety belts for passenger seats exclusively.

In order to improve the safety performance of large coaches and reduce the ultra-large traffic accidents, China is expediting its formulation and implementation of safety technical standards on the coaches. At present, after the adaptability improvement, some safety technical standards such as "The Safety Requirements for Bus Construction", "The Safety Requirements for Light Bus Construction", "The Strength of the Seats and Their Anchorages of Passenger Vehicles" and "The Safety Requirements for Double Decker Safety" are established successively based on the study of and reference to the international safety regulations and technical standards. These standards can be classified into two categories. The first category includes national compulsory standards and the second one covers national recommended ones. Standards of the second category are up to enterprises to follow and higher in requirements on safety performance than the first category.

4.3 Regulations on collision test of the passenger vehicle

In recent years, during the formulation process of technical regulation standards for the passenger vehicle safety in China, the most spectacular event is the implementation of the standards on "Collision Test for the Passenger Vehicle". A total of 19 standards related to vehicle safety have been proposed by the vehicle technical committee for standardization of China to the State Council in recent few years. Nine of them are compulsory standards, including "Safety Property Requirements and Test Methods for Automobile Fuel Tank" formulated in 2001, "The Protection of the Occupants in the Event of a Frontal Collision for Passenger Car" in 2003, "The Requirements of Fuel System Safety in the Event of Rear-end Collision for Passenger Car" and "The Protection of the Occupants in the Event of a Lateral Collision" in 2004 (Note 4).

Standards on the frontal collision have been implemented in 2000. However, because there are comparatively more lateral collisions and rear collisions in the collision accidents, "The Requirements of Fuel System Safety in the Event of Rear-end Collision for Passenger Car" and "The Protection of the Occupants in the Event of a Lateral Collision" have been supplemented. These two standards have already been applied to the new type approved vehicle types since the 1st, July, 2006, and will be applied to the already type-approved vehicle types from the 18th, January, 2009. If any already type-approved vehicle fails to meet the standards during the transition period, it will be deleted from the national announced vehicle list and, as a result, its sale will be forbidden.

4.4 Collision test: C-NCAP (China-New Car Assessment Program)

The initial "New Car Assessment Program"(C-NCAP) in China was promulgated by China Automotive Technology & Research Center on the 1st, August, 2006 (Note 5). The passenger vehicle safety performance data collected from the collision test started to be released in October, 2006. The results of collision test by C-NCAP are evaluated into 6 star grades: the lowest grade is 1 star, while the highest grade is 5+ stars. The safety performance of the test vehicle is evaluated into different grades according to the degree of damage to main body parts of the robot driver, including head, chest and leg, in the collision test. According to China Automotive Technology & Research Center, the test standards of grade evaluation are stricter than the compulsory safety standards specified by the state: the collision speed in the collision test of C-NCAP is 64 km/h, while that in the national compulsory collision test is 48-50 km/h. However, it will take a certain period for products of domestic "self-owned brand" automobile enterprises to achieve a relatively high grade in the evaluation. But consumers lay more and more emphasis on the vehicle collision test. According to an Internet census in 2007, 89.9% of the respondents expressed high concern with the star grade evaluated in the C-NCAP collision test of the vehicle they would purchase, 92.5% would carefully compare the configurations of the safety performance during the process of comparison for purchase, 59.1% expressed that if the vehicle they intended to purchase achieved a relatively low grade in the evaluation of C-NCAP collision test, they would consider other types of vehicles, while 24.2% would completely abandon the vehicle with a low grade (Note 6). Therefore, the situation is very urgent for the "self-owned brand" automobile enterprises to improve the safety technical performance of the passenger vehicle as soon as possible.

4.5 Policy evaluation

The policy efforts of paying more attention to and taking measures to improve the vehicle safety performance by Chinese government are laudable. It is of significance to continuously improve the standards on the safety performance for especially large coaches which might cause ultra-large traffic accidents. In another aspect, with the popularity and the continuous increase in the population of the passenger vehicle, the collision accidents involving passenger vehicles have been on the rise, attracting more and more emphasis on the safety performance of the passenger vehicle. Under such circumstances, introduction and execution of C-NCAP collision test evaluation system is of tremendous importance to stimulate automobile enterprises to improve the technologies for the safety performance of the complete passenger vehicle.

However, as pointed out by some relevant experts, limited importance has been attached to the vehicle safety performance technologies by Chinese government so far compared with the control of energy conservation and emission of pollutants of the vehicle (Song, 2007). Although the intensive development of ESP (Electronic Stability Program), CAPS (Collaboration with Active and Passive Safety), EBD (Electric Brakeforce Distribution) etc. electronic technologies for the vehicle safety is specified in "Eleventh Five-year Plan of the Automobile Industry", these highly integrated technologies entail a large amount of research and development cost and human resources, and close cooperation in the development and production processes between the complete automobile enterprises and auto parts companies; independent research and development and manufacturing are extremely difficult for any individual components enterprise. In view of the relatively weak technical foundation of Chinese automobile industry, especially the wide technical gap between the "self-owned brand" complete automobile enterprises as well as auto parts ones and foreign-funded companies, specific supporting policy measures are indispensable to prevent foreign-funded companies' monopoly of these technologies.

5. Conclusions

Many developed countries once suffered the rigorous period called “traffic war” in the aspect of traffic safety when automobiles were fast popularized. However, efforts in reinforcing education in safety awareness, elimination of actions against the traffic regulations and improving vehicle safety performance have alleviated to a great extent problems in traffic safety. These experiences are of significant referential value for China.

At present, China cannot be juxtaposed with the developed countries in terms of policies on popularizing technologies solving the problems of vehicle transportation mainly because Chinese automobile industry is still at a low technical level, the technical reserve of the “self-owned brand” automobile enterprises are relatively weak, and the technical development system is directed by the state, and the strong expectation is paid to the “self-owned brand" vehicles and there are no specific fiscal resources for solving the problems related to the vehicle transportation in China. Though great progresses have been made in the aspects of safety technical level in China compared to those in the vehicle popularity period in the developed countries, taking its population scale and the severity of the relevant problems into account, it is an important and urgent task for China’s policy-making departments to promote the improvement of the relevant technical level of the domestic automobile industry and to contain the problems of vehicle transportation into the smallest range by learning the experiences on solving the relevant problems in the developed countries.

With reference to the policy system, policy environment and implementation experience of the developed countries on solving the safety of vehicle transportation, firstly, the importance of forming a comprehensive policy system should be recognized. At present, Chinese government has been preferentially establishing various technical standard system and technical regulation benchmark. And in the future, the comprehensive policies of combined application of the technical regulations and rewards or punishment should be carried out.

Secondly, policy-making departments would fully consider the technical gap between the “self-owned brand” enterprises and multinational corporations, and according to stages of the policies, especially the policies on fiscal subsidy and tax encouragement. At the present time that more and more expectations are paid to the cultivation of “self-owned brand” in the automobile industry by Chinese government and industrial community, it is hardly to accept that the policies of fiscal subsidy and tax rewards and punishment are implemented completely according to the technology levels under the circumstance that the new techniques are almost controlled by the foreign side of the joint venture enterprises, i.e. the multinational corporations.

Thirdly, the problem is the system of technology development. The development of vehicle-related technologies entails much research and development expenditure and human capital, so independent development is extremely difficult for the “self-owned brand” automobile enterprises or auto parts manufacturers. In China, the development of new technologies, especially the future technologies, is usually taken on by the national research institutions and universities, which are financially supported by the government. However, the efficiency of such technology development system is doubted. Except the fundamental research, China should break the system of technology development directed by the government and establish the system directed by the enterprises and research institutions themselves, which should be the direction of adjustment in China’s system of transportation-related technologies. In addition, considering the influences and advantages of technologies possessed by the foreign party of joint ventures, how to use the technology advantages of the multinational corporations efficiently when pursuing the “independent development" and “self-owned brand” is also an extremely important task for policy-making departments in China.

This article has sorted out problems related to the vehicle transportation in China, evaluated Chinese government’s policy measures for alleviating the relevant problems, and discussed the possible policy directions in the future. As experienced by the developed countries, the relevant policies in China will develop towards the direction of comprehensive policies made up of the regulatory policies on the law and regulation and the technology standard and the rewards/punishments policies on the tax or fiscal subsidy. However, under the circumstance that great hope is pinned on the “self-developed” and “self-owned brand” by Chinese government and the industrial community, China will go through a complex game process in its formulation of technology policies related to vehicle transportation.

References

Arnott R. (2001) The Economic Theory of Urban Traffic Congestion: a Microscopic Research Agenda, Working Paper 502, Department of Economics, Boston College, Chestnut Hill, MA.

Crandall, R. D., H. K. Gruenspecht, et al. (1986). Regulating the Automobile. Washington DC., The Brookings Institution.

China Automotive Year Book 2010, edit by China Automotive Technology & Research Center, China Association of Automotive Manufacture, China Automotive Year Book Editorial Department, November, 2010 (in Chinese).

China Statistical Year Book 2010, [Online] Available: http://www.stats.gov.cn/tjsj/ndsj/ 2011/indexch.htm (April 1, 2012) (in Chinese).

Elvik, R., A. Høye, et al. (2009). The Handbook of Road Safety Measures Second Edition. Bingley, Emerald Group Publishing Limited.

Huang, R. J. (2011). Reexamining the Accident Externality from Driving Using Individual Data. Risk Theory Seminar. University of Arkansas-Little Rock, USA.

Hultkrantz, L. & G. Lindberg (2011). Pay-as-you-speed: An Economic Field Experiment. *Journal of Transport Economics and Policy* 45(3), 415-436(422).

Parry, I. W. H. (2004). Comparing Alternative Policies to Reduce Traffic Accidents. *Journal of Urban Economics* 56: 346–368.

PARRY, I. W. H., M. WALLS, et al. (2007). Automobile Externalities and Policies. *Journal of Economic Literature* XLV, 373–399.

Schrage, A. (2006). Traffic Congestion and Accidents. Working paper. http://epub.uni-regensburg.de/4535/1/Congestion_and_ Accidents _ WP.pdf.

Si, K. (2006). Development Outline of Technical Regulation on the Vehicle Safety in China. *Commercial Vehicle No.*8, 103-106 (in Chinese).

Song, J., (2007), Problems on the Development of Vehicle Safety Technology. [Online] Available: http://www.aptchina.com/news/67345/ (April 1, 2012) (in Chinese).

Note

Note 1. See http://news.163.com/special/xiaocheshigupinfa/([Online] Available: April 1, 2012) (in Chinese).

Note 2. *China: Construction of Much Safer Roads-the International Symposium on Road Safety*, the 28th, June, 28, 2007.

Note 3. "Environment Series of Policy and Regulation on Automobile Industry in China: Chapter of Coach safety", *People Daily*, October, 19, 2006(in Chinese).

Note 4. The long duration between the formulation and the implementation is due to the international announcement before the execution of the national compulsory standard according to the regulation of WTO.

Note 5. The impartiality of the evaluation result is questioned because C-NCAP is promulgated and performed by CATARC, a profitable organization rather than a government department.

Note 6. *Oriental Morning Post*, August, 1, 2007 (in Chinese).

Table 1 Population of Vehicles in China (10 thousand vehicles)

year	Vehicles in total	coach minivan sedan	truck	Private ownership there into		
				Total	coach, minivan	truck
1985	321	79	223	28	2	26
1990	551	162	358	82	24	58
1995	1,040	418	569	250	114	136
2000	1,609	854	698	625	365	260
2001	1,802	994	741	771	470	301
2002	2,053	1,202	812	969	624	345
2003	2,383	1,479	854	1,219	846	373
2004	2,694	1,736	893	1,482	1,070	412
2005	3,160	2,132	956	1,848	1,384	464
2006	3,697	2.620	986	2,333	1.824	495
2007	4,358	3,195	1,054	2,876	2,317	539
2008	5,099	3,838	1,126	3,501	2,880	596
2009	6,280	4,845	1,368	4,574	3,808	753
2010	7,805	6,119	1,596	-	4,911	-

Note: Because the data classified according to the new vehicle standard before 2004 is unavailable, the data listed in this table is classified according to the old standard.

Data: China Statistical Year Book 2010, http://www.stats.gov.cn/tjsj/ndsj/2010/indexch.htm

Table 2 Status Quo of the Traffic Accident in China

year	Number of the accidents (number)	Death Toll (person)	Injuries (person)	Death rate per one million people (%)	Population of the driving license holder (10 thousand people)
1980	116,692	21,818	80,824	22.1	245
1985	202,394	40,906	136,829	38.9	462
1990	250,297	49,271	155,072	43.1	791
1995	271,843	71,494	159,308	59.0	1,673
1998	346,129	78,067	222,721	62.5	2,974
1999	412,860	83,529	286,080	65.9	3,361
2000	616,971	93,853	418,721	73.8	3,747
2001	773,306	115,266	546,485	89.7	4,463
2002	785,837	118,193	562,074	91.3	4,827
2003	660,839	103,394	487,940	80.0	5,368
2004	517,888	107,076	480,865	82.4	7,102
2005	450,254	98,738	469,911	75.6	8,018
2006	378,781	89,455	431,139	68.4	9,317
2007	327,209	81,649	380.442	61.8	10,708
2008	265,204	73,484	304,919	55.3	12,209
2009	238,351	67,759	275,125	50.1	13,821
2010	219,521	65,225	254,075	47.6	15,182

Information: Reorganized by the author according to the information on the website of Ministry of Public Security http://www.mps.gov.cn.