

## Promote the Development of New Energy Vehicles and Carbon Neutrality in Beijing

Xinyi Mei<sup>1</sup>, Yuexue Miao<sup>2</sup>, XiaojunJia<sup>3</sup> and Xiguang Zhang<sup>1\*</sup>

<sup>1</sup>Postdoctoral fellow, Beijing Laboratory of National Economic Security Early-warning Engineering, Beijing Jiaotong University, China

<sup>2</sup>Researcher, Beijing Laboratory of National Economic Security Early-warning Engineering, Beijing Jiaotong University, China

<sup>3</sup>Professor, Beijing Laboratory of National Economic Security Early-warning Engineering, Beijing Jiaotong University, China

**\*Corresponding Author:** Xiguang Zhang, Postdoctoral fellow, National Academy of Economic Security, Beijing Jiaotong University, China.

**Received:** July 08, 2022; **Published:** August 06, 2022

DOI: 10.55162/MCET.03.070

### Abstract

For the further implementation of Jinping Xi's speech spirit, on the Fifth Plenary Session of the 19th CPC Central Committee. China will accurately grasp the characteristics of the Times in the new stage of development while facing "The overall strategy of the great rejuvenation of the Chinese nation and the great changes unseen in the world in a century". China will unswervingly implement the new development concept of "innovation, coordination, green, open and sharing". China will also speed up the construction of domestic and international dual cycle to promote the new development pattern of each other.

In particular, we investigated and implemented the target goals and tasks of carbon peak and carbon neutrality set out in the 14th Five-Year Plan. According to the survey, with a population of 1.4 billion and a middle class of 560 million, in 2020, China had 280 million cars and 4.92 million new energy vehicles. In 2021, China had 302 million cars and 7.84 million new energy vehicles. China's oil industry is 65 percent dependent on foreign investment, and gas-powered vehicles account for one-third of its oil consumption. Among them, Beijing has a permanent population of 21.886 million. In 2021, there were 6.143 million civil vehicles, an increase of 140,000, and 507,000 new energy vehicles, an increase of 107,000.

According to the 2021 China Urban Transport Report, Beijing's rush-hour commuter congestion index was 2.04. Beijing's urban traffic congestion has been normalized. The environmental protection pressure of energy conservation and emission reduction is rather huge for Beijing. Energy consumption, pollution, traffic efficiency, travel safety and other problems are forcing the whole auto industry of Beijing to upgrade. Aiming at these problems, this paper puts forward four suggestions.

**Keywords:** Electric vehicles; Industrial chain; Supply chain security; Carbon neutrality

### Introduction

#### **Background 1: General Secretary Xi's commitment to carbon neutrality**

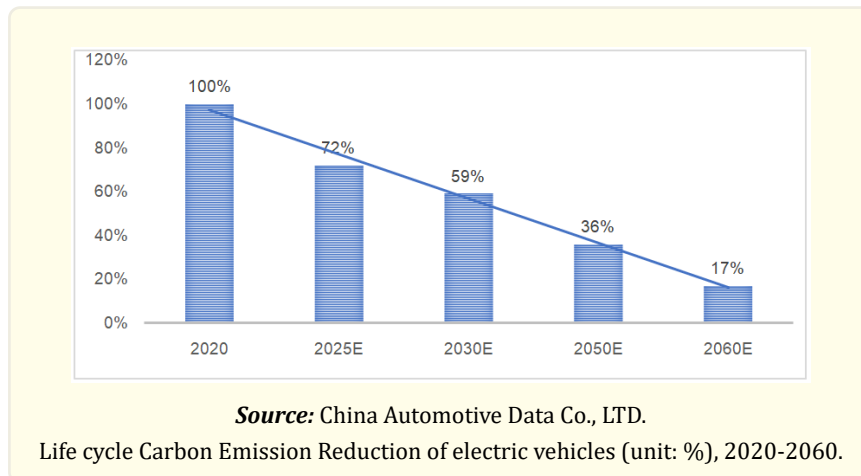
In September 2020, General Secretary Xi promised at the 75th Session of the United Nations General Assembly that China would adopt more forceful policies and measures to achieve carbon neutrality by 2060. This embodies the vision of building a community with a shared future for mankind and demonstrates its sense of responsibility as a major country [1]. Currently, China's annual carbon emissions are about 16 billion tons. China has the world's largest energy system (production and consumption), and fossil energy accounts for about 85% of primary energy. In order to achieve carbon neutrality, China needs to change its net emissions from 10 billion tons to 0 billion tons in 40 years. To achieve this goal, China needs to significantly increase input on the basis of the current carbon

reduction plan, strive to break through the boundary between current technology and social cognition [2], and mobilize the whole society to carry out “carbon neutrality” [3].

### **Background 2: The restructuring of the automobile industry and the realization of the goal of carbon neutrality**

With a population of 1.4 billion and a middle class of 560 million, China now has more than 200 million cars. According to the China Association of Automobile Manufacturers (CAAC), the cumulative sales volume from January to December 2021 was 26.275 million units, and the sales volume in December was 2.786 million units, up 10.5% month on month, down 1.6% year on year and up 3.8% year on year. In 2021, the production and sales of new energy vehicles exceeded 3.5 million, and the production and sales of new energy vehicles completed 3.545 million and 3.521 million respectively, both increasing by 1.6 times year-on-year, and the market share reached 13.4%, 8 percentage points higher than the previous year. China is already the world’s largest auto production and sales place, and the largest electric vehicle scale in the world. By 2050, the number of pure electric passenger vehicles in China is expected to reach 230 million, while the number of electric vehicles in Beijing is estimated to be 6.73 million. China’s oil dependence on foreign 65%, oil vehicles account for 1/3 of the oil consumption, the withdrawal of oil vehicles has been the general trend. The low-carbon development of the automobile industry is crucial to achieve the goal of carbon neutrality.

According to the analysis of “China Automotive Low-Carbon Action Plan Research Report 2021”, pure electric passenger vehicles have great potential for carbon emission reduction in the life cycle. Based on 2020, the emission reduction can be achieved to 59% in 2030 and 17% in 2020 by 2060.



The new generation of scientific and technological revolution is promoting the restructuring of the automobile industry. The comprehensive application of new technologies such as internet of things and artificial intelligence has greatly expanded the connotation of the automobile industry, making the boundary of the automobile industry gradually blurred, and gradually showing the new characteristics of “electric, intelligent, connected and sharing” [4].

	<i>S (Strengths)</i>	<i>W (Weaknesses)</i>
New energy vehicles	<ul style="list-style-type: none"> <li>➤ The policy advantages</li> <li>➤ Low carbon environmental protection</li> <li>➤ The price is low</li> <li>➤ The noise is small</li> <li>➤ Energy saving</li> </ul>	<ul style="list-style-type: none"> <li>➤ Weak core technology</li> <li>➤ Ownership is low</li> <li>➤ Reuse of used batteries</li> <li>➤ Short range</li> <li>➤ Inadequate infrastructure</li> <li>➤ Price is high</li> </ul>
Conventional vehicles	<ul style="list-style-type: none"> <li>➤ Financial strength</li> <li>➤ Research and development ability</li> <li>➤ Brands and Customers</li> <li>➤ power</li> <li>➤ security</li> <li>➤ Come on easily</li> </ul>	<ul style="list-style-type: none"> <li>➤ High carbon emissions</li> <li>➤ Price is high</li> <li>➤ There is a shortage of specialist talent</li> <li>➤ The enterprise scale is small</li> <li>➤ Weak competitiveness</li> </ul>
	<i>O (Opportunities)</i>	<i>T (Threats)</i>
New energy vehicles	<ul style="list-style-type: none"> <li>➤ The energy crisis</li> <li>➤ Foreign cooperation</li> <li>➤ National awareness of environmental protection is rising</li> <li>➤ Support of policy</li> <li>➤ Great market potential</li> </ul>	<ul style="list-style-type: none"> <li>➤ Consumer acceptance is low</li> <li>➤ The market is highly competitive</li> <li>➤ Technological reform of enterprises</li> <li>➤ Government subsidies fall</li> <li>➤ Lack of technology</li> </ul>
Conventional vehicles	<ul style="list-style-type: none"> <li>➤ Support policy</li> <li>➤ Sales channels</li> <li>➤ Complete supply chain</li> <li>➤ Rich experience in car building</li> </ul>	<ul style="list-style-type: none"> <li>➤ Oil price fluctuations</li> <li>➤ CO2 emission problem</li> <li>➤ Subsidies for new energy vehicles</li> <li>➤ competitiveness</li> </ul>

SWOT analysis of new energy vehicles and conventional vehicles.

The importance of the original core technologies is gradually weakening, and may even gradually become the sunk cost of enterprise transformation. Automotive electronic services such as intelligent navigation, Internet of vehicles and intelligent travel are becoming the heights of the value chain of the automotive industry. Seizing the opportunity of global automobile industry reconstruction, the development of Electric, intelligent and connected automobile in China is not only an excellent opportunity to catch up with the world's automobile power, but also an effective path to achieve low-carbon development [5].

### **Background 3: Promote the transformation and upgrading of Beijing's automobile industry to solve the "traffic congestion" + "carbon neutral" dual problems**

#### **Traffic pressure**

By the end of 2021, the permanent population of Beijing is 21.886 million, and the car ownership is 6.143 million, among which the number of new energy vehicles has reached 507,000. According to China Urban Transport Report 2021, Beijing's rush hour commuter congestion index was 2.048 the actual rush hour commuter speed was 25.12km/h. Urban traffic congestion has become normal, energy conservation and emission reduction environmental pressure is huge.

#### **Industrial base**

At present, Beijing has formed three new energy vehicle industrial bases in Changping, Fangshan and Daxing, with a total vehicle production capacity of 80,000 units. In terms of key components, the industry has gathered and developed in the three major parts of battery, motor and electronic control. The total battery capacity reaches 810 Gw and the motor capacity reaches 40,000 sets. The new

energy intelligent vehicle market in Beijing has formed an endogenous driving force and a rapidly growing consumption environment, providing a greater room for growth for vehicle and upstream and downstream parts enterprises.

### *Scientific research platform*

At present, there are 19 national innovation platforms related to new energy smart vehicles in Beijing, among which 8 companies have the new energy smart vehicle business as the core, including the State Key Laboratory of Automotive Safety and Energy, The National Engineering Laboratory of Electric Vehicles, The National New Energy Vehicle Technology Innovation Center, The National Intelligent and Connected Vehicle Innovation Center, Etc.

### *Intelligent network*

Beijing has launched the first pilot application of Internet of Vehicles and autonomous driving map, and built a good intelligent network innovation ecology, with the advantages in scientific and technological innovation, planning policy, test verification, and demonstration and application. It takes the lead in building the autonomous driving policy system in China, and leads the autonomous driving road test in China. In order to ensure the orderly operation of electric vehicles, three guarantee platforms have been built, namely, the Public Electric Vehicle Operation Support Platform, the Intelligent Management Service Platform for Electric Vehicle Charging Facilities and the Home-Level Electric Vehicle Monitoring Platform [6].

### *Smart energy*

Beijing is the national second-class solar energy resource area. In 2021, Beijing has installed more than 0.75million kilowatts of photovoltaic power generation, and could generate 1 billion KWH of green electricity every year. Beijing has an existing construction area of more than 700 million square meters, and the installed distributed photovoltaic scale exceeds 2,000 megawatts. With the energy storage system, it has huge development potential.

Meanwhile, electric vehicles are expected to account for 10.9 percent of Beijing's total daily electricity consumption in 2050. The capacity of power batteries carried by electric vehicles is 40-60kwh, equivalent to a small distributed mobile energy storage system. Based on the scale of 6.73 million electric vehicles in Beijing in the future, this system can provide an astonishing 263-403GWh of emergency electricity. The power battery can be further transformed into energy storage system through cascade utilization after its performance attenuation.

Problems such as energy consumption, pollution, traffic efficiency and travel safety are forcing the upgrading of the automobile industry. Beijing's automobile industry has the development advantages of transformation and upgrading to electric, intelligent, and connected, which will help solve the dual problems of "traffic congestion" and "carbon neutrality" in Beijing [7, 8].

### *Suggestion*

**First**, select the right breakthrough point to promote the innovation and development of Beijing's new energy vehicle industry, vigorously develop intelligent and connected new energy vehicles, seize the value highland of the industrial chain, lead the optimization and reconstruction of supply chain security system, and create new advantages for the development of Beijing's automobile industry.

At present, the gap between China's core and key technologies such as power battery and electric drive and the world's automobile powers is relatively small. China's independently developed Beidou navigation system and 5G technology lead the world, and the construction of new infrastructure such as clean energy and the Internet of Things is unprecedented. These advantages have laid a solid foundation for the rapid development of Intelligent connected vehicles in China.

In 2021, the proportion of automotive electronics in vehicle cost has exceeded 50%, and automotive electronic services such as intelligent navigation, Internet of vehicles and intelligent travel are becoming the value chain highland of the automotive industry. It is suggested that on the basis of the overall idea of developing the new energy vehicle industry in Beijing, the intelligent network should

be highlighted as the core. We will further promote the application of Beidou satellite navigation and positioning system, high-resolution earth observation system, vehicle electronic control, high-performance chips, laser/millimeter wave radar, micro-electro-mechanical systems, and inertial navigation systems. Huawei and other technology giants are encouraged to independently develop and domestically replace industrial-grade vehicle regulation system and power train system to solve the bottleneck problem.

Actively cultivate road intelligent facilities, high precision space and time benchmark service and intelligent car basic map, networking, network security, intelligent cockpit, intelligent driving, intelligent travel, and other new forms, power Chinese car companies grab snatched intelligent industrial chain value highland, leading the supply chain security system optimization reengineering, further enhance the Beijing core industrial chain, supply chain international competitiveness. By further integrating the new energy vehicle industry chain and supply chain, more new industries, new growth points and new investment will be excavated, so as to achieve a win-win situation in economy, energy, environment and climate.

**Second**, priority should be given to the development of small electric vehicles with shared intelligent network, the construction of “smart ring road” and supporting comprehensive service stations should be tested, the supervision of intelligent driving should be coordinated, and the system of innovative application scenarios of Beijing’s new energy electric vehicle industry should be established.

#### ***Innovate the design concept of electric vehicles***

In view of the traffic congestion and other actual conditions in Beijing mega-cities, we should grasp the commuting needs of Beijing commuters for tidal travel, change the design concept of pursuing large-scale, luxurious and high energy consumption by imitating fuel cars, and give priority to the development of low-cost, low-carbon “electric, intelligent, connected and sharing” miniaturized cars. Highlight the core functions of intelligence and network connection, give full play to the advantages of automatic driving, so that people can realize mobile office and entertainment in the process of driving; Highlight the characteristics of low cost, miniaturization, and adhere to the principle of enough is good, make the car cheaper, low-carbon, and more suitable for sharing [9].

#### ***Pilot construction of intelligent network road***

At present, the test sites in Beijing are all located in the outer suburbs, which is not conducive to carrying out simulated real environment pressure test.

It is suggested that with the maturity of the technology, we should explore the opening of independent pilot lanes for autonomous driving in the third and fourth ring roads, and test the construction of Beijing “intelligent network” ring road, which creates a realistic scene for the realization of intelligent car driving and shared travel [10]. Real-life operation will accelerate the transformation of scientific and technological achievements such as automatic driving, intelligent marshal-driving and intelligent scheduling. On the “intelligent ring road”, scientific planning and construction of charging and power changing + tire replacement + cleaning and disinfection multi-functional service site, for the new energy vehicles at the same time to provide charging and changing services, tire maintenance and recycling services, as well as cleaning and disinfection services. Through the integrated vehicle comprehensive service mode, it adapts to the multi-dimensional service demand of vehicles and promotes the recovery and step utilization of consumables such as power batteries and tires.

#### ***Coordinate the safety supervision of intelligent driving***

In the era of intelligent network connection, it is possible for the government to manage the right to drive cars as a whole. Separate lane and road management between automatic driving and manual driving will be implemented, and the supervision of automatic driving right will be incorporated into the 110 Command Center of Beijing Municipal Public Security and the intelligent traffic management system, which can not only guarantee the safety and efficiency of intelligent driving. And can strengthen national information security, traffic safety, city management system safety.

### *Advocate green and low-carbon shared travel*

It is suggested that Beijing should strengthen the publicity of “carbon neutral” knowledge, promote the sharing concept of electric vehicles with light ownership and heavy use of electric vehicles, give full play to the role of “hummingbird effect” and guide enterprises and citizens to carry out greening activities. We will further standardize intelligent sharing online ride-hailing platforms, and provide personalized intelligent and green travel services such as private cars, ride-sharing and intelligent travel route planning according to users’ needs. At the same time, healthbao, intelligent temperature measurement, intelligent early warning and other technologies are applied to create a “safe travel tool”, which can detect and screen passengers’ health status in real time and feed the data back to the regulatory authorities in real time to meet the special needs of safe travel in megacities under normal state of epidemic prevention.

**Third**, promote the cross-boundary and integrated development of the electric vehicle industry, smart energy, smart transportation and smart city, and solve the dual problems of “traffic congestion” and “carbon neutrality” in Beijing.

With lithium battery as the link, the new energy vehicle industry can carry out technological integration with lithium battery, energy storage, photovoltaic, wind power and other industries [11]. With the prominent cost advantages of photovoltaic and wind power industries, the combination with energy storage is more conducive to the stability of new energy generation system and the deployment demand of power grid. The increasing maturity of photovoltaic building integrated [12] and other technologies can accelerate the application of photovoltaic cars, photovoltaic buses, photovoltaic roads, photovoltaic sheds, photovoltaic high-speed rail, photovoltaic walls, photovoltaic agriculture, photovoltaic fisheries and other scenarios to achieve the integrated development of smart cars and smart energy [13].

The government shall coordinate and lead the construction of a vehicle-road network cloud coordination system, establish an intelligent traffic safety management platform, improve the smart city brain, formulate the laws and policies related to the promotion and application of intelligent driving, and plan the construction scheme of integrated development of intelligent vehicles, intelligent transportation and smart city.

It is suggested to take new energy vehicles as the main line and carrier [14] and build a multi-border and integrated intelligent vehicle green industrial ecosystem through multi-dimensional, comprehensive and three-dimensional innovation of technology, product, experience, business model and application scenarios, so as to truly solve the dual problems of “traffic congestion” and “carbon neutrality” in Beijing [15, 16].

**Fourth**, launch the knowledge map construction project of Beijing new energy automobile industry chain, supply chain and carbon emission chain, build the early warning system and platform of Beijing new energy automobile industry safety and carbon emission, provide support for the implementation of industrial safety development and carbon neutrality.

With the help of big data and graph database technology, the overall context and correlation of Beijing electric vehicle industry chain, value chain, supply chain and carbon emission chain are fully understood through the research and construction of industrial digital knowledge map. On the one hand, it can improve the value of the industrial chain, strengthen the chain of the supply chain, implement the carbon neutral task and identify the key links. On the other hand, it can provide data and knowledge base support for intelligent reasoning and prediction based on knowledge graph and intelligent algorithm model by using big data, cloud computing and artificial intelligence.

Based on the national industrial security research think-tank team, set up the electric car industry safety and emissions [17] early warning index system, from the industry survival environment, the international competitiveness, external dependency, industry control, industry development, industrial development ability, brand ability, supply chain ability, carbon neutral ability, such as quantitative index evaluation system is established [18, 19].

Relying on the Beijing Laboratory of The National Economic Security Early Warning Project, a monitoring and early warning platform for the safety and carbon emissions of Beijing electric vehicle industry was built, and an early warning evaluation model was

established [20]. A visual early warning and monitoring platform was developed to dynamically and accurately monitor the status of industrial safety and carbon emissions [21]. At the same time, Beijing electric vehicle industry safety [22] and carbon emission regular release system. For the carbon quota, carbon credits scientific allocation, improve the dual control of energy consumption, cross-industry, cross-link life cycle carbon emission management. Accelerate the construction of national energy use rights, carbon emission rights trading market implementation to provide data and decision-making support.

## Conclusion

Against the backdrop of the new era, we should fully implement the spirit of General Secretary JinpingXi's speech at the fifth Plenary Session of the 19th CPC Central Committee, implement the goals and tasks specified in the 14th Five-Year Plan, and accurately grasp the characteristics of the new stage of development -- the strategic overarching goal of the Great rejuvenation of the Chinese nation and major changes unseen in the world in a century. We will unswervingly implement the new development concept of "innovation, coordination, green, openness and sharing", accelerate the construction of a new development pattern of domestic and international double circulation mutually reinforcing, and accelerate the realization of Beijing's goal of "carbon peak and carbon neutral".

Comply with the "electric, intelligence, snatched, sharing" is a new feature of the world automobile industry in the future development direction, accurately grasp the Chinese electric vehicles become the world's first production and sales of the new features of industrial development, attaches great importance to the electric car industry chain and supply chain security and innovation development for establishing a new development pattern of domestic and international binary important practical significance.

In Beijing ten "high-tech" industry the most in the industry leading new energy smart car industry as the breakthrough point, seize the new round of revolution of science and technology of automobile industry chain, supply chain reconstruction opportunity, vigorously develop electric car, intelligent, snatched, sharing, preempt the industry chain value high, leading to optimize supply chain security system reengineering.

To carry out the "innovation, coordination, green, open, sharing" new development concept, the priority to the development of low cost, low carbon "electric, intelligent, snatched, sharing" miniaturization, intelligent loop test construction, construction of filling in electric integrated services site, for the Beijing office workers provide cheap, convenient way of personalized green travel, pull the Beijing green consumption. It also launched the knowledge atlas construction project of Beijing new energy vehicle industry chain, supply chain and carbon emission chain, and built an early warning system and platform for Beijing new energy vehicle industry safety and carbon emission. While further promoting the crossover and integrated development of the electric vehicle industry, smart energy, smart transportation and smart city, and building a green industrial ecosystem of new energy electric vehicles in Beijing, meanwhile, Beijing can truly solve the dual problems of "traffic congestion" and "carbon neutrality".

## Reference

1. Lin BQ. "Path, opportunity and challenge of China's carbon neutral goal in 2060". China Business News 19.A11 (2020).
2. Chai Qimin and Xu Huaqing. "Accelerate scientific and technological innovation and promote the construction of Carbon neutral country in China". Science and Technology Daily 1 (2020).
3. Sustainable Development Economic Guide 08 (2020): 13-14.
4. Liu Zongwei, Kuang Xu and Zhao Fuquan. Science and technology management research 36.4 (2016): 121-127.
5. Zhao Fuquan and Liu Zongwei. China Science and Technology Forum 1 (2016): 58-62.
6. Zhao Fuquan and Liu Zongwei. "Analysis of strategic value and Advantages and Disadvantages of China's development of intelligent vehicles". Discussion of Modern Economy 4 (2016): 49-53.
7. Zhang JT and Zhang L. "Preliminary discussion on the development of carbon capture, utilization and storage for carbon neutrality". Thermal Power Generation 1 (2021): 1-6.
8. Zhang Yaxin, Luo Huilin and Wang Can. Climate Change Research (2021):1-13.
9. Liu Zongwei., et al. Automobile Technology 1 (2017): 1-6+47.



10. Wang hui. "5G+ autonomous driving intelligent vehicle "driving" to develop highway". Transportation enterprise management 34.6 (2019): 4-6.
11. Xu shaofeng. "Embrace carbon neutrality and help build low-carbon sustainable future of power grid". Electric technology 21.12 (2020): 7-8.
12. Zhang Xiaoling. "Promoting passive low-energy buildings and striving to achieve carbon neutrality". Construction Science and Technology 19 (2020): 1.
13. Zhou Jianqi. "Distributed photovoltaic will fully release potential during the "14<sup>th</sup> Five-Year Plan". People's Political Consultative Conference 7 (2020).
14. Lin Boqiang. "The main contradiction of the development of new energy vehicles has changed how government subsidies help achieve carbon neutrality goals". China Business News A11 (2020).
15. Dong Yang. "New energy vehicles will fulfill the main way of social carbon reduction". China Energy News 18 (2020).
16. Huang J. "China needs to strengthen scientific and technological support to achieve carbon neutrality by 2060". Economic Guide for Sustainable Development 10 (2020): 15-16.
17. Zhao Jiagli. "Construction of green and low-carbon evaluation system for Transportation industry in small and medium-sized Cities". China Storage and Transportation 10 (2020): 126-127.
18. Shi Qiao. "The Pioneering achievements of Industrial Safety Theory research in China -- Comments on Professor Li Menggang's Industrial Safety Theory Research". China circulation economy 27.3 (2013): 127-128.
19. Li Menggang. Research on industrial Safety Theory. Management Modernization 3 (2006): 49-52.
20. Tan Feiyan, Zhang Li, Li Menggang. "Construction of Industrial safety index system in China from the perspective of low-carbon economy". Statistics and Decision 16 (2016): 57-60.
21. Li Menggang. "The strategic position of nuclear power in energy security should be reevaluated". Economic Research Review 6 (2009): 37-38.
22. Jiang Zhimin and Li Menggang. "The dilemma of Chinese Automobile Industry". China Merchants Weekly 1 (2007): 20-21.

**Volume 3 Issue 3 September 2022**

**© All rights are reserved by Xiguang Zhang., et al.**