CUSTOMER PURCHASE INTENTION TOWARD NEW ENERGY PASSENGER VEHICLES: A CASE OF CHINA

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ABSTRACT

Title of Dissertation	Customer Purchase Intention Toward New Energy Passenger Vehicles: A Case of China
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From 2009 to 2015, the sales of new energy passenger vehicles in China rapidly surged from 319 to 206,793 units, which recorded an increasing popularity of new energy vehicles. This study aims to investigate the effects of customer perceived value (price value, quality value, emotional value and social value), government policy and environmental consciousness on customer purchase intention toward new energy passenger vehicles in China. This study also intends to give suggestions to promote the new energy vehicle market as well as to increase the number of users. The data were collected using the snowball sampling and convenience samplingwith317 respondents from China and analyzed using ordinary least squares regression. The results demonstrated that customer purchase intention toward new energy passenger vehicles had a significantly positive relationship with price value, environmental consciousness, quality value and emotional value. Furthermore, the results proved that customer purchase intention did not have a significantly positive relationship with social value and government policy. Accordingly, the following suggestions were proposed: the Chinese government should support the technology research and development of vehicle manufacturers to reduce production costs and providea lower price for the new energy passenger vehicle; all kinds of media, environmental protection organizations, local communities, and the Chinese government should strengthen the promotion of environmental protection knowledge to increase customers' environmental consciousness; vehicle manufacturers should devote more efforts to ensure the quality of the new energy passenger vehicle and the

Chinese government should establish stringent production standards and quality inspection system; vehicle manufacturers should provide customers with more chances to test driving to give customers direct and true emotional feelings about driving the new energy passenger vehicle.

Keywords: New energy passenger vehicle, Customer purchase intention, Customer perceived value, Government policy, Environmental consciousness

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CHAPTER 1

INTRODUCTION

Conventional automobiles not only bring convenience and comfort to human livesbut also become the symbol of identity and status of the owners. However, there are several problems caused by conventional automobilesin China at present. Firstly, automobile exhaust emissions have caused severe environmental problems. As shown in Figure 1.1, the total emissions of four pollutants (nitrogen oxides, hydrocarbons, carbon monoxide and particulate matter) from 2010 to 2014 have continued to grow significantly from 35.8 to 39.2 million tons at an average annual increase of 2.3% (Ministry of Environmental Protection of the People's Republic of China, 2016). Automobile exhaust emissions have become the major source of air pollution causing fog and haze(Ministry of Environmental Protection of the People's Republic of China, 2016).In recent years, fog andhaze continuously occurred in Beijing, Tianjin, Hebei, Pearl River Delta, Yangtze River Delta and other places. In 2015, widespread and persistent fog andhaze appeared 11 times totally in China (China Meteorological Administration & National Climate Commission, 2016). Secondly, according to the forecast, China's annual consumption of vehicle fuel will exceed 200 million tons in 2020 (Innovation Center for Energy and Transportation, Development Research Center of the State Council, & E4tech Co. Ltd., 2009). Energy crisisand environmental issues will become more prominent. Also, industrial technology upgrading will face tremendous pressure. Therefore, the Chinese government has been to encourage the development of new energy sources like wind and solar, while leveraging existing electricity, methanol, and other resources to replace gasoline and diesel. Thirdly, China's conventional automobile industry often lacks its own core technology and brand (Development Research Centre of the State Council, Society of Automotive Engineers of China, & Volkswagen Group (China), 2015). Currently, China’s automobile industry is facing a new round of restructuring and reshuffling

and will gradually shift to energy-saving, environmentally friendly and safe new energy vehicles, which will be a turning point in catching up with the international automobile industry and standing in the front of the global automobile industry.

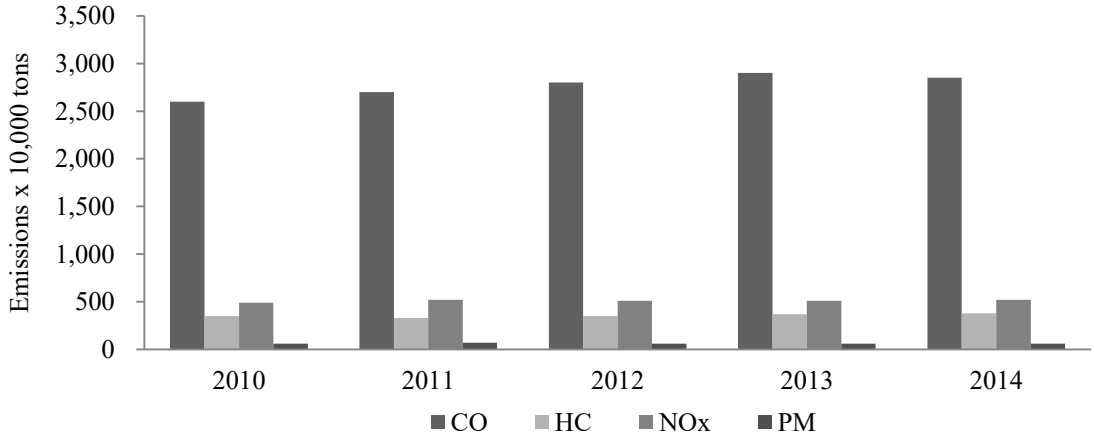

Figure 1.1 Automobile Exhaust Emissions in China from 2010 to 2014

Note: Data are from the Ministry of Environmental Protection of the People's Republic of China (2016).

As stated above, there are some problems caused by conventional automobiles. Therefore, the development of new energy vehicles will be an important opportunity for the automobile industry to deal with environmental issues, energy crisis, and market structural upgrading. Nowadays, the development of new energy vehicles in China is still at an initial stage. As shown in Figure 1.2, in 2011, the sales of new energy passenger vehicles in China exceeded 1,000 units (China Association of Automobile Manufactures, 2012). From 2012 to 2014, the sales reached 5,577 units, 3,540 units, and 5,016 unitsrespectively (China Association of Automobile Manufactures, 2013, 2014, 2015). In 2015, the sales increased sharply and reached 206,793 units which occupied around 1% of the entire sales of passenger vehicles in China (China Association of Automobile Manufactures, 2016). All these data showed a major breakthrough of the new energy vehicle industry in China. But the overall goal of China's new energy vehicle industry is: by 2020, the cumulative production and sales of new energy vehicles reach 5 million units and the scale of the new energy vehicle industry is at the top of the world (State Council of the People's Republic of China, 2012). Therefore, there is still a considerable gap between the Chinese

government’s target and actual sales in the market.

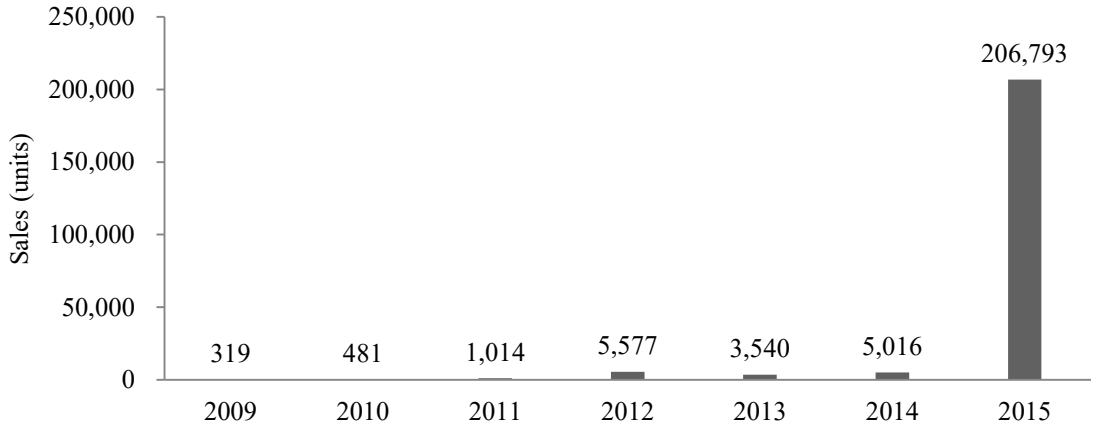

Figure 1.2 Sales of New Energy Passenger Vehicles in China from 2009 to 2015
Note: Data are from the China Association of Automobile Manufactures (2010, 2011, 2012, 2013, 2014, 2015,2016).

All mentioned aboveleadto the objectives of this study: (1) to provide an overview ofthe current development situation of new energy passenger vehicles in China; (2) to investigate the effects of customer perceived value (price value, quality value, emotional value and social value), government policy and environmental consciousness on customer purchase intention toward new energy passenger vehicles; (3) to give suggestions to promote the new energy vehicle market as well as to increase the number of users.

Furthermore,since the new energy passenger vehicle is an environmentally friendly product and it will alleviate the environmental problems caused by automobile exhaustemissions, there is an urgent need to popularize and promote the new energy passenger vehicle. Therefore, this research is of great importance and significance. Firstly,the theory of customer purchase intention toward new energy passenger vehicles will be enriched. In the studies of the environmentally friendly product, consumer’s perception and environmental consciousnessare considered as the main factors. In addition, during the process of developingand promoting new energy passenger vehicles, the Chinese government has taken a large number of policies. Therefore, this research will build a theoretical model of customer purchase intention toward new energy passenger vehiclesfrom three aspects and analyze theeffectsof these factors on customer purchase intention.Secondly, the results of this

research will help theChinese governmentand manufacturers of the new energy passenger vehicle to understand customers'needs, preferences and concernsabout the new energy passenger vehicle, to formulate appropriate strategies to promote customer purchase intention toward new energy passenger vehicles, and ultimately to boost the development of new energy passenger vehiclesin China.

CHAPTER 2

BACKGROUND AND HYPOTHESES

This section provides an overview of new energy passenger vehicles in China and proposes hypotheses based on previous literature reviews.

2.1Background: New Energy Passenger Vehicles

New energy passenger vehiclesare relative to conventional fuel passenger vehicles. New energy passenger vehicles refer to automobiles which take unconventional fuels as the source of motive power (or take conventional fuels as the source of motive power but are equipped with new-type vehicle power sets), take advanced technologies in propulsion control and drive, and are manufactured with advanced technical principles, new technologies and new structures (Ministry of Industry and Information Technology of the People's Republic of China, 2009). New energy passenger vehicles also mean automobiles adopting new types of power systems that are fully or mainly reliant on new types of energy (State Council of the People's Republic of China, 2012). As for the classification, new energy passenger vehicles include hybrid vehicles, battery electric vehicles, fuel cell electric vehicles, hydrogen engine vehicles and vehicles with other new energy sources (Ministry of Industry and Information Technology of the People's Republic of China, 2009). Wang (2015) described each category in details: (1) hybrid vehicles, most gasoline-electric hybrid, have at least two energy converters and automotive systems. They have advantages of internal combustion engine's high-performance and electric motor's low-emission; (2) battery electric vehicles do not rely on any fossil raw materials but entirely rely on on-board batteries as the only source of power. Battery power comes from natural gas, solar energy, tidal energy, geothermal energy, etc.; (3) fuel cell electric vehicles are the ideal pollution-free vehicles with a very high

efficiency of energy conversion. Cell energy comes from the electrochemical reaction of oxygen and hydrogen, which directly turn into electricity without combustion; (4) hydrogen engine vehicles refer to vehicles using the electricity produced by burning hydrogen. During the burning process, they only emit pure water which does not cause any pollution; (5) vehicles with other new energy sources mainly use methanol and dimethyl ether as the power. However, they are not the ideal new energy vehicles since methanol and dimethyl ether are toxic and will produce polluting gasses during the combustion process.

In recent years, it isnoteworthy that domestic-brand new energy passenger vehicles havemade great achievements in China. As shown in Figure 2.1, the top five best-selling brands of new energy passenger vehicles in 2015 were all domestic brands and they took up 80% of the annual sales of new energy passenger vehicles in China, while foreign and joint-venture brands only had a few sales("Analysis of the top five automakers," 2016).However, foreign and joint-venture enterprises will accelerate the development and promotion of their new energy passenger vehicles since the Chinese government offers more benefits to them. Two joint-venture brands (ZINORO and DENZA) are qualified in the catalog of recommended models in the new energy vehicle's promotion and application project (second batch) so that they can receive government subsidies. Therefore, there will be more competitions among domestic, foreign and joint-venture brands in the future new energy passenger vehicle market.

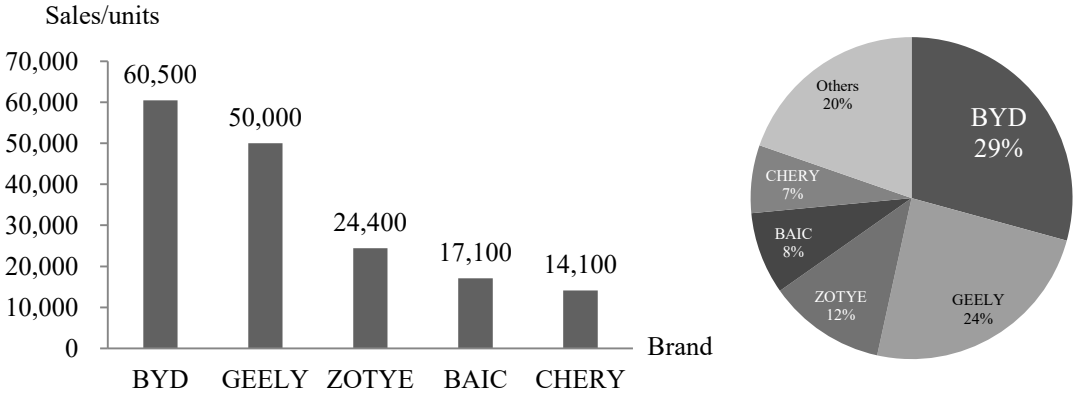

Figure 2.1 Top FiveBest-selling Brands of New Energy Passenger Vehicles in China in 2015

Note: Data are from"Analysis of the top five automakers"(2016).

The subsidized price of most domestic-brand new energy passenger vehicles is more than ¥150,000 ($21,712) and the price of foreign and joint-venture brands is much higher from around ¥250,000 ($36,187) to ¥1,350,000 ($195,406), as shown in Table 2.1. Based on the research findings of Wang (2012), more than 60% of customerswere willing to pay less than ¥100,000 ($14,475) for new energy passenger vehicles, 32% of customerswere willing to pay ¥100,000 ($14,475) to ¥200,000 ($28,949), and only 7% of customerswere willing to pay more than ¥200,000 ($28,949). Therefore, the subsidized price of most new energy passenger vehicles is beyond thepreferred price of most customers.

Table 2.1 Introduction of On-selling New Energy Passenger Vehicles in China

	Model	**Original price/¥10,000 ($10,000)**	**Subsidized price/¥10,000 ($10,000)**	**Data source**
Domestic brand				
BYD	Qin EV300	26.0-31.0 (3.8-4.5)	20.5-25.5 (3.0-3.7)	("BYD Automobile," 2017)
	e6	31.0-37.0 (4.5-5.4)	25.5-31.5 (3.7-4.6)	
	e5	23.0-25.0 (3.3-3.6)	17.5-19.5 (2.5-2.8)	
CHANGAN	Yidong EV	23.5-25.0 (3.4-3.6)	19.0-20.5 (2.8-3.0)	("CHANGAN Automobile," 2017)
BAIC	ES 210	34.7 (5.0)	30.2 (4.4)	("BAIC Automobile," 2017)
	EU 260	25.7 (3.7)	20.2 (2.9)	
	EX200	20.7-21.7 (3.0-3.1)	16.2-17.2 (2.3-2.5)	
	EV200	21.0-24.7 (3.0-3.6)	16.5-20.2 (2.4-2.9)	
	EV 160	17.8-19.0 (2.6-2.8)	13.3-14.5 (1.9-2.1)	
GAC	Chuanqi GA5 PHEA	20.0-22.0 (2.9-3.2)	16.7-18.7 (2.4-2.7)	("GAC Automobile," 2017)
DONGFENG	E30	16.0-20.0 (2.3-2.9)	12.8-16.8 (1.9-2.4)	("DONGFENG Automobile," 2017)
ROEWE	e 550	24.0 (3.5)	20.8 (3.0)	("ROEWE Automobile,"
	e 950	28.9-30.9 (4.2-	25.7-27.7 (3.7-	

		4.5)	4.0)	2017)
	e 50	18.9 (2.7)	14.4 (2.1)	
	750 HYBIRD	23.7 (3.4)	20.5 (3.0)	
GEELY	Dihao EV	22.9-25.0 (3.3-3.6)	17.4-19.5 (2.5-2.8)	(“GEELY Automobile,” 2017)
JAC	iEV5	15.3-18.0 (2.2-2.6)	10. 8-13.5 (1.6-2.0)	(“JAC Automobile,” 2017)
	iEV4	15.3-15.5 (2.21-2.24)	10. 8-11.0 (1.56-1.59)	
	iEV6S	22.0 (3.2)	16.5 (2.4)	
ZOTYE	Yun 100S	15.9-16.9 (2.3-2.4)	11.4-12.5 (1.7-1.8)	(“ZOTYE Automobile,” 2017)
	E30	18.2 (2.6)	13.7 (2.0)	
CHERY	eQ	16.0 (2.3)	11.5 (1.7)	(“CHERY Automobile,” 2017)
	Arrizo 7e	18.0-21.3 (2.6-3.1)	14.8-18.1 (2.1-2.6)	
Foreign brand				
TESLA	Model S	65.8-104.9 (9.5-15.2)	No subsidy	(“TESLA Automobile,” 2017)
	Model X	75.4-115.3 (11.0-16.7)		
	Model 3	-		
BMW	X5 PHEV	92.8 (13.4)	No subsidy	(“BMW Automobile,” 2017)
	i3	41.7-51.7 (6.0-7.5)		
	i8	198.8 (28.8)		
VOLVO	XC90 T8	109.8-135.8 (15.9-19.7)	No subsidy	(“VOLVO Automobile,” 2017)
	S60L E	50.6-56.0 (7.3-8.1)		
Joint-venture brand				
ZINORO (BRILLIANCE-BMW)	1E	-	-	(“ZINORO Automobile,” 2017)
DENZA (BYD-DAIMLER)	DENZA	30.6-32.3 (4.4-4.7)	25.1-26.8 (3.6-3.9)	(“DENZA Automobile,” 2017)
QICHEN (DONGFENG-NISSAN)	Chenfeng	24.3-25.7 (3.5-3.7)	No subsidy	(“QICHEN Automobile,” 2017)

In addition, there is no competitive advantage in the price of new energy passenger vehicleswhen compared withthe price of conventional fuel passenger

vehicles (Sun, 2015). More than half of the customersthought that the price of new energy passenger vehicles should be almost the same or even cheaper than conventional fuel passenger vehicles (Wang, 2012). However, by comparing similar models as shown in Table 2.2, it indicates that the subsidized price of most new energy passenger vehicles is much higher (from 1.2 to 2.5 times) than the price of conventional fuel passenger vehicles. Therefore, the huge price difference greatly reduces the customer purchase intention toward new energy passenger vehiclesin China(Sun, 2015).

Table 2.2 Price Comparison Between New Energy Passenger Vehicles and Similar Conventional Fuel Passenger Vehicles

Brand	**Price of NEPV/¥10,000 ($10,000)**	**Price of CFPV/¥10,000 ($10,000)**	**Data source**
CHANGAN	Yidong EV 19.0-20.5 (2.8-3.0)	Yidong 8.1-9.6 (1.2-1.4)	(“CHANGAN Automobile,” 2017)
GAC	Chuanqi GA5 PHEA 16.7-18.7 (2.4-2.7)	Chuanqi GA5 11.7-15.0 (1.7-2.2)	(“GAC Automobile,” 2017)
ROEWE	e 550 20.8 (3.0)	550 11.9-18.3 (1.7-2.6)	(“ROEWE Automobile,” 2017)
	e 950 28.9-30.9/4.2-4.5	950 18.0-24.0 (2.6-3.5)	
	750 HYBRID 20.5 (3.0)	750 16.3-22.5 (2.4-3.3)	
GEELY	Dihao EV 17.4-19.5 (2.5-2.8)	Dihao 7.0-10.1 (1.0-1.5)	(“GEELY Automobile,” 2017)
CHERY	Arrizo 7e 14.8-18.1 (2.1-2.6)	Arrizo 8.0-9.3 (1.2-1,3)	(“CHERY Automobile,” 2017)
BMW	X5 PHEV 92.8 (13.4)	X5 75.8-91.8	(“BMW Automobile,” 2017)
VOLVO	XC90 T8 109.8-135.8 (15.9-19.7)	XC90 68.8-91.8 (10.0-13.3)	(“VOLVO Automobile,” 2017)
	S60L E 50.6-56.0 (7.3-8.1)	S60L 26.7-39.1 (3.9-5.7)	

Note: NEPV=new energy passenger vehicles, CFPV=conventional fuel passenger vehicles.

The global automobile market will shift from conventional energy to new energy,which will strongly influence the industrial chain of new energy vehicles

(Ruan, 2010). If China wants to compete with developed countries for the advantageous position in the future automobile market, China must advance with the times and seize the opportunity todevelop new energy vehicles (Xu & Wu, 2009).

2.2Literature Reviews and Hypotheses

Various studies have reported the factors thatrelate to customer purchase intention.In this study, customer perceived value, government policy, and environmental consciousness are thought to be positively related to customer purchase intention toward new energy passenger vehicles. Moreover, hypotheses describing the relationships between these concepts are proposed.

2.2.1Purchase Intention

Fishbein and Ajzen (1975) regarded purchase intention as the customer's subjective attitude and assessment, which was a critical factor to predict customer'sbehavior. Monroe (1990) believed that purchase intention was the customer's attitude toward a product or service and the possible willingness to know the product and service.Dodds, Monroe, and Grewa (1991) thought that purchase intention could not only reflect the customer's satisfaction level of a productbut also measure the purchase possibility of the product. Agarwaland Karahanna (2000)stated that purchase intention was formed by the attitude towardpredictive behaviors and subjectivenorms that led to the actual behavior given the availability of opportunities and resources.Schiffman and Kanuk (2000) indicated that purchase intention measured the possibility ofpurchasing a certain product and higher purchase intention revealed higher purchase probability.In addition, purchase intention usually was related to the behavior, perception, and attitude of a consumer. (Mirabi, Akbariyeh, & Tahmasebifard, 2015) and could beinfluenced by internal or external motivations during the buying process (Gogoi, 2013).In summary, purchase intention refers to the customer's attitude toward a product or service and the possibility of buying the product or service, under the influence of some internal orexternal factors. Moreover,

purchase intention can be considered as the prerequisite for purchase behavior and used to predict customer'sbehavior.

2.2.2Customer Perceived Value

As shown in Table 2.3, different scholars have different definitions of customer perceived value, but there still are some similarities: customer perceived value varies from different customers and is highly subjective; customer perceived value is provided by enterprises, perceived by customers and finally determined by customers, while enterprises can affect it through their products and behaviors; customer perceived value is the result of a tradeoff between the benefit and the sacrifice.

Table 2.3 Definition of Customer Perceived Value

Definition	**Scholar**
Customer's overall assessment of the utility of a product based on the perception of what is received and what is given.	Zeithaml (1988: p.14)
A tradeoff between the quality and benefit they perceived in the product relative to the sacrifice they perceived by paying the price.	Monroe (1990: p.46)
Customer's perceived preference for and evaluation of product attribute, attribute performance, and consequence arising from use that facilitates (or blocks) achieving the customer's goal and purpose in use situation.	Woodruff (1997: p.142)
The difference between the benefit and the sacrifice perceived by customers, in terms of their expectations, needs and wants.	Lapierre (2000: p.123)
The contrast balance between received utility and paid cost during the process of buying and using a product.	Dong, Quan, and Qu (1999)
Customer's subjective assessment ofthe relative value of a product or service.	Chen (2003)
The degree of the customer's perception and evaluation on how a product's presence is compatible with thecustomer's need in the entire interaction process.	Cheng (2007)

Since the 1970s, the competitionamong enterprises kept changing and innovating constantly, fromfocusing on product quality to seeking for customer satisfaction and loyalty. Until the 1990s, the concept of customer perceived value was proposed. After that, researches on customer perceived value increasingly became the focus of scholars and entrepreneurs, which was the rational and inevitable result of

enterprises' continuous pursuits of competitive advantage. Porter (1980) pointed out that the competitive strategy obtained through low cost or differentiation was ultimately derived from values that enterprises could create for customers. Woodruff (1997) suggested that customer perceived value is the next source of competitive advantage. Customer perceived value theory not only brought a new marketing strategy to enterprises but also provided new ideas and methods to build core competitiveness. In summary, the academic exploration of customer perceived value is a gradually deepening process. More and more scholars believe that the enterprise should treat the value from the customer's perspective and allow the customer to perceive and maximize the value.

As shown in Table 2.4, Sweeney and Soutar (2001) developed a simple and practical four-dimensional scale of customer perceived value based on the research onthe consumption value. These multiple value dimensions could explain customer'schoice better than a single "value for money" view and produce superior results when investigating the consumption value.

Table 2.4 Four Dimensions of Customer Perceived Value

Price value	The utility derived from the product due to the reduction of its perceived short term and longer term cost.
Quality value	The utility derived from the perceived quality and expected the performance of the product.
Emotional value	The utility derived from the feeling or affective state that a product generates.
Social value	The utility derived from the product's ability to enhance social self-concept.

Based on the Theory of Consumption Values (Sheth, Newman, & Gross, 1991), there were five consumption values that could predict consumption behavior, as well asdescribe and explain it. In addition, according to Acquisition-Transaction Utility Theory (Thaler, 1983), consumer's purchase probability depended on the received value compared to the purchased cost.Zeithaml (1988) proved that customer would have a higher purchase intention if they had a higher perceived value. Bei and Simpson (1995) proved that consumer who perceived more utilities from the purchase was more likely to buy the product.Chen and Dubinsky (2003) conducted a research on customer's choice for the online shop based on customer perceived value. They

found that purchase intention had a significantly positive relationship with customer perceived value. Wang, Li, and Ye (2007) indicated that customer's perceived risk and benefit of a product would affect customer perceived value, and ultimately affect purchase intention. In summary, the positive relationship between customer perceived value and purchase intention had been consistently affirmed by foreign and domestic scholars. Therefore, the following hypotheses were proposed.

H1: Customer purchase intention toward new energy passenger vehicles has a positive relationship with price value.

H2: Customer purchase intention toward new energy passenger vehicles has a positive relationship with quality value.

H3: Customer purchase intention toward new energy passenger vehicles has a positive relationship with emotional value.

H4: Customer purchase intention toward new energy passenger vehicles has a positive relationship with social value.

2.2.3 Government Policy

Government policy is a kind of administrative approach that plays a significant role in guiding citizen's behavior. Nowadays, more and more countries are facing severe environmental issues and the energy crisis, so governments startto formulate relevant policies to guide customer'spurchasing behavior. As a country with a large population and limited resource, China faces the same problems.In the early 2000s, China began to develop the new energy vehicle industry. In order to promote this new industry, the Chinese government had adopted a large number of policies. Table 2.5 shows some important policies on new energy vehicles in China from 2001 to 2015. These policies were mainly focused on two aspects: research and development, and consumption. On the one hand, the Chinese government supported and subsidized new energy vehicle manufacturer's technology research and development; on the other hand, the Chinese government promoted consumption through purchase subsidy, tax incentive, and loan support. In summary, the development of the new energy vehicle industry is placed in an important and strategic position by the Chinese government.

Table 2.5 Government Policies on New Energy Vehicles in China from 2001 to 2015

Year	Policy
2001	National “863” Plan-Electric Vehicle Key Project
2004	Automobile Industry Development Policy
2005	Policy on Optimizing the Structure of Automobile Industry and Promoting the Development of Electric Vehicle
2007	Guidance Directory for Adjustment of Industrial Structure
2008	Notice on Further Strengthening the Work of Saving Fuel
2009	Automobile Industry Promotion Plan
2009	Notice on Carrying Out Pilot Work of Energy Conservation and New Energy Vehicle’s Demonstration and Extension
2009	"Ten Cities, Thousand Vehicles"-Demonstration Project on Popularization and Application of Energy Conservation and New Energy Vehicle
2010	Pilot Work on New Energy Vehicle Subsidy for Private Buyers
2011	Vehicle and Vessel Tax Law of the People's Republic of China
2012	Planning for the Development of Energy Conservation and New Energy Vehicle Industry: 2012-2020
2013	Continuing to Carry Out Popularization and Application of New Energy Vehicle
2014	Guidance on Accelerating Popularization and Application of New Energy Vehicle
2015	Electric Vehicle Charging Infrastructure Development Guide: 2015-202
2016	Financial Support Policy on the Promotion and Application of New Energy Vehicle: 2016-2020

“Financial Support Policy on the Promotion and Application of New Energy Vehicle: 2016-2020” is the Chinese government’s newest policy on new energy vehicles. Thedetails are: (1) the purchaser will be subsidized. When selling the new energy passenger vehicle, the manufacturer settles with the purchaser at the subsidized price, then central budget will grant the subsidy to the manufacturer according to approved procedures; (2) subsidized products by central budget are battery electric vehicles, hybrid vehicles and fuel cell vehicles incorporated in the “Catalog of Recommended Models in the New Energy Vehicle’s Promotion and Application Project”; (3) subsidizing standard is specifically shown in Table 2.6.

Table 2.6 Subsidizing Standard of New Energy Passenger Vehiclesin China in 2016

	R: Driving range (km.)			
	100≤R＜150	150≤R＜250	R≥250	R≥50
Battery	¥32,000($4,633)	¥45,000($6,515)	¥55,000($7,962)	-

electric vehicle				
Hybrid vehicle	-	-	-	¥32,000($4,633)
Fuel cell electric vehicle	¥200,000($28,954) per vehicle			

Note: Driving range is the vehicle's highest mileage only relying on battery power in pure electric mode.

Incentive Theory (Skinner, 1974) is a specific theory of motivation, which concerns the incentive or motive to do something. Stern (1999) indicated that the incentive could lead to and instruct consumer's pro-environmental behaviorand he found that the non-monetary incentive, especially associated with convenience, could also have an important effect on consumer's pro-environmental behavior. Tang and Zheng (2011) proved the positive relationship between government subsidies and the market share of hybrid vehicles in 4 selected cities in China through scenario analysis and panel data fixed-effect model. Tang and Wu (2012) confirmed the positive relationship between government subsidies and the sales of hybrid vehiclesbased on customerutility theory and the multiple regression models. Xin (2012) conducted an in-depth empirical study of customer's potential behavior toward new energy passenger vehicles and found that government policy was one of the factors that affected customer purchase intention. Ji (2014) indicated that customer purchase intention toward new energy passenger vehicleswas positively related to industrial policy formulated by the government. Niu (2015) verified that government promotion policy had a positive effect on customer purchase intention toward new energy passenger vehicles. In summary, the positive relationship between government policy and purchase intention had been consistently affirmed by foreign and domestic scholars. Therefore, the following hypothesis was proposed.

H5: Customer purchase intention toward new energy passenger vehicles has a positive relationship with government policy.

2.2.4 Environmental Consciousness

Environmental consciousness referred to human awareness of environmental issues and concern about the impact of their behaviors on the environment (Gadenne, Kennedy, & McKeiver, 2009).With an unprecedented focus on the sustainability in the past few decades, governments, businesses, and individuals had gradually become aware of the need to protect the environment (Gadenne, Sharma, Kerr, & Smith, 2011).The concern about environmental issues had been shared not only by environmental groups, legislators, and public authorities but also by customers and local communities (Petts, 1998). Therefore, more and more customers are aware that it is necessary to change their previous consumption practices and decrease the impacts of their behaviors on the environment.

Based on the Norm-Activation Theory (Schwartz, 1977), Stern (2000) confirmed that environmental concern that is within environmental awareness could be transformed into behavior. Schlegelmilch and Bohlen (1996) indicated that customer's environmental consciousness had a positive effect on the pro-environmental purchasing behavior, with the green product market expanding at a remarkable rate. Chitra (2007) suggested that customer's environmental consciousness had a positive effect on the purchase willingness for theeco-friendly product. Qu (2007) pointed out that customer's environmental behavior was fundamentally affected by the environmental consciousness instead of the social background. Wang, Li, Liao and Wen (2010) confirmed that environmental consciousness could effectively predict customer purchase intention. Sun, Li and Huang (2010) found that, in Guangzhou and Beijing, customer purchase attitude toward the green product had a positive relationship with environmental consciousness and purchase attitude would further affect purchase intention. Huang, Lin, Lai, and Lin (2014) found that environmental consciousness positively affected consumer's greenconsumption behavior. In summary, the positive relationship between environmental consciousness and purchase intention had been consistently affirmed by foreign and domestic scholars. Therefore, the following hypothesis was proposed.

H6: Customer purchase intention toward new energy passenger vehicles has a positive relationship with environmental consciousness.

CHAPTER 3

METHODOLOGY

3.1Measures

The first independent variable, customer perceived value (price value, quality value, emotional value and social value), was measured by 24 modified questions originally developed by Sweeney and Soutar (2001), Oliver and Lee (2010), Ozaki and Sevastyanova (2011), Lai, Liu, Sun, Zhang, and Xu (2015); the second independent variable, government policy, was measured by 8 modified questions originally proposed by Lai et al. (2015); the third independent variable, environmental consciousness, was measured by 7 modified questions originally advanced by Schlegelmilch, Bohlen, and Diamantopoulos (1996), Oliver and Lee (2010), Ozaki and Sevastyanova (2011); the dependent variable, purchase intention, was measured by 3 modified questions originally introduced by Lai et al. (2015).Besides, all the questions for customer perceived value, government policy, environmental consciousness and purchase intention were scored on a five-level Likert scale: 1 was equal to strongly disagree, 2 was equal to disagree,3 was equal to neutral, 4 was equal to agree, and 5 was equal to strongly agree.

In addition to the independent and dependent variables, demographic factors were controlled inthis study. Control variables include gender, age, education, individual annual income and knowledge about new energy vehicle. Specifically, gender was measured as a dummy variable (male=1, female=0); age was measured as an ordinal scale (1=below 25, 2=25-35, 3=36-45, 4=above 45); education was measured as an ordinal scale (1=under college, 2=college, 3=undergraduate, 4=master, 5=doctor); individual annual income was measured as an ordinal scale (1=below ¥50,000/$7,238, 2=¥50,000-¥100,000/$14,477, 3=¥100,000-¥150,000/$21,715, 4=¥150,000-¥200,000/$28,854, 5=above ¥200,000); knowledge about new energy

vehicle was measured as an ordinal scale (1=nothing, 2=little, 3=some, 4=much, 5=a great deal).

3.2Samples and Data Collection

The self-administered questionnaire was used to collect data from respondents. Since the questionnaire was translated from English to Chinese, pilot studies were used. Through two rounds of pilot studies, the results showed that the questionnaire could be clearly understood by native speakers and no deviation was found.In this study, snowball sampling and convenience sampling were used and the questionnaire was voluntarily answered by respondents without any compensation. A total of 375 questionnaires were distributed, including 225 online questionnaires and 150 paper questionnaires.Online distribution was implemented through social media. The link to the online questionnaire was posted on Wechat, Facebook, and Twitter to search for and invite respondents to participate. Also, messages asking respondents to share the link were sent in order to reach more respondents. Paper distribution was implemented in the shopping malls, public libraries, and parks. In the end, 317 completely filled questionnaires were returned, including 225 online questionnaires through snowball sampling and 92 paper questionnaires through convenience sampling. Thus, it yielded an 84.5 percent response rate.

3.3Analysis Strategy

Data wereanalyzedby ordinary least squares (OLS) regression which is one of the most basic and most commonly used prediction techniques with applications in fields as diverse as statistics, finance, economics, and psychology.It allows the researcher to estimate the relationshipbetween a set of independent variables and dependent variables. Its implementation on computers is efficient, so it can be very quickly applied to problems with hundreds of features anddata. Moreover, it produces solutions that are easily interpretable. The data analysis was performed using PASW Statistics 18.0.0.

CHAPTER 4

RESULTS

Descriptive statistics are reported in Table 4.1. It shows that the final sample is composed of 153 males (48.3%) and 164 females (51.7%). For the age, 125 respondents wereunder 25, 59 respondents were between 25 and 35, 48 respondents were between 36 and 45, and 85 respondents were above 45. For the education, 40 respondents did not receive the college education, 45 respondents received the college education, 148 respondents held Bachelor's degrees, 58 respondents held Master's degrees, and 26 respondents held Doctor's degrees. For the knowledge about the new energy vehicle, 32 respondents knew nothing, 84 respondents knew little, 159 respondents knew something, 39 respondents knew much, and 3 respondents knew a great deal.

Table 4.1 Descriptive Statistics of All Respondents

Gender	Male:153(48.3%) Female: 164(51.7%)
Age	Under 25: 125 (39.4%) 25-35: 59 (18.6%) 36-45: 48 (15.1%) Above 45: 85 (26.8%)
Education	Under college: 40 (12.6%) College: 45 (14.2%) Undergraduate: 148 (46.7%) Master: 58 (18.3) Doctor: 26 (8.2%)
Occupation	Private owner: 18 (5.7%) Company employee: 70 (22.1%) Government employee: 9 (2.8%) Student: 140 (44.2%) Worker: 56 (17.7%) Other: 24 (7.6%)
Individual annual income	Under ¥50,000/$7,238: 202 (63.7%) ¥50,000-¥100,000/$14,477: 74 (23.3%)

	¥100,000-¥150,000/$21,715: 25 (7.9%) ¥150,000-¥200,000/$28,854: 6 (1.9%) Above ¥200,000: 10 (3.2%)
Main purpose of buying the vehicle	Work commuting: 168 (53.0%) Business: 8 (2.5%) Long-distance travelling: 14 (4.4%) Short-distance travelling: 36 (11.4%) Other: 91 (28.7%)
Number of owned conventional vehicles	0: 161 (50.8%) 1: 124 (39.1%) 2: 23 (7.3%) 3 or more: 9 (2.8%)
Knowledge about the new energy vehicle	Nothing: 32 (10.1%) Little: 84 (26.5%) Some: 159 (50.2%) Much: 39 (12.3%) A great deal: 3 (0.9%)
Number of owned new energy vehicles	0: 301 (95.0%) 1: 10 (3.2%) 2: 6 (1.9%) 3 or more: 0
Preferred type of the new energy vehicle	Hybrid vehicle: 189 (59.6%) Battery electric vehicle: 42 (13.2%) Fuel cell electric vehicle: 31 (9.8%) Hydrogen engine vehicle: 27 (8.5%) Other: 28 (8.8%)
Preferred brand of the new energy vehicle	Domestic brand: 111 (35.0%) Foreign brand: 129 (40.7%) Joint-venture brand: 77 (24.3%)
Preferred price of the new energy vehicle	Mean: ¥155,500/$22,500 Standard deviation: 9.067

Prior to OLS regression analysis, it was necessary to perform a series of preliminary analyses. Firstly, construct reliability was evaluated by Cronbach's alpha (α). The results, as shown in Table 4.2, indicated that all coefficients exceeded 0.6 and were acceptable as recommended by Nunnally (1967). Thus, the reliability was confirmed. Secondly, Table 4.3 reported Pearson correlations among allvariables. The results showed that customer purchase intention had a positive correlation with price value, quality value, emotional value, social value, government policy and environmental consciousness separately and the correlation was significant at the 0.01 level; customer purchase intention had a positive correlation with knowledge about the new energy vehicle, which meant customers with more knowledge about the new

energy vehicle would have higher purchase intention, and the correlation was significant at the 0.05 level. In addition, the results indicated that females had higher purchase intention than males, younger customers had higher purchase intention than older customers, customers with lower education had higher purchase intention than customers with higher education,and customers with higher individual annual income had higher purchase intention than customers with lower individual annual income,but all these correlations were not statistically significant.

Finally, the results of OLS regression analysisare presented in Table 4.4. Moreover, the test for the possible presence of multicollinearity among all variables was performed using the Variance Inflation Factor (VIF) statistics. The VIFs in the model ranged from 1.140 to 2.422, which was considerably below the critical value of 3.3 as suggested by Petter, Straub and Rai (2007).

Table 4.2 Construct Reliability Results

	PV	QV	EV	SV	GP	EC	PI
Cronbach's alpha	0.627	0.664	0.875	0.857	0.917	0.818	0.629

Note: PV=price value, QV=quality value, EV=emotional value, SV=social value, GP=government policy, EC=environmental consciousness, PI=purchase intention.

Table 4.3 Pearson Correlations Results

	PI	PV	QV	EV	SV	GP	EC	Gender	Age	Education	IAI	KNEV
PI	1											
PV	.573**	1										
QV	.393**	.309**	1									
EV	.512**	.321**	.418**	1								
SV	.379**	.129*	.313**	.655**	1							
GP	.272**	.102	.056	.366**	.240**	1						
EC	.448**	.176**	.256**	.542**	.457**	.498**	1					
Gender	-.037	-.089	-.137*	-.101	.004	.068	-.127*	1				

Age	-.027	-.072	-.172**	-.041	.057	.104	.155**	.062	1			
Education	-.034	.002	-.028	-.004	-.091	.048	-.121*	.013	-.480**	1		
IAI	.016	-.140*	-.125*	-.012	.081	.142*	.011	.195**	.357**	.092	1	
KNEV	.139*	.041	.005	-.016	-.003	.153**	.020	.235**	.171**	.011	.244**	1

Note: IAI=individual annual income, KNEV=Knowledge about the new energy vehicle.

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.4 Ordinary Least Squares Regression Results

	Dependent variables
	Purchase intention
Independent variables	
Price value	0.418***
Quality value	0.118*
Emotional value	0.107*
Social value	0.062
Government policy	0.015
Environmental consciousness	0.179***
Control variables	
Gender	0.026
Age	-0.037
Education	-0.024
Individual annual income	0.050
Knowledge about new energy vehicle	0.067*
R-square	0.527
Adjusted R-square	0.510
Number of observations	317

Note: Unstandardized beta coefficients are reported

***. Correlation is significant at the 0.001 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Given the statistical analyses stated above, hypotheses1, 2, 3 and 6 are supported, while hypotheses 4 and 5 are not supported. Details of all hypotheses are shown as follows:

Hypothesis 1 predicted a positive relationship between price value and customer purchase intention toward new energy passenger vehicles. The result indicated a significantlypositive relationship between the two variables (β=.418; $p<.001$). Therefore, Hypothesis 1 is supported.

Hypothesis 2 predicted a positive relationship between quality value and customer purchase intention toward new energy passenger vehicles. The result indicated a significantlypositive relationship between the two variables (β=.118; $p<.05$). Therefore, Hypothesis 2 is supported.

Hypothesis 3 predicted a positive relationship between emotional value and customer purchase intention toward new energy passenger vehicles. The result indicated a significantlypositive relationship between the two variables (β=.107; $p<.05$). Therefore, Hypothesis 3 is supported.

Hypothesis 4 predicted a positive relationship between social value and customer purchase intention toward new energy passenger vehicles. The result indicated a positive relationship between the two variables, but the relationship was not statistically significant (β=.062; $p>.05$). Therefore, Hypothesis 4 is not supported.

Hypothesis 5 predicted a positive relationship between government policy and customer purchase intention toward new energy passenger vehicles. The result indicated a positive relationship between the two variables, but the relationship was not statistically significant (β=.015; $p>.05$). Therefore, Hypothesis 5 is not supported.

Hypothesis 6 predicted a positive relationship between environmental consciousness and customer purchase intention toward new energy passenger vehicles. The result indicated a significantlypositive relationship between the two variables (β=.179; $p<.001$). Therefore, Hypothesis 6 is supported.

Lastly, the relationships between control variables and the dependent variable are described as follows: customer purchase intention had a significantly positive relationship with knowledge about the new energy vehicle (β=.067; $p<.05$), which meant customers with more knowledge about the new energy vehicle would have higher purchase intention. In addition, males had higher purchase intention than

females (β=0.026; p>.05), younger customers had higher purchase intention than older customers (β=-0.037; p>.05), customers with lower education had higher purchase intention than customers with higher education (β=-0.024; p>.05),customers with higher individual annual income had higher purchase intention than customers with lower individual annual income (β=.050; p>.05), but all these relationships were not statistically significant.

CHAPTER 5

DISCUSSION

5.1 Results

It is proved in this study thatcustomer purchase intention toward new energy passenger vehicles had a positive relationship that is significant at the 0.001 level with price value and environmental consciousness.Specifically, customers with higher price value and environmental consciousnesswould have higher purchase intention. In addition, it isprovedthat customer purchase intention hada positive relationship that is significant at the 0.5 level with quality value and emotional value. Concretely, customers with higher quality value and emotional value would have higher purchase intention. Furthermore, it isfound that customer purchase intention did not havea significantly positive relationship with social value and government policy. In summary, price value and environmental consciousness had strongest positive effects on customer purchase intention toward new energy passenger vehicles, followed by quality value and emotional value, but social value and government policy did not affect customer purchase intention.

5.2 Research Contributions

Firstly, this study makes a contribution to previous studies of new energy passenger vehicles in China. This study conducted a comprehensive and coherent research from three different aspects: perceived value, government policy, and environmental consciousness, which enriched the knowledge of customer purchase intention. Secondly, this study confirms the positive relationship between customer purchase intention and price value, environmental consciousness. This result is consistent with previous research findings. Based on the results of the questionnaire,

the preferred average price of the new energy passenger vehiclewas ¥155,000 ($22,436)which was less than the price of most on-selling new energy passenger vehicles in China. Therefore, it supports that price value has a strong effecton customer purchase intention toward new energy vehicles. Moreover, this study further stresses the importance of environmental awareness. Thirdly, this study proves the positive relationship between customer purchase intention and quality value, emotional value, which is also consistent with previous research findings. It indicates that customers not only focus on the qualitybut also emphasizethe emotional feeling when buying and using a product. Lastly, this study shows that customer purchase intention do not have a significantly positive relationship with social value and government policy. This result is not consistent with previous research findings. It suggests that customers have not regarded new energy passenger vehicles as the symbol of identity and status nowadays. Furthermore, the Chinese government will gradually decrease the subsidy of purchasing new energy passenger vehicles in the next few years (Ministry of Finance of the People's Republic of China et al., 2015). Therefore, it can be reasonably predicted that government policy will not affect customer purchase intention in the future.

Moreover, there are some practical implications of this study and the following suggestions are proposed. Firstly, the Chinese government should pay more attention to encouraging, supporting and subsidizing the technology research and development of new energy passenger vehicle manufacturers, which canmakevehicle manufacturers reduce production costs and then provide customers with a lower price for the new energy passenger vehicle. Secondly, all kinds of media, environmental protection organizations, local communities, and the Chinese governmentshould strengthenthe promotion of environmental protection knowledge in society, which can be a feasible way to increase customers’environmental consciousness. Thirdly, many respondents are concerned about the battery lifespanand driving range according to the questionnaire results, so vehicle manufacturers should devote more efforts to ensure the quality of the new energy passenger vehicle. In addition, the Chinese government should establish stringent production standards and quality inspection systemto avoid security incidents. Lastly, vehicle manufacturers should provide

customers with more chances to test driving, which can give customers direct and true emotional feelings about drivingnew energy passenger vehicles.

5.3 Limitationsand Future Research Direction

There are two main limitations of this study. Firstly, data were mainly collected from Chongqing province. Therefore, a study based on geographically limited data may weaken the generalizability of the results. Secondly, snowball sampling and convenience sampling may cause bias or inaccuracy of the results. Snowball sampling is biased because the first respondents give people with more social connections an unknown but higher chance of selection (Berg, 2006). Moreover, convenience sampling is biased because the researchermay unconsciously approach some kinds of respondents and avoid others (Lucas, 2014).

Although this study deepens the understandingof factors affecting customer purchase intention toward new energy passenger vehicles, more research avenues can be explored. Firstly, future studies can extend the sample size and collect data from other regions of China. Secondly, future studies can expand the sampling frame in order to get a more diverse sample composition. Thirdly, other factors related to customer purchase intention can be explored. For instance, customers still hold a big doubt about new energy passenger vehicles and think it is risky to purchase such a new product. Therefore, customer perceived risk can be added infuture studies.

CHAPTER 6

CONCLUSION

In conclusion, this study deepensthe understanding of the current development situation of new energy passenger vehiclesin China and expands previous knowledge about factors affecting customer purchase intention toward new energy passenger vehicles in China. Despite the research limitations, this study proved that customer purchase intention toward new energy passenger vehicles had a positive relationship that is significant at the 0.001 level with price value and environmental consciousness, and a positive relationship that is significant at the 0.05 level with quality value and emotional value.Furthermore,this studyfound that customer purchase intention did not have a significantly positive relationship with social value and government policy. Accordingly, the following suggestions were proposed: the Chinese government should support the technology research and development of vehicle manufacturers to reduce production costs and provide a lower price for the new energy passenger vehicle; all kinds of media, environmental protection organizations, local communities, and the Chinese government should strengthen the promotion of environmental protection knowledge to increase customers' environmental consciousness; vehicle manufacturers should devote more efforts to ensure the quality of the new energy passenger vehicle and the Chinese government should establish stringent production standards and quality inspection system; vehicle manufacturers should provide customers with more chances to test driving to give customers direct and true emotional feelings about driving the new energy passenger vehicle.

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